

**PLANT COMMUNITY STRUCTURE AND BIOMASS
PRODUCTIVITY OF SEASONALLY FLOODED WETLANDS OF
BRAHMAPUTRA FLOODPLAINS, ASSAM, INDIA**

Thesis submitted to the
Saurashtra University, Rajkot (Gujarat)



For the Award of the Degree of
DOCTOR OF PHILOSOPHY
IN
WILDLIFE SCIENCE

By
MONIKA SHARMA
PhD Registration No: 16802

WILDLIFE INSTITUTE OF INDIA



January 2024

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Under the Supervision of

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Ms. **Monika Sharma** has put in more than six terms of research work embodied in this thesis under our guidance and supervision. The work presented in this thesis has not been submitted for any degree of any other University or Institution.

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I also certify that the research work was appreciated by all who were present, and the comments made by the faculty and researchers have been appropriately included in the thesis.

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Dean, Faculty of Wildlife Sciences,
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Date: 25/01/2024

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Table of Contents

S. No.	Content	Page No.
i	<i>List of Tables</i>	iii
ii	<i>List of Figures</i>	v
iii	<i>List of Plates</i>	ix
iv	<i>Publications</i>	xi
v	<i>Acknowledgement</i>	xiii
vi	<i>Executive Summary</i>	xx
CHAPTER 1	Introduction	1-16
1.1	Background	1
1.2	Literature Review	5
1.3	Justification of the Study	13
1.4	Objectives	14
1.5	Key Questions	14
1.6	Organization of Thesis	16
CHAPTER 2	Study Area	17-28
2.1	Background	17
2.2	Conservation History	17
2.3	Terrain, Geology and Soil	19
2.4	Climate	19
2.5	Flora and Fauna	21
2.6	Habitat Management	24
2.7	Local Communities and Livelihoods	26
2.8	Threats	26
CHAPTER 3	Soil Seed Bank Characteristics and Composition of Riverine Alluvial Grasslands	29-78
3.1	Introduction	29
3.2	Methodology	31
3.3	Results	35
3.4	Discussion	72
3.5	Conclusion	76
CHAPTER 4	Plant Species Composition and Structure of Riverine Alluvial Grasslands	79-109
4.1	Introduction	79
4.2	Methodology	81
4.3	Results	85
4.4	Discussion	104
4.5	Conclusion	108
CHAPTER 5	Biomass Productivity of Riverine Alluvial Grasslands	110-156
5.1	Introduction	110

S. No.	Content	Page No.
5.2	Methodology	114
5.3	Results	117
5.4	Discussion	150
5.5	Conclusion	155
CHAPTER 6	Resource Dependence and Attitudes of Local Communities Toward Conservation of Kaziranga Tiger Reserve	157-189
6.1	Introduction	157
6.2	Methodology	159
6.3	Results	161
6.4	Discussion	184
6.5	Conclusion	188
CHAPTER 7	Synthesis and Management Recommendations	190-196
7.1	Introduction	190
7.2	Key Research Findings	190
7.3	Conservation Implication and Management Recommendation	195
	Literature Cited	197-222
Appendices	List of Appendices	223-524
Appendix 1	Factors Affecting Plant Species Composition and Biomass Productivity of Wet Grasslands	223
Appendix 2	Threats to Ungulates in the Kaziranga Tiger Reserve, Assam, India	223
Appendix 3	Soil Seed Bank Characteristics and Composition of Riverine Alluvial Grasslands	224-347
Appendix 4	Plant Species Composition and Structure of Riverine Alluvial Grasslands	348-367
Appendix 5	Biomass Productivity of Riverine Alluvial Grasslands	368-405
Appendix 6	Resource Dependence and Attitudes of Local Communities Toward Conservation of Kaziranga Tiger Reserve	406-524

LIST OF TABLES

Table No.	Title	Page No.
Table 4.1	Plant species composition of riverine alluvial grasslands recorded during 2014-15 in Kaziranga National Park, Assam, India	87
Table 4.2	Dominant plant families recorded from riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India	88
Table 4.3	Overall and seasonal plant communities recorded from riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India	89
Table 4.4	Diversity indices recorded from riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India	93
Table 4.5	Soil nutrient content (in percentages) recorded from experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India	94
Table 5.1	Overall and seasonal aboveground biomass productivity (g m^{-2}) recorded from experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India	118
Table 5.2	Overall and seasonal aboveground biomass productivity (g m^{-2}) in terms of classes (monocots, dicots and ferns) recorded from experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India	119
Table 5.3	Overall and seasonal aboveground biomass productivity (g m^{-2}) in terms of growth forms (grasses, sedges, climbers, herbs, ferns, shrubs and trees) recorded from experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India	120
Table 5.4	Overall and seasonal aboveground biomass productivity (g m^{-2}) in terms of life cycles (annuals, perennials and deciduous) recorded from experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India	121
Table 5.5	Overall and seasonal belowground biomass productivity (g m^{-2}) recorded from experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India	134
Table 5.6	GLM models with the environmental variables that best explain the variations in the aboveground biomass productivity (g m^{-2}) of experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India	136
Table 5.7	GLM models with the environmental variables that best explain the variations in the belowground biomass productivity (g m^{-2}) of	146

Table No.	Title	Page No.
	experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India	
Table 6.1	Villages with maximum resource extraction in terms of thatch, fodder, fuelwood and fish material selected for a socio-economic and entry point survey around Kaziranga Tiger Reserve, Assam, India	184

LIST OF FIGURES

Figure No.	Title	Page No.
Figure 2.1	Location of the study area showing Kaziranga National Park, Assam, India	18
Figure 2.2	Precipitation based dendrogram classification depicting seasons classification during 2014-15 in Kaziranga National Park, Assam, India	20
Figure 2.3	Trends in mean precipitation and temperature during 2014-15 in Kaziranga National Park, Assam, India	20
Figure 4.1	Species-area curve for experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India. (Herbivore exclusion in short grassland: N-324; Herbivore inclusion in short grassland N-144; Herbivore exclusion in tall grassland N-216; Herbivore inclusion in tall grassland N-216; Herbivore exclusion in tall grassland burning N-144; Herbivore exclusion in tall grassland invasive removal N-108)	83
Figure 4.2	Graph showing the occurrence of invasive (in percentages) in tall grassland experimental sites during 2014-15 in Kaziranga National Park, Assam, India	92
Figure 4.3	NMDS ordination plots depicting dissimilarities in plant species composition among experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park (a) overall (adonis pseudo $F_{1152}=41.62$, $df=5$, $R^2=0.72$, $P\leq 0.001$), (b) dry season (adonis pseudo $F_{612}=40.51$, $df=5$, $R^2=0.84$, $P\leq 0.001$), and (c) wet season (adonis pseudo $F_{540}=24.76$, $df=5$, $R^2=0.78$, $P\leq 0.001$)	101
Figure 4.4	CCA triplot showing the plant species distribution in the experimental sites of riverine alluvial grasslands along the environmental gradient (a) overall, (b) dry season, and (c) wet season. Abbreviations of environmental gradient: C-organic carbon, N-nitrogen, P-phosphorus, K-potassium, RF-rainfall, MINT-minimum temperature and MAXT-maximum temperature. For plant species abbreviations, refer to Appendix Table 4.5	103
Figure 5.1	Graph showing the aboveground biomass productivity of invasives (in $g\ m^{-2}$) in tall grassland experimental sites during 2014-15 in Kaziranga National Park, Assam, India	125

Figure No.	Title	Page No.
Figure 5.2	Correlogram showing the relationship between environmental parameters explaining variation in aboveground biomass productivity (g m^{-2}) of riverine alluvial grasslands of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P>0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P<0.05$)	138
Figure 5.3	Correlogram showing the relationship between environmental parameters explaining variation in aboveground biomass productivity (g m^{-2}) of short grasslands (SG) of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P>0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P<0.05$)	138
Figure 5.4	Correlogram showing the relationship between environmental parameters explaining variation in aboveground biomass productivity (g m^{-2}) of tall grassland (TG) of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P>0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P<0.05$)	139
Figure 5.5	Correlogram showing the relationship between environmental parameters explaining variation in aboveground biomass productivity (g m^{-2}) of herbivore exclusion in short grassland (HES) of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P>0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P<0.05$)	140
Figure 5.6	Correlogram showing the relationship between environmental parameters explaining variation in aboveground biomass productivity (g m^{-2}) of herbivore inclusion in short grassland (HIS) of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P>0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P<0.05$)	141

Figure No.	Title	Page No.
Figure 5.7	Correlogram showing the relationship between environmental parameters explaining variation in aboveground biomass productivity (g m^{-2}) of herbivore exclusion in tall grassland (HET) of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P>0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P<0.05$)	142
Figure 5.8	Correlogram showing the relationship between environmental parameters explaining variation in aboveground biomass productivity (g m^{-2}) of herbivore inclusion in tall grassland (HIT) of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P>0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P<0.05$)	143
Figure 5.9	Correlogram showing the relationship between environmental parameters explaining variation in aboveground biomass productivity (g m^{-2}) of herbivore exclusion in tall grassland with burning (HETB) of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P>0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P<0.05$)	144
Figure 5.10	Correlogram showing the relationship between environmental parameters explaining variation in aboveground biomass productivity (g m^{-2}) of herbivore exclusion in tall grassland with invasive removal (HETIR) of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P>0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P<0.05$)	145
Figure 5.11	Correlogram showing the relationship between environmental parameters explaining variation in belowground biomass productivity (g m^{-2}) of riverine alluvial grasslands of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P>0.05$), whereas the values within the red	147

Figure No.	Title	Page No.
	(negative correlation) and blue (positive correlation) boxes represent significant correlation ($P<0.05$)	
Figure 5.12	Correlogram showing the relationship between environmental parameters explaining variation in belowground biomass productivity (g m^{-2}) of herbivore inclusion in short grassland (HIS) of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P>0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P<0.05$)	148
Figure 5.13	Correlogram showing the relationship between environmental parameters explaining variation in belowground biomass productivity (g m^{-2}) of herbivore inclusion in tall grassland (HET) of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P>0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P<0.05$)	149

LIST OF PLATES

Plate No.	Title	Page No.
Plate 1	Glimpses of (a) short grassland, (b) tall grasslands, (c) wetland (locally known as beels), and (d) woodland	525
Plate 2	Glimpses of eight mega- and meso-herbivores, (a) greater one-horned rhino (<i>Rhinoceros unicornis</i>), (b) Asian elephant (<i>Elephas maximus</i>), (c) Asiatic wild buffalo (<i>Bubalus arnee</i>), (d) Indian bison (<i>Bos gaurus</i>), (e) swamp deer (<i>Rucervus duvaucelii</i>), (f) hog deer (<i>Axis porcinus</i>), (g) sambar (<i>Rusa unicolor</i>), and (h) Indian red muntjac (<i>Muntiacus muntjak</i>)	525
Plate 3	Glimpses of, (a) flood, (b) siltation, (c) controlled burning management, (d) invasives <i>Mimosa</i> spp. and <i>Mikania micrantha</i> , (e) ecotourism activities including elephant ride and jeep safari, and (f) local community settlements and occupations	527
Plate 4	Glimpses of soil seed bank study (a) soil sample collection from short grasslands, (b) soil sample collection from tall grassland, (c) sun drying soil samples before sieving, (d) seed hand sorting process from soil sample using sieves, (e) types of seeds separated from soil samples, (f) types of seed surface identified from soil samples viz., smooth and rough, (g) types of seed conditions identified from soil samples viz., whole seeds, cracked seeds and split seeds, (h) soil sample processing for seed germination in greenhouse, (i) earthen pots arrangement for seed germination, and (j) earthen pots showing plant species germinated under natural and flooding treatments	528
Plate 5	Glimpses of (a) short grassland experimental sites, (b) herbivore exclusion and inclusion experiments conducted in short grassland, (c) herbivore exclusion experiment conducted in tall grassland, (d) herbivore inclusion experiment conducted in tall grassland, (e) herbivore exclusion with burning experiment conducted in tall grassland, (f) flood inundation in short grassland experimental site, and (g) flood inundation in tall grassland experimental site	530
Plate 6	Glimpses of vegetation characteristics and biomass estimation studies (a) collection and identification of plant species, (b) experimental sites GPS location data collection, (c) abundance data collection using quadrat method to determine vegetation composition and structure, (d) biomass data collection using harvest method to determine aboveground biomass productivity, (e) harvested biomass plot, (f) hand sorting of individual plant species to determine wet and dry weight, (g) collection of roots and rhizomes to determine belowground biomass productivity, (h) roots and rhizomes material collected from below soil	532

	surface, (i) weighing balance to record wet and dry weight of individual plant species and roots and rhizomes material, (j) drying plant species and roots and rhizomes materials using electric oven, and (k) soil sample collection from short and tall grasslands for soil nutrient analysis using soil auger	
Plate 7	Glimpses of soil nutrient laboratory analysis (a) sun drying of soil samples for soil nutrient analysis, (b) weighing of soil samples for soil nutrient analysis, (c) soil carbon estimation using Walkley-Black titration method (d) soil phosphorus estimation using UV Visible Spectrophotometer	534
Plate 8	Glimpses of socio-economic and entry-point surveys (a) interaction with local communities using questionnaire survey, (b) livestock's grazing recorded along the fringes of Reserve, (c) collected <i>Saccharum</i> spp. bundles for thatching, (d) collected <i>Imperata cylindrica</i> bundles for thatching, (e) thatch construction using species viz., <i>Saccharum</i> spp., <i>Imperata cylindrica</i> and <i>Chrysopogon zizanioides</i> , (f) fodder collection for livestock, (g) wood collection along Reserve boundary (h) entry-point survey to determine quantity of resource extraction, (i) permanent and temporary nylon fishing nets for fish extraction, and (j) community fishing and extracted fish material	535

PUBLICATIONS

List of Publications

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EXECUTIVE SUMMARY

1. Climatic, biotic and pyric factors play a vital role in grassland management by shaping the structure and function of vegetation communities. Thus, any change in frequency, intensity and size of the aforementioned factors can accelerate and decelerate grassland the successional processes. Climatic factors like flooding (high precipitation) and temperature influence changes in the seed bank characteristics, vegetation communities, plant species diversity, biomass productivity and soil nutrient characteristics. Inundation due to floods has profound effects on the seed banks of wet grasslands, impacting the germination, establishment, and survival of plant species. Biotic factors such as grazing exclusion or inclusion can structurally change vegetation composition, plant species diversity, biomass productivity, and growth of woody and invasive species. It also functionally alters the soil nutrient cycle by increasing and decreasing soil organic carbon (C), nitrogen (N), phosphorous (P) and potassium (K) content through defoliation, trampling, defecation and urination processes. Pyric factors such as prescribed burning and invasive removal structurally alter vegetation composition and assemblages by maintaining heterogeneity and native vegetation recovery and increasing plant species diversity and biomass productivity. These practices also limit the growth of woody and invasive species and functionally enhance the soil nutrient content (C, N, P & K). Besides this, the resource extraction from the fringe villages of the Reserve by local communities also changes the structure and functions of the wet grassland ecosystems, which leads to the degradation of surrounding areas of the Protected Area and results into a conflict between the Forest Department and local people. Kaziranga National Park (KNP) in the Brahmaputra floodplains provides an opportunity to examine the diverse aspects of seasonally flooded wetlands, particularly focusing on their seed bank characteristics, plant species composition, biomass productivity, and the sustainable management of their resources. These wet grasslands, which are inherently linked to the web and flow of water regimes, present a rich tapestry of ecological interactions and human utilization. The study aimed to — a) examine the seed bank characteristics of seasonally flooded wet grasslands, b)

- examine the plant species composition of these wet grasslands in terms of species diversity, richness and community structure, c) determine the biomass productivity of these wet grasslands in different inundation and management regimes (burning and invasive removal), and d) quantify the amount of biomass extracted by the local people from Kaziranga Tiger Reserve (KTR).
2. The study was carried out in KNP, Assam, India, situated in the Brahmaputra floodplains. It lies between latitudes 26°34' N to 26°46' N and longitudes 93°08' E to 93°36' E and encompasses an area of 429 km². The climate of the area is subtropical monsoon type. From January 2014 to December 2015, the total annual precipitation in the study area varied from 1630.4 to 2247.8 mm, with a mean annual precipitation of 1939.1 ±308.7 mm. High precipitation was recorded in the wet season (April to September), which varied from 1557 to 2021.2 mm with a mean precipitation of 1939.1 ±308.7 mm, and low precipitation in the dry season (October to March), which varied from 73.4 to 226.6 mm with mean precipitation 150 ±76.6 mm. The MAXT ranged from 27 to 39 °C, and the MINT ranged from 5 to 23 °C. Floods are an annual process in Kaziranga (from June to October), which replenish the soil with nutrient-rich alluvial deposits. KNP, with its flat terrain, is characterized by numerous permanent water bodies (*beels*). Four vegetation types had been identified from KNP viz., alluvial inundated grasslands, tropical wet evergreen forests, tropical semi-evergreen forests and aquatic flora. Alluvial inundated grasslands were further classified into short grassland (SG) and tall grassland (TG). As per management practices, TG is subjected to annual controlled burning and invasive removal (*Mimosa* spp. and *Mikania micrantha*). This mosaic of habitat supports the world's largest population of *Rhinoceros unicornis*, the highest ecological density of *Panthera tigris*, and a significant population of the *Elephas maximus*, *Bubalus arnee*, *Rucervus duvaucelii* and *Axis porcinus*.
 3. For the soil seed bank study, 96 soil transects were laid in SG (n=48) and TG (n=48), where soil samples were collected from upper (0-5 cm), middle (5-10 cm) and lower (10-15 cm) soil layers, in three replicates of 1m x 1m quadrates. For natural and flooding treatments, two sets of soil samples were prepared, which were further subjected to hand sorting and seed germination experiments. For the hand sorting experiment, seed abundance was recorded for physical characteristics viz., seed

condition, seed coat surfaces and seed appendages; similarly, for the germination experiment, seed abundance was recorded in terms of vegetation composition. In SG, a total mean of 6925.54 ± 741.66 seedlings with a seed density of $10,892 \text{ seeds/m}^2$ was recorded and in TG total mean of 6925.54 ± 741.66 seedlings with a seed density of $10,892 \text{ seeds/m}^2$ was recorded. Compared to flooding treatments, the high mean seed abundances and densities were recorded in natural treatments in both SG & TG (Mann-Whitney, $P < 0.05$). Irrespective of seasons and experiments, SG showed high mean seed abundances and densities compared to TG (Mann-Whitney, $P < 0.05$). Irrespective of seasons and experiments, among the three soil layers, the upper soil layer showed significantly the highest mean seed abundances and densities in both SG & TG (Kruskal-Wallis, $P < 0.05$). In the hand sorting experiment, a total mean of 227.42 ± 28.77 seedlings with a seed density of 358 seeds/m^2 were recorded in SG and 477.67 ± 62.40 seedlings with a seed density of 751 seeds/m^2 in TG. Irrespective of seasons, TG showed high seed mean abundances and densities compared to SG (Mann-Whitney, $P < 0.05$). Irrespective of seasons, among the three soil layers, the upper soil layer showed the highest mean seed abundances and densities in both SG & TG (Kruskal-Wallis, $P < 0.05$). In terms of physical characteristics, irrespective of seasons and soil layers, high mean seed abundances and densities were recorded for seeds with whole conditions, smooth surfaces, and without appendages in both SG & TG. In the germination experiment, a total mean of 6698.13 ± 716.31 seedlings with a seed density of $10,534 \text{ seeds/m}^2$ were recorded in SG and 3521.08 ± 538.67 seedlings with a seed density of $5,538 \text{ seeds/m}^2$ were recorded in TG. Compared to flooding treatment, the high mean seed abundances and densities were recorded in natural conditions in both SG & TG (Mann-Whitney, $P < 0.05$). Irrespective of seasons and experiments, SG showed high mean seed abundances and densities compared to TG (Mann-Whitney, $P < 0.05$). Irrespective of seasons and experiments, among the three soil layers, the upper soil layer showed the highest mean seed abundances and densities in both SG & TG (Kruskal-Wallis, $P < 0.05$). In terms of species composition, a total of 160 and 154 plant species were germinated from the soil seed bank of SG & TG, respectively. Irrespective of seasons, experiments and soil layers, family Poaceae & growth form herbs dominated in both SG & TG. Among species, irrespective of seasons, treatments and

soil layers, *Cynodon dactylon* contributed most to the mean seed abundances and densities in SG. In TG, overall and in flooding treatment, *Apluda mutica* and in natural treatment, *Phyllanthus niruri* showed the highest mean seed abundances and densities. In the upper soil layer, *Apluda mutica* and *Phyllanthus niruri* showed the highest mean seed abundances and densities. In the middle soil layer, *Imperata cylindrica*, *Phyllanthus niruri*, *Pouzolzia zeylanica* and *Apluda mutica* showed the highest mean seed abundances and densities. In the lower soil layer, *Apluda mutica*, *Phyllanthus niruri* and *Imperata cylindrica* showed the highest mean seed abundances and densities. In terms of species composition similarities, irrespective of seasons, the highest pairwise overlap between the upper & middle layers, upper & lower layers and middle & lower layers were recorded in flooding treatments compared to natural treatments in both SG & TG. In both SG & TG, the highest pairwise overlap was recorded between the middle & lower soil layers.

4. Data on vegetation composition and soil nutrient status viz., carbon (C), nitrogen (N), phosphorus (P), and potassium (K), was collected from inside and outside of 15 exclosures that were subjected to different management regimes, including six experimental sites viz., herbivore exclusion in short grassland (HES), herbivore inclusion in short grassland (HIS), herbivore exclusion in tall grassland (HET), herbivore inclusion in tall grassland (HIT), herbivore exclusion in tall grassland burning (HETB), and herbivore exclusion in tall grassland invasive removal (HETIR). Quadrat method was used to study vegetation structure and composition in which, data on abundance was collected from 1m x 1m quadrats in three replicates. From January 2014 to December 2015, data was collected from 1152 plots and a total of 390 soil samples were analyzed to estimate soil C, N, P & K concentration. From SG & TG, a total of 96 and 104 species were recorded, respectively. In both SG & TG, irrespective of seasons, the family Poaceae and growth form herbs dominated. SG plant communities were dominated by *Cynodon dactylon*, *Hemarthria compressa* and *Carex vesicaria* and TG dominated by *Saccharum* spp. Overall, a total of 113 and 2,756 woody individuals were recorded in SG & TG, respectively. Irrespective of seasons, compared to TG, SG showed high species richness (Mann-Whitney, $P>0.05$) and diversity (Mann-Whitney, $P>0.05$). Compared to SG, irrespective of seasons, TG showed high woody individuals and

soil C (Mann-Whitney, $P<0.05$), N (Mann-Whitney, $P<0.05$), P (Mann-Whitney, $P<0.05$) & K (Mann-Whitney, $P<0.05$) content. No invasion of *Mimosa* spp. and *Mikania micrantha* was recorded in SG. In TG, the overall occurrence of *Mimosa* spp. was 11.84% and *Mikania micrantha* was 17.69%. Irrespective of seasons, compared to *Mimosa* spp., high *Mikania micrantha* occurrence was recorded. Irrespective of seasons, grazing exclusion promoted woody individuals, richness, diversity and soil nutrient content in both SG & TG and *vice-versa* for grazing inclusion. Irrespective of seasons, burning and invasive removal in TG reduced woody and enhanced soil nutrient content. Irrespective of seasons, burning in TG decreased species richness and diversity, while invasive removal increased richness and diversity. In terms of invasives, irrespective of seasons, grazing exclusion enhances the occurrence of *Mimosa* spp. while grazing, burning and invasive removal reduces *Mimosa* spp. Irrespective of seasons, grazing exclusion and inclusion enhances the occurrence of *Mikania micrantha* while invasive removal reduces *Mikania micrantha*. Burning reduces the occurrence of *Mikania micrantha* in the wet season while enhances *Mikania micrantha* in the dry season. High similarities in species composition were recorded overall between HETIR & HIT ($BC_{ij}=0.82$), in the dry season between HETB & HIT ($BC_{ij}=0.82$), and the wet season between HET & HIT ($BC_{ij}=0.78$); the lowest was recorded between HES & HETB ($BC_{ij}\leq 0.04$). Grassland species distribution was defined by soil C, N & P content.

5. Harvest method and root material digging were used to assess aboveground biomass productivity (AGBP) and belowground biomass productivity (BGBP), respectively. AGBP data was collected from all 15 exclosures (inside and outside) subjected to different management regimes, viz., HES, HIS, HET, HIT, HETB, & HETIR, whereas, for BGBP, data was only collected from HIS & HIT experimental sites. In each experimental site, data was collected in three replicates from 1m x 1m quadrats. Data was collected from January 2014 to December 2015 to assess AGBP (1152 plots) and BGBP (360 plots) and to derive the influence of factors like soil C, N, P & K content, rainfall (RF), minimum temperature (MINT) and maximum temperature (MAXT) on AGBP & BGBP. Overall mean annual AGBP recorded for SG and TG was $4165.68\pm 639.75 \text{ g m}^{-2}$ and $29672.73\pm 4157.22 \text{ g m}^{-2}$, respectively.

Irrespective of seasons, compared to SG, high annual AGBP was recorded in TG (Mann-Whitney, $P < 0.05$). Irrespective of seasons, class monocots, growth form grasses, family Poaceae and life cycle perennials contributed maximum to mean annual AGBP in both SG & TG. Irrespective of seasons, *Hemarthria compressa* contributed maximum to mean annual AGBP in SG and *Saccharum* spp. in TG. Irrespective of seasons, compared to SG, the TG showed the high mean annual AGBP in terms of class monocots (Mann-Whitney, $P < 0.05$), growth form grasses (Mann-Whitney, $P < 0.05$), family Poaceae and life cycle perennials (Mann-Whitney, $P < 0.05$). Irrespective of seasons, grazing exclusion enhances the mean annual AGBP in SG while decreases the mean annual AGBP in TG. In TG, irrespective of seasons, burning and invasive removal enhances mean annual AGBP. Irrespective of seasons, grazing exclusion enhances the mean annual AGBP of invasive *Mimosa* spp. and reduces the mean annual AGBP of invasive *Mikania micrantha*. Contrarily, grazing inclusion throughout the study period reduces the mean annual AGBP of *Mimosa* spp. and increases the mean annual AGBP of *Mikania micrantha*. Burning reduces the mean annual AGBP of *Mimosa* spp. Burning reduces the mean annual AGBP of *Mikania micrantha* in the wet season while increases in the dry season. Irrespective of seasons, invasive removal reduces the mean annual AGBP of both invasives, *Mimosa* spp. and *Mikania micrantha*. Overall, the mean BGBP of HIS & HET were $2740.00 \pm 189.59 \text{ g m}^{-2}$ and $9463.34 \pm 737.82 \text{ g m}^{-2}$, respectively. Irrespective of seasons, compared to HIS, a high mean annual BGBP was recorded for HIT (t-test, $P < 0.05$). The mean annual AGBP of grasslands was influenced by C, N, P, K, RF & MINT while the mean annual BGBP was influenced by C, N, P, K, RF, MINT & MAXT.

6. Conducted socio-economic survey from 2015 to 2016 in 32 villages within a 2 km radius of the Kaziranga Tiger Reserve (KTR). Carried out random sampling, representing approximately 15% of households in each village using the semi-structured questionnaire comprised of both open- and close-ended questions. Further, the data collected was validated using entry-point monitoring. A total of 663 respondents were interviewed during socio-economic surveys and 6,520 during entry-point surveys. The socio-economic survey revealed that the majority of respondents belong to the Hindu religion (84.01%) and tea tribe caste (39.67%). The

majority of respondents belonged to the nuclear family (61.69%). Recorded mean family size of $5.25 \pm 0.07/\text{hh}$ (household). Majority of respondents had a Kaccha house (70.44%). In terms of amenities, 84.31% of households had electricity, 64.71% mobile phones, 33.33% television & 48.87% vehicles. Majority of respondents were utilizing handpumps (72.85%) to conduct water-related activities and fuelwood (95.02%) as a cooking source. In terms of occupation, the maximum respondents were involved in wage labour (75.87%) and agriculture (73.15%). Maximum mean annual income was generated through tourism (242565.22 ± 6647.79 INR/annum/hh) and government jobs (174363.64 ± 29031.14 INR/annum/hh). Entry point survey revealed that the majority of respondents belong to the Hindu religion (78.79%) and tea tribe caste (25.84%). Fringe villages were dependent on the KTR for grazing grounds and the collection of thatching, fodder, fuelwood, and fishing resources. About 81.90% of respondents were involved in grazing. Majority of respondents (82.14%) were involved in grazing livestock on the Reserve's periphery. Maximum grazing activities were recorded during the winter season (96.87%). Majority of respondents were extracting thatch (74.19%), fodder (94.38%), fuelwood (85.64%) and fish (100%) resources from outside the Reserve. Maximum thatch (83.18%), fodder (75.84%) and fuelwood (94.55%) was collected during winters while fishing (92.52%) was mostly conducted during the monsoon. In terms of thatch, compared to inside, the high mean annual quantity was extracted from the outside Reserve (528.55 ± 22.06 kg/annum, Mann-Whitney, $P < 0.05$). Compared to the socio-economic survey, the entry point monitoring showed high mean annual quantity of thatch extraction (6224.56 ± 571.59 kg/annum, Mann-Whitney, $P < 0.05$). *Saccharum* spp. was the most extracted thatch species. In terms of fodder, compared to outside, the high mean annual quantity was extracted from inside Reserve (608.24 ± 180.81 kg/annum, Mann-Whitney, $P < 0.05$). Compared to the socio-economic survey, the entry point monitoring showed high mean annual quantity of fodder extraction (3151.37 ± 412.50 kg/annum, Mann-Whitney, $P < 0.05$). *Hemarthria compressa* was the most extracted fodder species. In terms of fuelwood, compared to inside, the high mean annual quantity was extracted from the outside Reserve (2925.85 ± 69.07 kg/annum, Mann-Whitney, $P < 0.05$). Compared to the socio-economic survey, the entry point monitoring showed high mean annual

quantity of fuelwood extraction (14873.22 ± 2643.25 kg/annum, Mann-Whitney, $P < 0.05$). *Albizia procera* and *Lagerstroemia speciosa* were the most extracted fuelwood species. In terms of fish, compared to outside, the high mean annual quantity was extracted from inside the Reserve (352.09 ± 19.12 kg/annum, Mann-Whitney, $P > 0.05$). Compared to the socio-economic survey, the entry point monitoring showed high mean annual quantity of fish extraction (6310.97 ± 428.09 kg/annum, Mann-Whitney, $P < 0.05$). *Anabas testudineus* and *Puntius sophore* were the most extracted fish species. Majority of respondents were aware of the status of KTR (91.10%). Majority of respondents found KTR important (73.01%), as it provides livelihood opportunities to local communities (90.93%). However, about 19.87% of respondents found KTR to be of no importance; its close proximity enhances crop/livestock/human-wildlife conflict (77.50%). Most respondents found that the Forest Department is more cooperative (51.28%). However, the relationship between the Forest Department and local communities can be further improved, if the department provides secondary employment or alternate livelihood options to local communities (54.15%).

7. From the seed bank study, it was concluded that SG habitats were richer in terms of seed abundance and densities compared to TG. In soil layers of SG & TG, the upper soil layer represents the highest seed abundances and densities. Flooding and natural conditions directly influence the seed abundances, densities, and species composition in both SG & TG. Soil seed banks of SG comprise seedlings from the existing vegetation, whereas, in TG, the composition differs from the aboveground vegetation. Based on plant community composition and productivity results, it was concluded that comparatively SG were more species-rich and diverse and TG were more productive in terms of AGBP & BGBP. Herbivore exclusion promotes heterogeneity, woody and invasive species and soil nutrient content and vice-versa for herbivore inclusion. Herbivore exclusion promoted AGBP in SG while inclusion reduces productivity. Contrary, herbivore exclusion reduces AGBP in TG while inclusion enhances productivity. Burning decreases heterogeneity while invasive uprooting increases it. In TG, burning and invasive removal promoted AGBP, reduce woody growth, including invasive *Mimosa* spp. and promotes soil nutrients; however, burning promotes while invasive uprooting reduces fire-adapted invasive

Mikania micrantha. Herbivore exclusion increases the AGBP of invasive *Mimosa* spp. while herbivore inclusion, burning and invasive removal reduces its AGBP. Herbivore exclusion & inclusion increases the AGBP of invasive *Mikania micrantha* while invasive removal reduces its AGBP. Burning reduces the AGBP of *Mikania micrantha* in the wet season, while increases it in the dry season. TG grasslands were more susceptible to succession and invasion compared to SG, as they exhibited higher woody individuals, invasive occurrence and soil nutrient content. From the socio-economic survey study it was concluded that despite intensified conservation efforts, fringe Reserve areas are still being exploited for grazing and collection of thatch, fodder, fuelwood and fish resources. The challenges persist, likely stemming from insufficient essential facilities, low income, and limited livelihood options for the local communities.

8. To mitigate the ongoing impact of climate change, succession and invasion on these grasslands, the present study recommends (a) to use soil seed banks of SG & TG to grow and preserve crucial plant species with their seedlings, (b) to prioritize the resprouting and vegetative propagation of essential tall grass species representing aboveground vegetation within the greenhouses, (c) short-term rotational grazing for SG and long-term for TG to promote heterogeneity, productivity and soil quality, (d) conducting controlled annual burning in dry and invaded areas post manual uprooting of invasives and woody species to enhance productivity and mitigate the harmful effects of invasion and succession in grasslands, (e) manual uprooting of invasives during both dry and wet season cycles to enhance heterogeneity, productivity and soil quality in TG, (f) to develop alternative livelihood strategies reduce the dependency of local communities on Reserve, (g) to foster a positive attitude within local communities, which offers timely solutions and compensations, as well as develop strategies to control conflicts, (h) to strengthened local institutions with respect to their role, rights and responsibilities in conservation planning and implementation, and (i) regular sensitization and awareness programmes among local communities and other stakeholders need to be conducted regarding conservation and its benefits.

CHAPTER 1

INTRODUCTION

1.1 Background

Grasslands are ecosystems dominated by graminoids, with a sparse abundance of shrub or tree species (Bardgett et al., 2021). These grasslands are formed in areas where climatic and edaphic conditions favour the growth of graminoids and prohibit the trees growth (Lahkar, 2008). Grassland ecosystems are the outcome of multiple co-occurring factors, including indiscriminate periodic floods, drought, grazing, fire or edaphic conditions (Lehmkuhl, 1989; Lahkar, 2008). These grasslands, with about 52×10^6 km², are one of the most widespread ecosystems, covering about one-fifth and about 40% of the world's land surface, including 15×10^6 km² of tropical grasslands (Genxu et al., 2002; Buisson et al., 2018). Tropical grasslands comprise approximately 10% of Earth's landmass, accounting for about 15% of the carbon stored terrestrially and 30% of global net primary productivity (Genxu et al., 2002; Buisson et al., 2018; Sinha et al., 2022). These biodiverse ecosystems have a high degree of endemism and provide key ecosystem services, including direct economic services from fibre, food, fodder, medicines and various other products, and non-physical services like nutrient and water cycling, erosion control, climate regulation, habitat for native charismatic and globally threatened animals including rhinos, elephants and wild buffaloes, and cultural services (Buisson et al., 2018).

Unlike tropical forests, the conservation value of tropical grasslands is underappreciated, and their degradation is widespread and accelerating at an alarming rate (Buisson et al., 2020; Bardgett et al., 2021). Agriculture conversion, afforestation, sand mining, urbanization, changes in intensity and frequency of burning, biological invasion, overgrazing, altered edaphic conditions, and woody encroachment threaten these grasslands and their associated fauna (Buisson et al., 2018). Additionally, tropical grasslands are vulnerable to climate change induced frequent floods and droughts (Toogood & Joyce, 2009; Borah et al., 2018; IPCC, 2022). Globally, about 48% of vegetation areas have dried due to decreased precipitation and increased evapotranspiration (Lal et al., 2023). Fluctuations in the cycles of flood and drought

conditions play a crucial role in vegetation regeneration by nurturing soil seed banks (Bao et al., 2014; Bao et al., 2017; Bao et al., 2018). These climatic variations provide the necessary conditions for species development, reproduction, and replenishment, each adopting different life strategies under various phases of the hydrological cycle (Bao et al., 2014; de Souza et al., 2016; Bao et al., 2017).

Experimental studies conducted in tropical grasslands have reported that extreme climatic events, such as flooding and temperature fluctuations, can prompt rapid changes in vegetation composition and structure (Chaneton & Lavado, 1996; Toogood et al., 2008). These events may reduce plant species richness and diversity, inhibit woody growth, and enhance invasive spread (Lehmkuhl, 1989; Toogood et al., 2008; Choudhury et al., 2016). Additionally, they improve soil nutrient and moisture conditions (Lehmkuhl, 1989; Chaneton & Lavado, 1996). Furthermore, flood-induced soil nutrient and moisture content promote plant biomass productivity and nutrient uptake, while the decline in frequent floods or dry climatic conditions can decrease productivity and soil nutrient uptake (van Oorschot et al., 1998; Sarmiento et al., 2006). Environmental parameters such as precipitation, flooding, temperature, and humidity also define the distribution patterns of wet grassland plant species (Zelnik & Carni, 2013) (Appendix Table 1.1).

Apart from the aforementioned climatic events, the changing frequency and intensity of grazing, burning and invasive uprooting are the major factors that govern the vegetation structure and function of tropical grasslands (Ratnam et al., 2016; Borah et al., 2018; Buisson et al., 2018) (Appendix Table 1.1). Thus, any change in frequency, intensity, and size of the aforementioned factors can accelerate and arrest the successional processes of tropical grassland (Collins & Barber, 1986; Sharma et al., 2023). Therefore, the conservation of these vulnerable ecosystems requires scientifically validated management strategies. Due to the paucity of scientific evidence-based studies from tropical grasslands, it remains unclear what management regime works best for the restoration and rewilding of tropical grasslands (Buisson et al., 2020). IPCC (2022) recommends reseedling, controlled grazing, burning, invasive uprooting and community-based natural resource management as adaptive conservation

and restoration strategies to mitigate the impact of ongoing natural and anthropogenic pressures on tropical grasslands.

Reseeding using a soil seed bank is a natural and cost-effective method to restore and regenerate the native vegetation composition of tropical grassland ecosystems (Ferreira et al., 2015; Kiss et al., 2018). Experimental studies from tropical grasslands reported that the identification of seeds ‘soft’ morpho-functional seed traits allows one to predict for each taxa the chances of dispersal, persistence and germination capacity (Grime et al., 1981; Thompson, 1993; Ninot et al., 2008). In tropical grasslands, soil seed bank characteristics such as seedling distribution, abundances and densities, composition, and vegetation similarities depend on factors like climatic events (changes in precipitation, including flooding and drought conditions) (Bao et al., 2017; Mall et al., 2019), changing intensities of grazing (Silva & Overbeck, 2020), invasion dynamics (Dairel & Fidelis, 2020), and management practices like burning (de Oliveira et al., 2019). Particularly in terms of the soil seed bank of tropical grasslands, changes in flood inundation dynamics (cycle of wet and dry conditions) play a pivotal role in shaping the seed bank characteristics (de Souza et al., 2016; Bao et al., 2017). Experimental studies conducted in tropical grasslands have found that flooding promotes seed distribution (Bao et al., 2018) and alters seed germination strategies (Bao et al., 2017). Prolonged flood inundation decreases seedling germination by reducing seed abundance and density in the soil. On the contrary, drought conditions facilitate seed germination by enhancing seed abundance and densities in the soil (Bao et al., 2017). Additionally, flooding enhances vegetation composition similarities while drought conditions reduce it (Bao et al., 2014) (Appendix Table 1.1).

Mega- and meso-herbivores modify vegetation characteristics (composition, structure, richness, diversity and productivity) by controlling species colonization and extinction rates (Olff & Ritchie, 1998) and altering soil nutrient content (i.e., C-carbon, N-nitrogen, P-phosphorus, and K-potassium) through defoliation, trampling, dung and urine depositions (Olff & Ritchie, 1998; Altesor et al., 2005). Experimental herbivore exclusion from tropical grasslands alters plant community compositions (Burns et al., 2009), reduces plant species richness (Burns et al., 2009), enhances plant species diversity (Chaneton & Facelli, 1991), promotes woody encroachment (Smart et

al.,1985) and proliferation of invasive species (Potter et al., 2021), reduce biomass productivity (McNaughton, 1976) and improves soil nutrient (C, N, P and K) content (Hatton & Smart, 1984; Singh et al., 1991) (Appendix Table 1.1).

Prescribed or experimental burning removes standing aboveground biomass and enhances soil nutrient (C, N, P and K) content and biomass productivity through volatilization and ash deposition (Harrington, 1974; Singh et al., 1991; Sankaran, 2016; Pathak et al., 2017), consequently impacting vegetation characteristics by altering plant community composition (heterogeneous) (Kumar et al., 2015), decreasing plant species richness (Koerner et al., 2014), increasing plant species diversity (Adams et al., 1982; Nerlekar et al., 2022), and limiting woody growth and invasive species (Lonsdale & Miller, 1993; Clark & Wilson, 2001; Nerlekar et al., 2022) (Appendix Table 1.1).

According to the Convention on Biological Diversity, biological invasion of alien species is a major threat to biodiversity conservation, second only to habitat destruction (Nath et al., 2019). In tropical grasslands, invasive species with high plasticity of germination-related capability modify plant community composition by replacing native flora and altering soil nutrient conditions (Clark & Wilson, 2001; Afreen et al., 2018; Srivastava & Raghubanshi, 2021). Invasive manual uprooting is an ecologically effective technique used to restore invaded native grassland vegetation, as it effectively decreases the invasive and woody cover, recovers native species and promotes high plant species richness and diversity (Guido & Piller, 2017; Nerlekar et al., 2022; Sinha et al., 2022). It reduces the biomass productivity of invasives by decreasing their vegetation cover (Guido & Piller, 2017). Studies examining the impact of experimental invasive uprooting on edaphic conditions in tropical grasslands are limited, wherein non-invaded areas have higher soil nutrient (C, N, P and K) content compared to invaded areas (Choudhury, 2017; Srivastava & Raghubanshi, 2021) (Appendix Table 1.1).

Most of the aforementioned experimental studies assessing the soil seed bank characteristics and impact of management practices like managed herbivory, burning and invasive removal on tropical grassland vegetation characteristics and soil nutrient content have emerged from Africa, America and Europe, with very few studies from Asia (Sankaran, 2016; Mall et al., 2019; Sharma et al., 2023). Protected Areas of India and Nepal are the last remaining strongholds of riverine alluvial grasslands, one of the

last remaining highly productive subtropical grassland ecosystems, which are understudied with respect to the impact of management interventions on grassland integrity and their associated mega- and meso-herbivores (Bezbarua, 2007; Choudhury, 2017; Thapa et al., 2021; Sinha et al., 2022).

The riverine alluvial grasslands of Kaziranga in Brahmaputra floodplains of Assam are vulnerable to climatic events like seasonal flooding and subjected to combinations of herbivory, and management practices such as prescribed burning and manual uprooting of globally noxious invasive, *Mikania micrantha* and *Mimosa* spp. (Vasu, 2003; Vasu & Singh, 2015). The United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Convention (WHC) identified habitat degradation due to the rapid increase in the periphery village population, agriculture development, and overgrazing by wildlife and livestock as key threats to Kaziranga National Park (WHC, 2011). However, the lack of scientific-validated experimental studies based on outcomes of the soil seed bank characteristics and the effect of mega- and meso-herbivore grazing and current management practices are creating hurdles in their conservation and management (Singh & Yadava, 1974; Lehmkhul, 1989; Devi, 2023). In addition, there is limited research available regarding the assessment of anthropogenic pressures and the participation of local communities in the conservation of these landscapes (Shrivastava & Heinen, 2007; Das, 2015).

To fulfill this gap, the study aims to provide information on the soil seed bank characteristics and the effect of grazing and management practices (burning and invasive removal) on vegetation and edaphic conditions of riverine alluvial grasslands of Kaziranga National Park (KNP). Moreover, the research aims to assess the extent of dependency and the attitudes of local communities toward the conservation of Kaziranga Tiger Reserve (KTR). The baseline information generated from the present study will educate management authorities and aid in formulating and upgrading current management practices. Additionally, delving into local communities distinctive needs and aspirations enables the creation of sustainable solutions that prioritize both human well-being and ecological equilibrium.

1.2 Literature Review

Very little research has been done on the grassland ecology in the floodplains of Brahmaputra Valley (Lehmkhul, 1989). The floodplains adjacent to the sub-Himalayan regions of the Ganges and Brahmaputra rivers represent some of the most dynamic ecosystems in Asia (Rawat, 2005). These landscapes have evolved and are managed by seasonal flood inundation and siltation, herbivore grazing, and management practices such as burning and invasive uprooting (Vasu, 2003; Rawat, 2005). The vegetation in the area is in a state of flux, reflecting mosaics of successional stages. This mosaic of unique riverine short grassland (SG) and tall grassland (TG) vegetation appears to be a key determinant for the spatial and temporal heterogeneity of food resources necessary to meet the nutritional requirements of large herbivore assemblages, including both grazers and mixed feeders (Thapa et al., 2021; Devi et al., 2022a). These riverine alluvial grasslands are potentially the most productive among the world's terrestrial ecosystems (Lehmkhul, 1989; Rawat, 2005). The height of Indian grasslands is generally less than 2 m, whereas riverine grasslands of the general *Phragmites-Saccharum-Imperata* type reach heights of 4-8 m (Lehmkhul, 1989; Khatri & Barua, 2011). Based on the relative height differences, one might infer much greater productivity of riverine alluvial grasslands. Throughout the dawn of civilizations, humans have exploited these areas to establish settlements, practice agriculture, and engage in livestock grazing (Rawat, 2005). However, conservation efforts have received minimal attention until recently (Rawat, 2005; Buisson et al., 2018).

Scientific investigations in these riverine alluvial grasslands have focused on their soil seed bank composition, vegetation characteristics, productivity potentials, and edaphic conditions (Mall et al., 2019; Bharali, 2010; Khatri & Barua, 2011). However, there is a notable gap in the literature, as only limited studies provided the impact of management interventions on grassland integrity and their associated mega- and meso-herbivores (Bezbarua, 2007; Choudhury, 2017; Thapa et al., 2021; Sinha et al., 2022).

Existing literature revealed that these riverine alluvial grasslands have a large abundance of viable seeds ranging from 28450 to 30750 seedlings/m² (Mall et al., 2019). In terms of vegetation composition and structure, these grasslands are primarily characterized by growth form herbs and members of the Poaceae family (Khatri & Barua, 2011). The SG plant community associations were dominated by short grasses

viz., *Cynodon dactylon*, *Axonopus compressus*, *Chrysopogon aciculatus*, and hydric species like *Cyperus niveus* (Biswas & Mathur, 2003; Choudhury et al., 2017). On the other hand, the TG plant community associations were dominated by tall grasses viz., like *Phragmites karka*, *Saccharum narenga*, *Saccharum ravennae*, *Saccharum spontaneum*, *Themeda arundinacea*, *Themeda villosa*, *Arundo donax*, *Typha elephantina*, *Imperata cylindrica*, *Apluda mutica*, *Cymbopogon flexuosus*, *Chrysopogon zizanioides*, and *Alpinia nigra* (Bezbarua, 2007; Khatri & Barua, 2011; Choudhury et al., 2017). Due to the prevalence of grasses and herbs as dominant growth forms, these grasslands exhibit relatively low species richness and diversity (Choudhury et al., 2017; Karki et al., 2000). The recorded plant species richness in riverine grasslands ranges from 2.00 to 20.93, while plant species diversity varies from 1.97 to 2.85 (Bezbarua, 2007; Lahkar, 2008; Karki et al., 2000). Experimental studies conducted in these grasslands indicate that the annual aboveground biomass productivity of SG ranges from 872 g m⁻² to 1410 g m⁻² (Lehmkuhl, 1989), while TG exhibits variability from 522.00 g m⁻² to 3545.10 g m⁻² (Ambasht et al., 1972; Singh & Yadava, 1974; Khatri & Barua, 2011; Tuboi, 2013). Additionally, the belowground biomass productivity recorded was 1131.00 g m⁻², which seasonally varies from 137 g m⁻² to 785 g m⁻² (Singh & Yadava, 1974). Studies on the alluvial soil of Brahmaputra plains and riverine grasslands indicate variations in soil composition, with soil C content ranging from 0.03 to 6.10%, N from 0.01 to 0.17%, P from 0.01 to 0.06%, and K ranging from 0.002 to 0.01% (Singh et al., 2004; Nath & Sarma, 2008; Bharali, 2010).

Historically, tropical grassland ecosystems have been subjected to various management practices to enhance their vegetation characteristics and edaphic conditions (Sharma et al., 2023). Nevertheless, the limited availability of experimental evidence has posed challenges to implementing effective management practices. Consequently, it is imperative to assess the efficacy of management practices to improve existing policies and plans to restore and conserve tropical grasslands (Sharma et al., 2023). The outcomes of experimental testing of diverse management strategies have been thoroughly documented in existing literature.

1.2.1 Reseeding using soil seed bank

The soil seed bank in tropical grassland soil is predominantly composed of seedlings from aboveground vegetation, playing a crucial role in the in-situ conservation and restoration of these grasslands (Mall et al., 2019; Kiss et al., 2018). An experimental study conducted in tropical grasslands of South America reported that topsoil translocation (soil bud bank) effectively propagated and restored native aboveground vegetation, including herbs, shrubs, and trees (Ferreira et al., 2015). Assessment of soil seed bank attributes involves the identification process, which encompasses visual examination of seed traits such as morphology, condition, surface texture, and the presence or absence of appendages (Grime et al., 1981; Ninot et al., 2008; Price et al., 2010). Additionally, evaluation extends to germination analysis, providing insight into the vegetation composition of soil seed banks (Price et al., 2010; Bao et al., 2017). Grime et al. (1981) and Thompson (1993) have developed a promising approach based on seed features concerning vegetation community dynamics. Grime et al. (1981) reported seed features and germination characteristics of seeds obtained from European grassland, marshland, and woodland habitats. In terms of physical traits, nine types of dispersule shapes (like spherical, ovoid, trigonous, lenticular, reniform, cylindrical, clavate, winged and conical), three types of appendages (like straight awn or spine, hygroscopic awn or spine and pappus or persistent calyx) and two types hairs or teeth structures (like radial or irregular and antrorse) were identified. In addition, germinule weight, surface texture (like smooth, rugose, tuberculate, muricate or reticulate, striate, hairy and mucilaginous) and colours (like black, multicoloured, and variable) were also identified. Another study conducted by Ninot et al. (2008) in grasslands of Europe reported that in terms of seed physical characteristics, a high number of seeds from grasslands represent ovoid, rhomboidal, turbinate, lenticular and reniform shapes. Additionally, most of the seeds lack attached appendages and show smooth surfaces.

In tropical grasslands, the soil seed bank characteristics were largely governed by climatic events like floods and drought (Bao et al., 2017; Bao et al., 2018; Mall et al., 2019). Cycles of flood and drought resulting due to the temporal and spatial variation in flood inundation level, influence the availability of habitats with the conditions necessary for seedling establishment, thereby allowing the occurrence of species with different life strategies for the various phases of the hydrological cycle (de Souza et al.,

2016; Bao et al., 2017). In soil seed banks, most of the seedlings were present in the upper soil layers, as aboveground vegetation tends to have a greater abundance of seeds nearer to the soil surface (Mall et al., 2019; Silva & Overbeck, 2020). The decline in seed bank abundance and densities at greater depths is likely attributed to various environmental factors like organic matter and litter, moisture content, seed rain, seed availability, germination, seed predation or seed viability (Mall et al., 2019).

Experimental study conducted in tropical grasslands of South America reported that flooding enhances seedling distribution, as soil samples collected post-flood event showed high seed abundances and densities (Bao et al., 2018). Another study from tropical grasslands of South America reported that flooding reduces seedling germination, as compared to submerged soil, high species abundance and densities of seedlings emergence were recorded in non-inundated soil (Bao et al., 2017). This discrepancy may be attributed to changes in seed germination strategies, often triggered by alterations in soil moisture conditions. Consequently, a different suite of species tends to germinate in flooded versus dry conditions (de Souza et al., 2016; Bao et al., 2017).

In terms of species composition, tropical grasslands soil seed bank comprises seedlings of aquatic, amphibian and terrestrial plant species (de Souza et al., 2016; Bao et al., 2017; Bao et al., 2018). The majority of germinated seedlings in these grasslands primarily consist of herbs and grasses, with a prevalence of species from the Poaceae, Cyperaceae, and Juncaceae families in the soil seed bank. This characteristic feature is also evident in the aboveground vegetation of these grasslands (de Souza et al., 2016; Bao et al., 2017; Bao et al., 2018; Silva & Overbeck, 2020). Experimental study conducted in tropical grasslands of South America reported that flooding enhances species similarities (Bao et al., 2014). As in these grasslands, terrestrial grasses dominate, but flooding introduces a variety of terrestrial, amphibious, and aquatic herbs. As the water level recedes, aquatic species die, allowing terrestrial annual herbaceous species to germinate. Thus, the soil seed bank similarity remains high pre- and post-flood, showcasing the resilience of these communities. Seeds struggle to develop, reproduce, and replenish on elevated ground with minimal flooding. During

droughts, species dissimilarity increases, and grass emergence becomes prominent (Bao et al., 2014; Bao et al., 2017).

1.2.2 Managed herbivory

Herbivory modifies vegetation characteristics by controlling species colonization and extinction rates (Olf & Ritchie, 1998) and altering soil nutrient properties through defoliation, trampling, dung and urine depositions (Olf & Ritchie, 1998; Altesor et al., 2005). The experimental study conducted in the tropical grasslands of South Africa, namely the Kruger National Park found that herbivore exclusion and inclusion alter plant community composition. Further, herbivore exclusion decreases species richness while inclusion increases richness (Burns et al., 2009). The alterations in vegetation composition were attributed to the foraging activities of herbivores. The rise in species richness associated with herbivory was primarily linked to a decline in the abundance of dominant grasses, leading to a subsequent increase in the richness of forbs and other sub-dominant grasses (Burns et al., 2009). In tropical grasslands, the experimental exclusion of herbivores enhances plant species diversity (Chaneton & Facelli, 1991), promote woody encroachment (Smart et al., 1985), the proliferation of invasive species (Potter et al., 2021), and improves soil nutrient (C, N, P and K) content (Hatton & Smart, 1984; Singh et al., 1991) and *vice-versa* for grazing inclusion (Hatton & Smart, 1984; Singh et al., 1991; Chaneton & Facelli, 1991; Potter et al., 2021). The exclusion of herbivores, coupled with substantial litter accumulation, undisturbed plant growth, root turnover, and microbial activities, likely contributed to the high plant species diversity, increased growth of woody species and invasive occurrence, and soil nutrient content (Hatton & Smart, 1984; Smart et al., 1985; Chaneton & Facelli, 1991; Potter et al., 2021). Devi et al. (2022a) reported that herbivores act as grazers and mixed feeders, consuming both woody and invasive species and possibly reducing species diversity, woody individuals and invasive species. Grazing by herbivores removes the accumulation of litter, a factor likely associated with the low soil nutrient content in the presence of herbivores (Altesor et al., 2005). In addition, grazing by herbivores can influence the quality and quantity of biomass productivity (Lehmkuhl, 1989). Grazing usually reduces the biomass productivity (Lehmkuhl, 1989). However, experimental grazing exclusion from tropical grasslands of America reported that grazing enhances

biomass productivity by eliminating dead biomass (Altesor et al., 2005). Similarly, in one of Africa's most widespread tropical grassland ecosystems, namely Serengeti National Park and Maasai-Mara, the biomass productivity of grazed areas were higher than ungrazed areas, as grazing stimulated productivity by preventing vegetation senescence (McNaughton, 1976).

1.2.3 Prescribed burning

The historical significance of burning in the management of grasslands has been well-documented (Daubenmire, 1968; Vogl, 1974; Adams et al., 1982). Experimental burning studies conducted in tropical grasslands of Asia reported that burning alters plant community structure and composition (Kumar et al., 2015). The areas subjected to burning exhibited a heterogeneous vegetation composition and structure, contrasting with the homogeneous composition and structure observed in unburned areas (Kumar et al., 2015). Koerner et al. (2014) conducted an experimental study in South Africa's grasslands, namely Kruger National Park, where they reported that burning reduces plant species richness, probably due to the burning of entire aboveground vegetation (Pathak et al., 2017). Experimental studies conducted in tropical grasslands of America reported that burning increases plant species diversity by promoting the growth of herbaceous plant species (Adams et al., 1982). Burning effectively restrains the expansion of woody and invasive species by thoroughly eliminating both the existing stands and seed banks of these species (Lonsdale & Miller, 1993; Clark & Wilson, 2001; Nerlekar et al., 2022). Experimental burning also removes aboveground biomass and enhances soil macro-nutrient (C, N, P, and K) content through volatilization and ash deposition (Harrington, 1974; Singh et al., 1991; Sankaran, 2016; Pathak et al., 2017). The absence of burning from tropical grasslands enhances litter accumulation and reduces plant biomass productivity (Bragg & Hulbert, 1976; Abrams et al., 1986; Singh, 1993). The effect of burning on production depends on many variables, such as intensity, frequency, timing (seasons) and species fuel loads (Kucera & Ehrenreich, 1962; Daubenmire, 1968; Vogl, 1974; Abrams et al., 1986). Experimental burning studies conducted in the tropical grasslands of Asia have reported a significant increase in biomass accumulation in burned areas compared to unburnt areas. This phenomenon

is attributed to improved soil nutrient conditions in the burned areas (Singh et al., 1991; Sankaran, 2016; Pathak et al., 2017).

1.2.4 Invasive uprooting

The rapid spread of invasive species in recent decades has become a significant concern in many sub-tropical and tropical grassland ecosystems (Dew et al., 2017; Das et al., 2019; Nath et al., 2019; Sinha et al., 2022). These species can disrupt ecosystem functions, including biodiversity, productivity (forage availability for herbivores) and soil nutrient cycles (Dew et al., 2017; Das et al., 2019). Drivers like habitat degradation and fragmentation, deforestation, population expansion, land use and land cover changes, urbanization and climate change are accelerating the invasion processes (Dew et al., 2017; Das et al., 2019; Nath et al., 2019). In tropical grasslands, invasive species with high plasticity of germination-related capability modify plant community composition by replacing native flora and altering soil nutrient conditions (Clark & Wilson, 2001; Afreen et al., 2018; Srivastava & Raghubanshi, 2021). Invasive manual uprooting is an ecologically effective technique used to restore invaded native grassland vegetation, as it effectively decreases the invasive and woody cover, recovers native species, and promotes high plant species richness and diversity (Guido & Piller, 2017; Nerlekar et al., 2022; Sinha et al., 2022). The impact of plant invasion on the ecosystem's primary productivity can range from positive to negative (Walker & Smith, 1997). Experimental studies conducted in the tropical grasslands of Africa have also reported that invasive species enhance biomass production due to rapid growth and high seed production (Witkowski & Wilson, 2001). The establishment of invasive species affects the ecological functioning of various ecosystems (Vilà et al., 2011; Afreen et al., 2018). Thus, preventive measures subject to invasive species havoc are a prime priority in biodiversity conservation (Hulme, 2009; Nath et al., 2019). Experimental studies conducted in tropical grasslands of Asia and Africa reported that manual uprooting of some of the noxious invasives like *Chromolaena odorata*, *Mimosa* spp. and *Mikania micarnta* have effectively reduced their densities and cover by promoting native species recovery (te Beest et al., 2012; Choudhury et al., 2017; Dew et al., 2017; Sinha et al., 2022). Studies examining the impact of experimental invasive uprooting on edaphic conditions in tropical grasslands are limited, wherein non-invaded areas

have higher macro-soil nutrient (C, N, P, and K) content than invaded areas (Choudhury, 2017; Srivastava & Raghubanshi, 2021).

In addition to the abovementioned factors, climate change and anthropogenic pressures pose significant threats to these floodplain wetland grasslands, impacting their ecological integrity and functionality (Tockner & Stanford, 2002; Lockaby et al., 2008; IPCC, 2022). Rising global temperatures contribute to altered precipitation patterns, leading to more frequent and intense floods (IPCC, 2022). Additionally, human activities, including urbanization, agriculture, and infrastructure development, have significantly impacted the natural functions of these wetland grasslands (Ambastha et al., 2007a; Sarkar et al., 2022). These combined stressors result in the loss of biodiversity, degradation of water quality, and diminished ecosystem services provided by floodplain wetlands, highlighting the urgent need for comprehensive conservation and adaptive management strategies (Tockner & Stanford, 2002; Ambastha et al., 2007a; Sarkar et al., 2022). In Asia, scientific studies have provided evidence that local communities residing along the fertile floodplains utilize these landscapes for grazing grounds and extraction of thatch, fodder, fuelwood, and fish materials (Ambastha et al., 2007a; Sarkar et al., 2022). These activities sometimes lead to significant depletion or deterioration of floodplain wetland grasslands, mainly due to the expansion of human settlements, reduction in habitat size, intensified agricultural practices, urbanization, overexploitation by local communities, and inadequately planned development activities (Ambastha et al., 2007a; Das, 2015). Research on the attitudes and perceptions of local communities has contributed significantly to our understanding of people's needs and aspirations. It has played a crucial role in identifying their ideas, opinions, and suggestions concerning conservation issues (Badola et al., 2012).

1.3 Justification of the Study

Forest restoration strategies such as afforestation, suppressing fire, excluding large herbivores or soil fertilizers are commonly misapplied to tropical grasslands (Buisson et al., 2018). Due to the paucity of scientific evidence-based studies on tropical grasslands, it remains unclear what management regime works best for the management, restoration and rewilding of tropical grasslands (Buisson et al., 2018).

IPCC (2022) recommends reseeding, controlled grazing, burning, invasive uprooting and community-based natural resource management as adaptive conservation and restoration strategies to mitigate the impact of ongoing natural and anthropogenic pressures on tropical grasslands. The present study was conducted in the riverine alluvial grasslands of Kaziranga National Park (KNP) in the Brahmaputra floodplains, which are subject to combinations of flooding, herbivory, and management practices such as prescribed burning and manual uprooting of globally noxious invasive, *Mikania micrantha* and *Mimosa* spp. (Vasu, 2003; Vasu & Singh, 2015; Nath et al., 2019). Given the lack of scientific evidence regarding the effectiveness of manual uprooting and burning in controlling biological invasion in this World Heritage Site, UNESCO WHC strongly recommended assessing the efficacy of these management interventions (WHC, 2011). Additionally, WHC recommends gaining insights into local communities the socio-economic structure and resource dependency patterns to mitigate anthropogenic pressures. It suggests developing resource use strategies that align with conservation goals and fostering awareness among community members about the importance of conservation.

1.4 Objectives

This study aims to provide conclusive evidence on the impact of flooding on soil seed bank characteristics and management practices like managed herbivory, prescribed burning and manual invasive uprooting on the vegetation characteristics and edaphic conditions of riverine alluvial grasslands of Brahmaputra floodplains. The present study includes the following objectives:

- 1) Examine the seed bank characteristics of seasonally flooded wet grasslands.
- 2) Examine the plant species composition of these wet grasslands in terms of species diversity, richness and community structure.
- 3) Determine the biomass productivity of these wet grasslands in different inundation and management regimes (burning and weed removal), and
- 4) Quantify the amount of biomass extracted by the local people from Kaziranga Tiger Reserve.

1.5 Key Questions

The study aims to answer the following research questions:

- 1) How do the seasonal variations influence the physical characteristics of short grasslands (SG) and tall grasslands (TG) soil seed banks in terms of (a) seed condition (whole, cracked, and split), (b) seed coat surface (smooth and rough), and (c) appendages (present or absent)?
- 2) How do seasonal variations influence vegetation characteristics (composition) of SG and TG soil seed banks given (a) natural and (b) flooding conditions?
- 3) Within SG and TG in KNP a) what is the seasonal vegetation characteristics (composition, structure, woody individuals, invasive occurrence and diversity indices) and b) what is the seasonal soil macro-nutrient (C, N, P and K) content?
- 4) Is there any similarity in the species composition between SG and TG?
- 5) Do environmental variables such as rainfall (RF), maximum temperature (MAXT), minimum temperature (MINT) and soil nutrient (C, N, P, and K) content influence plant species distribution in SG and TG?
- 6) What is the seasonal AGBP of SG and TG in terms of (a) classes such as monocots, dicots and ferns, (b) growth forms such as grasses, sedges, climbers, herbs, ferns, shrubs and trees, (c) families, (d) species, and (e) life cycles such as annual, perennial and deciduous, and (f) *Mimosa* spp. and *Mikania micrantha* invasion?
- 7) What is the seasonal BGBP of SG and TG?
- 8) Is seasonal variation in environmental parameters such as rainfall (RF), maximum temperature (MAXT) and minimum temperature (MINT) and soil macro-nutrient parameters viz., C, N, P and K content responsible for the variation in seasonal AGBP and BGBP of SG and TG?
- 9) What is the current demographic structure and socio-economic status of the local communities residing around KTR?
- 10) In terms of resource use patterns, what is the degree of dependency of the local communities on KTR for (a) grazing and (b) extraction of thatch, fodder, fuelwood and fish material?
- 11) Which factors influence the resource extraction of thatch, fodder, fuelwood and fish material?

- 12) What are the prevailing attitudes of the local communities toward KTR?
- 13) To what extent are the local communities aware of the conservation efforts and ecological significance of KTR?

1.6 Organization of Thesis

The thesis is organized into seven chapters. After a brief introduction in Chapter 1, the study area has been described in Chapter 2. The characteristics of soil seed banks and the composition of riverine alluvial grasslands are described in Chapter 3. The plant species composition and structure of riverine alluvial grasslands are described in Chapter 4. The biomass productivity of riverine alluvial grasslands is discussed in Chapter 5, followed by the resource dependence and attitudes of local communities toward the conservation of Kaziranga Tiger Reserve, which is discussed in Chapter 6. At the end of chapter 7, synthesis, conservation implications and management recommendations were presented with a general discussion regarding conservation strategy and management of grassland in Kaziranga National Park and Tiger Reserve.

CHAPTER 2

STUDY AREA

2.1 Background

The present study was conducted in Kaziranga National Park (KNP), located in the state of Assam in north-east India. With an area of about 430 km², KNP lies between latitudes 26°34'N to 26°46'N and longitudes 93°08'E to 93°36'E (Devi, 2023) (Figure 2.1). KNP is situated in the floodplains of the mighty Brahmaputra River, which runs along the Park's northern boundary, with the Mikir-Karbi Anglong Hills forming the southern boundary. KNP is spread over the civil jurisdictions of four districts, namely, Golaghat, Nagaon, Sonitpur and Biswanath and is parallel to National Highway-37. KNP is known for its successful conservation history of the Greater one-horned rhino globally. Besides rhinos, Kaziranga also provides a variety of habitats for a number of rare, endangered, and threatened charismatic species. A symbol of dedication to the conservation of animals and their habitat, Kaziranga, with a National Park status, represents the single largest Protected Area within the North-east Brahmaputra Valley (9A) Biogeographical Province to provide long-term viable conservation (Rodgers & Panwar, 1988). It falls within the Indo-Malayan Terrestrial Eco-Zone and the Brahmaputra Valley Semi-Evergreen Eco-Region (Areendran et al., 2020). Administratively, KNP has been divided into five different ranges, namely i) Agoratoli (Eastern), ii) Kohora (Central), iii) Bagori (Western), iv) Ghorakati (burapahar), and v) Biswanathghat (Northern).

2.2 Conservation History

In early 1908, the Kaziranga was first declared a Reserved Forest, later redesignated to Game Sanctuary in 1916, a Wildlife Sanctuary in 1950, and a National Park in 1974. In 1985, KNP was included on the World Heritage List of the "Convention Concerning the Protection of the World Cultural and Natural Heritage" under criteria IX and X of the Natural Heritage (Devi, 2023; Sharma et al., 2023). In 2007, Kaziranga was declared as a Tiger Reserve with an area of 1030 km². Of this 1030 km² Kaziranga Tiger

Reserve (KTR) area, the maximum area was covered by river (24.56%) and tall grass (24.39%) and the minimum area was covered by waterlogged (1.86%) and short grass (2.23%) (Sharma et al., 2023).

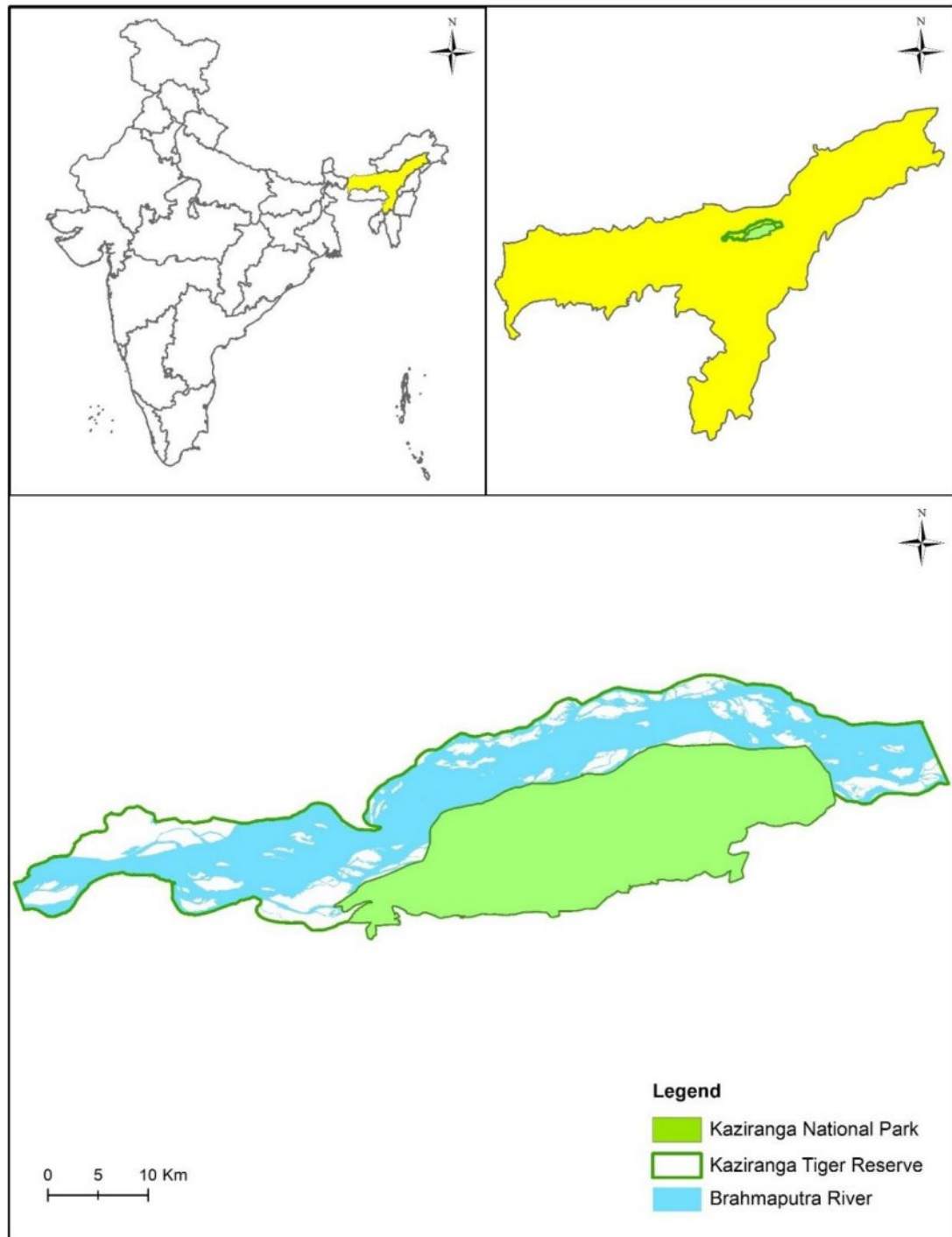


Figure 2.1. Location of the study area showing Kaziranga National Park, Assam, India.

2.3 Terrain, Geology and Soil

The terrain of the KNP is flat, with a gentle, almost imperceptible slope from east to west and from north to south (Devi, 2023). The entire KNP was formed by the alluvial deposits of the Brahmaputra River and its smaller tributaries, which carry a large amount of silt during annual floods. Lithologically, the soil composition is represented by grey silt and fine to medium sands (Devi, 2023). Older deposits of alluvium date back to the Pleistocene period and consist of sand, pebbles, clay, and silts with the formation of impure calcium carbonate (Devi, 2023). Alluvium of new origin is light in colour, consisting of sand, clay and pebbles and generally poor in calcium deposits. The area is swampy and criss-crossed by numerous water channels flowing through the Park's area. The permanent water bodies (locally known as *beels*) provide crucial habitats, especially short grasslands and water for drinking and wallowing for all wild animals, including mega- and meso-herbivores like Greater one-horned rhino (*Rhinoceros unicornis*), Asian elephant (*Elephas maximus*), Asiatic wild buffalo (*Bubalus arnee*), swamp deer (*Rucervus duvaucelii*), hog deer (*Axis porcinus*) and sambar (*Rusa unicolor*) (Devi, 2023). The Park, surrounded on the north by the Brahmaputra River, exhibits a braiding pattern with numerous stable and unstable river islands. In addition, Bhengrai and Jiya Diphlu rivers run east to west through the middle of the Park and rivers Mori Dhansiri, Difaloo, and Mori Difaloo run on the southern boundary of the Park (Yadava, 2015).

2.4 Climate

The climate of the area is subtropical monsoon type, including dry and wet seasons (Devi, 2023; Sharma et al., 2023). For the present study, which was conducted from 2014-15, rainfall based hierarchical clustering was used to identify dry and wet seasons (Figure 2.2). The clusters revealed that the dry season lasts for six months, from October to March and the wet season for six months, from April to September. From January 2014 to December 2015, the total annual precipitation in the study area varied from 1630.4 to 2247.8 mm, with a mean annual precipitation of 1939.1 ± 308.7 mm (Figure 2.3). High precipitation was recorded in the wet season (April to September), which varied from 1557 to 2021.2 mm with a mean precipitation of 1789.1 ± 232.1 mm, and

low precipitation in the dry season (October to March), which varied from 73.4 to 226.6 mm with a mean precipitation of 150 ± 76.6 mm. The MAXT ranged from 27 to 39°C, and the MINT ranged from 5 to 23°C (2014–15, Assam Forest Department). The relative humidity is high, seldom falling below 60% and may go up to 90% or more (Barua & Sharma, 1999).

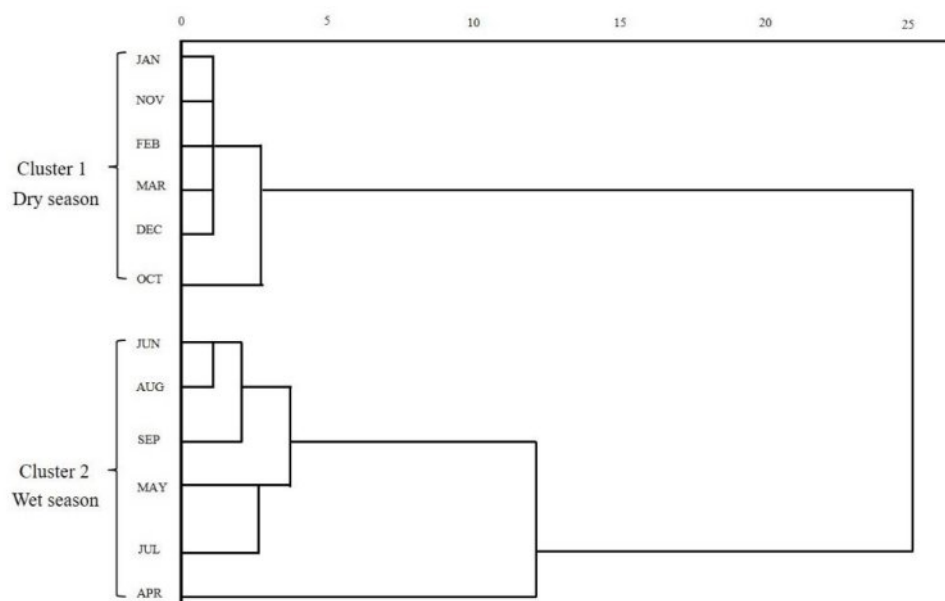


Figure 2.2. Precipitation based dendrogram classification depicting seasons classification during 2014-15 in Kaziranga National Park, Assam, India.

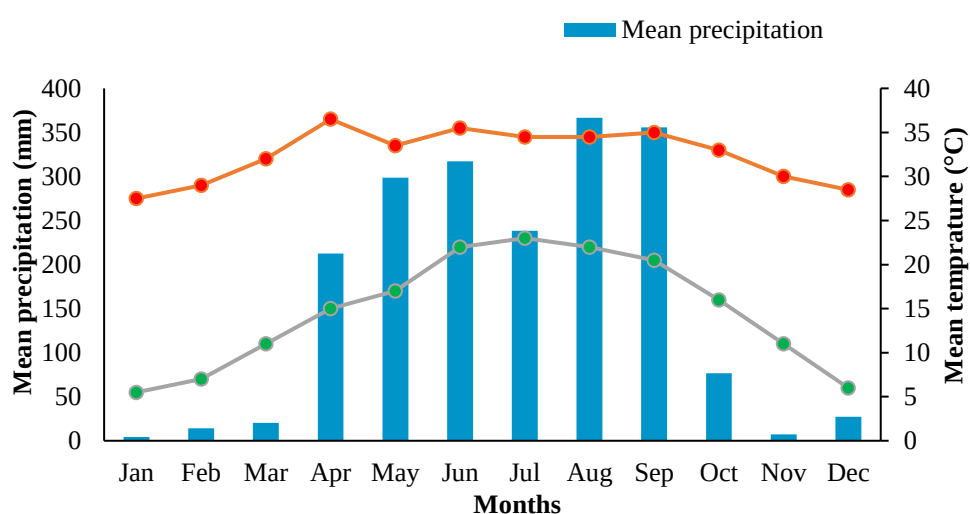


Figure 2.3. Trends in mean precipitation and temperature during 2014-15 in Kaziranga National Park, Assam, India.

2.5 Flora and Fauna

2.5.1 Flora

The vegetation of KNP comprises alluvial grasslands divisible into short and tall grasslands interspersed with tropical moist deciduous to semi-evergreen forests. Champion and Seth (1968) have described these grasslands as eastern wet alluvial grasslands (4D/2S2). Hajra and Jain (1994) classified the vegetation of the Park into four categories viz., (i) alluvial inundated grasslands, (ii) tropical wet evergreen forests, (iii) tropical semi-evergreen forests and (iv) aquatic vegetation. A brief description of the major physiognomic type is as follows:

- (i) **Alluvial inundated grasslands**- Almost two-thirds of the Park area is covered by grasslands (Hajra & Jain, 1994). Khatri and Barua (2011) further classified alluvial inundated grasslands into two categories, viz., short and tall grasslands. Short grasslands were distributed on the lower grounds around the edges of *beels* and other waterlogged areas, providing nutritious forage to herbivores. *Cynodon dactylon*, *Alternanthera* spp., *Cenchrus ciliaris*, *Cyperus* spp., *Eclipta prostrata*, *Chrysopogon aciculatus*, *Lippia* spp., *Fuchsia* sp., *Achyranthes* spp., *Hemarthria compressa*, *Polygonum* spp., *Ludwigia* spp., *Commelina* spp., *Paspalum conjugatum*, *Phyllanthus* spp., and *Digiteria* spp mainly dominated these grasslands. (Khatri & Barua, 2011). Tall grasslands are extensively distributed throughout the Park's on higher grounds and provide good shelter to herbivores and nutritious forage after burning. These habitats predominated with tall grass like *Saccharum* spp. and other plant species like *Phragmites karka*, *Miscanthus fuscus*, *Chrysopogon zizanioides*, *Apluda mutica*, *Imperata cylindrica*, *Dichanthium annulatum*, *Alpinia nigra*, *Desmodium triflorum*, *Paspalum conjugatum*, *Arundo donax*, *Digiteria* spp., *Setaria palmifolia*, *Erianthus* spp., *Vigna* spp., *Arundinella bengalensis*, *Indigofera* spp., *Sporobolus indicus*, *Uraria picta*, *Convolvulus* spp., *Leersia hexandra*, *Panicum* spp., *Ischaemum timorensis*, *Desmodium triflorum*, *Fimbristylis* spp. and *Eragrostis* spp. (Khatri & Barua, 2011).
- (ii) **Tropical wet-evergreen forests**- The tropical wet-evergreen forests are dominated by trees viz., *Alstonia scholaris*, *Dillenia indica*, *Garcinia tinctoria*,

Aphanamixis polystachya, *Syzygium cumini*, *Magnolia hodgsonii*, *Ficus rumphii*, *Cinnamomum bejolghota*, *Litsea nitida* and *Stereospermum tetragonum*. A thick undergrowth species layer is dominated by *Calamus tenuis* and *Alpinia nigra*.

- (iii) **Tropical semi-evergreen forests-** The tropical semi-evergreen forests are dominated by trees viz., *Albizia procera*, *Duabanga grandiflora*, *Lagerstroemia speciosa*, *Lagerstroemia parviflora*, *Firmiana simplex*, *Grewia serrulata*, *Mallotus philippensis*, *Lepisanthes senegalensis*, *Bombax ceiba*, *Bridelia retusa*, *Bischofia javanica*, *Crateva unilocularis*, *Leea indica*, and *Mallotus nudiflorus*. They often support luxuriant and impenetrable thickets of *Calamus tenuis*.
- (iv) **Aquatic vegetation-** The Aquatic vegetation is distributed in and around streams, lakes and waterbodies. These habitats were dominated by hydrophytes species viz., *Eichhornia crassipes*, *Azolla pinnata*, *Utricularia aurea*, *Trapa natans*, *Ceratophyllum demersum*, *Limnophila sessiliflora*, *Hydrilla verticillata*, *Hygroryza aristata*, *Ipomoea* sp., *Leersia hexandra*, *Pistia stratiotes*, *Ottelia alismoides*, *Vallisneria spiralis*, *Cryptocoryne retrospiralis*, *Nymphaea pubescens*, *Nymphoides cristata*, *Limnophila sessiliflora*, *Polygonum posumbu*, *Typha elephantina*, *Monochoria hastata*, *Kyllinga brevifolia*, *Lasia spinosa* and *Paspalum paspaloides*. *Eichhornia crassipes* (water hyacinth) is a noxious weed spreading and choking most of the waterbodies of KNP.

A floristic study conducted by Hajra and Jain (1994) in KNP and Manas National Park reported 561 plant species belonging to 378 genera and 116 families. Similarly, Baruah and Baruah (2000) reported 148 hydrophytic species belonging to 55 families, and Baruah and Baruah (2006) reported 60 grass species belonging to 41 genera.

2.5.2 Fauna

KNP harbours a rich faunal diversity, including 66 species of mammals, 559 species of birds, 75 species of reptiles, 24 species of amphibians, 80 species of fishes and 467 species of insects (Devi, 2023). It supports the largest population of Greater one-horned

rhino and Asiatic wild buffalo in the subcontinent. The other sympatric species found here are the Asian elephant, Indian bison (*Bos gaurus*), swamp deer, hog deer, sambar and Indian red muntjac (*Muntiacus muntjak*). KNP also supports the high ecological density of tigers (*Panthera tigris*). Besides this, the Gangetic River dolphin (*Platanista gangetica*), Gharial (*Gavialis gangeticus*), sloth bear (*Melursus ursinus*), Eurasian otter (*Lutra lutra*), smooth-coated otter (*Lutrogale perspicillata*) and Asian small-clawed otter (*Aonyx cinereus*), jungle cat (*Felis chaus*), pygmy hog (*Porcula salvania*), hispid hare (*Caprolagus hispidus*), Indian crested porcupine (*Hystrix indica*), capped langur (*Trachypithecus pileatus*) and Western hoolock gibbon (*Hoolock hoolock*) are some of the important fauna inhabiting the area (Devi, 2023). Due to its location at the junction of the East Asia/Australia flyway and Indo-Asian flyway, KNP supports diverse avifaunal assemblages and was designated as an 'Important Bird Area' in 2004. It supports 25 globally threatened bird species, including swamp francolin (*Ortygornis gularis*), lesser white-fronted goose (*Anser erythropus*), baer's pochard (*Aythya baeri*), ferruginous duck (*Aythya nyroca*), blyth's kingfisher (*Alcedo hercules*), pale-capped pigeon (*Columba punicea*), spotted greenshank (*Tringa guttifer*), Bengal florican (*Houbaropsis bengalensis*), black-bellied tern (*Sterna acuticauda*), greater spotted eagle (*Clanga clanga*), Eastern Imperial eagle (*Aquila heliaca*), Pallas's fish-eagle (*Haliaeetus leucoryphus*), lesser kestrel (*Falco naumanni*), white-bellied heron (*Ardea insignis*), spot-billed pelican (*Pelecanus philippensis*), dalmatian pelican (*Pelecanus crispus*), greater adjutant (*Leptoptilos dubius*), lesser adjutant (*Leptoptilos javanicus*), white-throated bushchat (*Saxicola insignis*), rufous-vented grass-babbler (*Laticilla burnesii*), bristled grassbird (*Schoenicola striatus*), marsh babbler (*Pellorneum palustre*), Jerdon's Babbler (*Chrysomma altirostre*), black-breasted parrotbill (*Paradoxornis flavirostris*) and finch's weaver (*Ploceus megarhynchus*) (Barua & Sharma, 1999; Devi, 2023). Some vulture species, viz., white-rumped vulture (*Gyps bengalensis*), Indian vulture (*Gyps indicus*), and slender-billed vulture (*Gyps tenuirostris*) are critically endangered birds reported from the area (Devi, 2023). Cuchia (*Monopterus cuchia*), freshwater garfish (*Xenentodon cancila*), catla (*Labeo catla*), great snakehead (*Channa marulius*), spotted snakehead (*Channa punctata*), Philippine catfish (*Clarias batrachus*), roho labeo (*Labeo rohita*), clown knifefish (*Chitala chitala*), bronze featherback (*Notopterus notopterus*), pabo catfish (*Ompok pabo*), olive

barb (*Systomus sarana*), wallago (*Wallago attu*) and climbing perch (*Anabas testudineus*) are some of the important fish species reported from the KNP (Devi, 2023). Along with this, KNP also supports 17 species of turtles and tortoises, including rare endangered and threatened Asian brown tortoise (*Manouria emys*), Black softshell turtle (*Asperedetes nigricans*), Narrow-headed softshell turtle (*Chitra indica*), Assam roofed turtle (*Kachuga sylhetensis*) and keeled box turtle (*Pyxidea mouhotii*). Among amphibians, Northern frog (*Phrynoglossus borealis*), common Asian toad (*Bufo melanostictus*), Indian hylid frog (*Hyla annectans*), ornate narrow-mouthed frog (*Microhyla ornata*), six-lined tree frog (*Polypedates leucomystax*), Indian bull frog (*Hoplobatrachus tigerinus*), Indian skipping frog (*Euphlyctis cyanophlyctis*) and leaf frog (*Rana tytleri*) (Devi, 2023). KNP harbours 35 species of snakes, including Burmese python (*Python molurus bivittatus*), buff-striped keelback (*Amphiesma stolata*), Eastern cat snake (*Boiga gokool*), copper-headed trinket snake (*Coelognathus radiatus*), Indian trinket snake (*Coelognathus helena*), common wolf snake (*Lycodon aulicus*), Indian rat snake (*Ptyas mucosa*), checkered keelback watersnake (*Xenochrophis piscator*), banded krait (*Bungarus fasciatus*), monocled cobra (*Naja kaouthia*) and king cobra (*Ophiophagus hannah*) (Devi, 2023). KNP also harbours 21 species of lizards, including green fan-throated lizard (*Ptyctolaemus gularis*), Khasi hill bent-toed gecko (*Cyrtodactylus khasiensis*), Bengal monitor (*Varanus bengalensis*), yellow monitor (*Varanus flavescens*) and water monitor (*Varanus salvator*).

2.6 Habitat management

2.6.1 Floods and de-siltation

In the Indian subcontinent, floods are widespread natural disasters during the southwest monsoon (June-August). The combined attribution of monsoonal precipitation and rapid melting of Himalayan glaciers accelerates the river's downward flows during the summer, creating a very high water flow rate compared to the river's capacity (Kumar et al., 2022). Among various rivers from the Himalayan regions, the Brahmaputra River in eastern India is one of the world's most affected flood hazard regions. In KNP, floods of varying degrees and magnitude are an annual phenomenon due to its proximity to the Brahmaputra River and high precipitation in the monsoon season (June to October)

(Devi, 2023; Sharma et al., 2023). With varying degrees of flood intensities and fluctuations in water level, a large area of the Park gets inundated (Borah et al., 2018). Floods not only replenish the soil with nutrient-rich alluvial deposits and regulate the water table throughout the year but also take a heavy toll with respect to animal mortality (Devi et al., 2022a). The number of waterbodies inside the Park has shrunk in size due to siltation (alluvial deposits) caused by annual floods. The area under the river and *beels* in KNP declined from 21% and 3.4% in 1990 to 14% and 2.6% in 2009, respectively (Vasu & Singh, 2015). A study by Medhi and Saha (2014) reported a decrease in the area under *beels* due to sedimentation and silt deposition and its conversion into short and tall grasslands. Therefore, as a part of habitat management, the de-siltation of waterbodies has been executed for many years in KNP (Vasu, 2003). Some highlands have been constructed inside the Park to provide shelter to animals during high floods and prevent animal mortality.

2.6.2 Fire

Prescribed grassland burning is a well-established practice in KNP. The entire tall grassland area within KNP is burned during the dry season between January and February, which may extend to April, depending on grassland phenology and soil moisture content. In KNP, prescribed controlled burning removes aboveground biomass and enhances soil nutrient content through volatilization and ash deposition, consequently impacting vegetation characteristics by altering plant community composition (heterogeneous) and limiting woody and invasive species growth (Vasu, 2003). It also controls grassland successional processes (i.e., conversion of tall grassland into forests), enhances forage palatability, availability and productivity and visibility, and facilitates anti-poaching surveillance. During grassland burning, proper fire lines were created, and only completely dry patches are burned to ensure the availability of green forage for mega- and meso-herbivores throughout the year. Burning also helps in controlling tree seedling germination and the proliferation of noxious invasive species, including *Mimosa* spp. and *Mikania micrantha* (Vasu, 2003; Vasu & Singh, 2015). Vegetation regrowth and resprouting are phenomenally fast in burned patches due to the arrival of monsoon season following burning (April

onwards). The mosaic pattern of new growth in burned areas attracts high herbivore density, which provides nutritious-rich forage to mega- and meso-herbivores.

2.7 Local communities and livelihoods

Assam has a heterogeneous set of three unique social groups, namely the hill tribes, plains tribes, and the non-tribals (Heinen & Shrivastava, 2009). The southern boundary of the KNP is inhabited by 150 revenue villages (Vasu, 2003). A study conducted by Heinen and Shrivastava (2009) identifies seven ethnoreligious local communities around KNP *viz.*, Brahmin, Kshatriya, Kayastha, Scheduled castes, Tribal, Muslim and Christian. Agriculture is the single largest occupation, followed by tea estate employment, livestock rearing and ecotourism (Heinen & Shrivastava, 2009; Shrivastava & Heinen; 2009; Hussain et al., 2012; Borah et al., 2018).

2.8 Threats

Habitat fragmentation, flooding and soil erosion, poaching and road killing, encroachment and domestic cattle grazing, and proliferation of invasions in grasslands and wetlands have been defined as critical threats to KNP (Devi, 2023) (Appendix Table 2.1).

2.7.1 Habitat fragmentation

The Park boundary has been fragmented due to an increase in human settlements, agriculture and tea gardens expansion and development activities along National highway-37. These developments disrupt the movement of animals within the park and between different habitats, affecting their feeding, breeding, and migratory patterns (Yadava, 2015; Sharma et al., 2023).

2.7.2 Flood and erosion

Soil erosion during floods plays a vital role in shaping the landscape of KNP. Annually, large chunks of land from the Northern boundary of the Park are washed away in floods received from the Brahmaputra River. As per the records, from 1912 to the late 2010s, KNP lost about 149.98 km² of area and gained about 60.85 km² of area (Patnaik et al., 2019).

2.7.3 Poaching and road killing

The poaching of the rhino, Asiatic wild buffalo and swamp deer for their horns and antlers for traditional medicinal purposes also threatens the population of wild animals in KNP (Patar, 2005; Patnaik et al., 2019). During high floods, wild animals migrate to Karbi-Anglong hills through National highway-37, making them more prone to poaching, accidents and drowning (Bonai, 1998; Yadava, 2014). Current plans are underway to convert the existing National highway-37 to a six-lane expressway, which in future will become a permanent barrier and increase the risk of wild animal mortality (Patnaik et al., 2019). Sometimes, late grassland burning affects the fawns, calves of ungulates, and herpetofauna (Bonai, 1998; Ahmed et al., 2005).

2.7.4 Encroachment and grazing issues

Establishing human settlements near the park boundaries and encroachments into the park lead to habitat loss, increased human-wildlife conflicts, and restricted animal-free movement. Settlements are increasing every year and pose a challenge as they may lead to other harmful anthropogenic activities like the expansion of agriculture, more extraction of fuelwood, fodder and fish species, and future development and construction of roads and markets. Grazing by domestic cattle also seriously threatens wild animals due to the possible spreading of diseases, like anthrax, among park animals (Vasu, 2003; Patnaik et al., 2019).

2.7.5 Invasive weeds and shrinking of grasslands and wetlands

The proliferation of invasive species in wet grasslands is a major threat to KNP. These invasive species have the potential to outcompete native flora, disrupt natural ecosystems, and degrade wildlife habitats. *Mimosa* spp. and *Mikania micrantha* are two noxious invasive plant species reported in KNP's grasslands (Vattakkavan et al., 2002; Vasu, 2003; Vasu & Singh, 2015). These quick-growing species form entanglements with main forage plants (grasses) to destroy their canopy and hamper the free movement of wild animals (Vasu & Singh, 2015). Along with this, the invasion of tree species like *Bombax ceiba* in grasslands has recently been a serious concern. It mainly spread in grasslands along the central and western ranges of the Park. In aquatic systems, the spreading of invasives, namely, *Ipomoea carnea* and *Eichhornia crassipes* is deteriorating the habitat and water quality.

Despite numerous issues and challenges, KNP authorities have played a crucial role in bringing the rhino population back from the brink of extinction. In fact, the last one hundred years have seen major conservation successes in KNP, with populations of many endangered species, including rhino, elephant and tiger, rising and the ecological integrity of the area being maintained despite high biotic pressures and stochastic perturbations in the landscape (Mathur et al., 2005). To mitigate the situation, considerable efforts have been taken by the forest department. Some measures include pressing speed boats service, patrolling through various modes like foot, vehicles, boats and elephants, repairing the highlands before the flood and anti-poaching vigilance through floating camps and deployment of staff members. For grassland habitat management and maintenance, annual burning and uprooting of invasive species was regularly conducted by forest department authorities (Yadava, 2015). They also sensitize and conduct awareness drives among the fringe villagers for wildlife conservation, seeking their cooperation and support and working rigorously to combat man-animal conflict issues. The forest department also maintains a dog squad to catch wildlife crime offenders.

CHAPTER 3

SOIL SEED BANK CHARACTERISTICS AND COMPOSITION OF RIVERINE ALLUVIAL GRASSLANDS

3.1 Introduction

The soil seed bank represents the pool of viable seeds, is one of the most critical and vital components of various kinds of ecosystems and can be defined as “*an aggregation of ungerminated seed potentially capable of replacing adult plants*” (Baker, 1989; DeBerry et al., 2000). These soil seed banks may function as the genetic memory of plant populations and play an important role in community dynamics and regeneration (Erfanzadeh et al., 2013). The capability of seeds to maintain their viability enables species to endure periods of disruption and devastation (Thompson, 2000; Erfanzadeh et al., 2013). Soil seed banks have high temporal (successional) and spatial variability, with conspicuous changes in abundance, density and plant species composition (Erfanzadeh et al., 2013). These banks also have vertical and horizontal distribution, where vertical distribution illustrates the depth arrangement of seeds within the soil (Erfanzadeh et al., 2013). In the environment, seed dispersion and distribution from one habitat to another are governed by various phenomena, such as — a) anemochory, where seeds disperse through wind, b) hydrochory, where seeds disperse through water, c) endozoochory, where seeds disperse through animal activities, for example, grazers consume fruits and/or seeds and transport seeds through their fur, plumage or feet, and d) gravity dispersal (Erfanzadeh et al., 2013; Traveset et al., 2014; Bao et al., 2018). Seeds from one habitat may exist in the soil of another, even if they are not apparent in the aboveground vegetation of that habitat (Erfanzadeh et al., 2013).

Tropical grasslands are characterized by a species-rich herbaceous plant community (Joyce et al., 2016; Buisson et al., 2018). These plant communities are maintained by changing intensities and frequencies of diverse factors, including climate change (specifically, alterations in precipitation and temperature), herbivory and management interventions (Joyce et al., 2016; Buisson et al., 2018; Sharma et al., 2023). Experimental studies on tropical grasslands have demonstrated that seed bank

composition is influenced by various factors, including climatic events such as changes in precipitation (flooding) and temperature (Bao et al., 2017; Mall et al., 2019), grazing intensities (Silva & Overbeck, 2020), and management practices like burning (de Oliveira et al., 2019). In seasonally inundated tropical grasslands, flooding mainly causes seasonal changes in plant community structure and composition, further influencing the seed bank abundance, density and composition (de Souza et al., 2016; Bao et al., 2017; Bao et al., 2018). These grasslands harbour a mixture of plant species capable of tolerating flooded and dry conditions (Bao et al., 2017; Bao et al., 2018). The changing cycles of wet (flooding) and dry conditions (i.e., the temporal and spatial fluctuations in water level and soil moisture) influence the availability of habitats with the conditions essential for seedling germination, thereby allowing the occurrence of plant species with different life strategies for the various phases of the hydrological cycle (de Souza et al., 2016; Bao et al., 2017; Bao et al., 2018). Experimental studies on seed bank composition of tropical grasslands found different seed abundance, density and species composition in flooded and non-flooded conditions (Bao et al., 2014; Bao et al., 2017; Bao et al., 2018). Experimental treatments with flood inundation conditions support more aquatic species (e.g., macrophytes) and low seed abundance and densities. Conversely, experimental treatment with non-flooding conditions supports terrestrial species, high seed abundance, and densities (Bao et al., 2014; Bao et al., 2017). Experimental evidence has also demonstrated that flood inundation conditions promote similarities in species composition. For example, an intermediate level of flooding in the tropical grasslands of Pantanal in South America found high species similarity during the wet season compared to the dry season (Bao et al., 2014). Studies examining the physical characteristics of seed banks in tropical grasslands are limited; available literature only documented a few seed characteristics like shape, size and weight (Holzel & Otte, 2004; Schmiede et al., 2009).

Seed bank physical or vegetation characteristics information is valuable in habitat restoration and conservation ecology (Ma et al., 2012). Most of the aforementioned experimental studies assessing tropical grassland seed bank characteristics have emerged from America, with limited studies from Asia (e.g. Mall et al., 2019). To fulfil this gap, the present chapter aims to provide the seed bank characteristics of subtropical

riverine alluvial grasslands of Kaziranga National Park (KNP). These grasslands are vulnerable to climatic events like seasonal flooding and subjected to combinations of herbivory and management practices such as prescribed burning and manual uprooting of globally noxious invasive, *Mikania micrantha* and *Mimosa* spp. (Vasu, 2003; Vasu & Singh, 2015). However, the lack of scientific-validated experimental studies based on seed bank physical and vegetation characteristics creates hurdles in their conservation and management. Hence, understanding and developing knowledge of soil seed banks will help predict and acquire the historical characteristics of these grassland communities, which have evolved over the years through many succession stages (Rawat, 2005). The assessment of seed bank attributes involves the identification process like visual examination of seed traits viz., morphology, condition, surface texture, and the presence or absence of appendages (Grime et al., 1981; Ninot et al., 2008; Price et al., 2010). Extending the evaluation to germination analysis sheds light on the composition of seed banks in terms of plant species (Price et al., 2010; Bao et al., 2017). This information further contributes to delineating and assessing tropical grassland vegetation's regenerative and restoration capacities, as Schmiede et al. (2009) exemplified. Therefore, baseline information generated from present work will aid management authorities in formulating and upgrading current management practices.

The chapter aims to provide answers to the following research questions:

1. How do the seasonal variations influence the physical characteristics of short grasslands (SG) and tall grasslands (TG) soil seed banks in terms of (a) seed condition (whole, cracked, and split), (b) seed coat surface (smooth and rough), and (c) appendages (present or absent)?
2. How do seasonal variations influence vegetation characteristics (composition) of SG and TG soil seed banks given (a) natural and (b) flooding conditions?

3.2 Methodology

3.2.1 Experimental design

The locations for experimental sites (ES) were selected based on the duration of accessibility. For heterogeneous sampling, these locations were selected in three

different ranges of KNP, namely central (Kohora), eastern (Agoratoli), and western (Bagori). The data was collected from 12 experimental sites representing short (n=6) and tall (n=6) grassland habitats (Appendix Table 3.1). A greenhouse measuring 20 meters in length, 10 meters in width, and 5 meters in height was constructed near the Park to replicate its environmental conditions for the seed germination experiment.

3.2.2 Field Sampling

Soil samples were collected for two years, from January 2014 to December 2015 (excluding the flood period from August to October), to examine the soil seed bank characteristics. The sampling period was divided into the dry (for November and January only) and the wet seasons (for April and July only). For the soil sample collection, a total of 96 transects were laid in each randomly selected site in short grasslands (no. of transects, n=48) and tall grasslands (n=48). During these transects, the 1m × 1m quadrates were laid, and data was collected from the three replicates. These soil samples were collected from three different soil layers, namely upper (0-5cm), middle (5-10cm) and lower (10-15cm) with the help of soil auger (length=15 cm, diameter=7.5 and radius=3.5). Separate composite samples were prepared by mixing four samples collected from the respective layers within a single quadrate following Silva and Overbeck (2020). A total of 1,728 composite samples were collected, with 864 collected during the dry season and 864 during the wet season (Appendix Table 3.2). Two distinct sets of soil samples were collected for an experiment investigating the influence of both natural and flooding conditions on the composition of seed bank vegetation. The soil samples were stored in polybags labelled with location, depth, date and month of collection. The soil samples gathered were transported to the base camp and were sun-dried for 2-3 days before processing.

3.2.3 Hand sorting Experiment

After drying, each composite soil sample was hand crushed and spread on steel plates to sort naked seeds, following Roberts (1981) and Ninot et al. (2008). After that, the soil samples were sequentially sieved through meshes of decreasing widths (1 mm, 0.5 mm, and 0.2 mm) to separate plant materials (debris and seeds) and mineral particles

(aggregates and sand) (Ninot et al., 2008). Seeds obtained from each soil sample were initially counted to gather abundance data. Subsequently, seeds were spread out on a white sheet for a detailed examination of their features. Based on the studies conducted by Grime et al. (1981) and Ninot et al. (2008), three key characteristics, viz., seed condition, coat surface and seed appendages were identified. Seed conditions were classified into three categories viz., whole (refers to intact seeds that have not been damaged or split), cracked (refers to seeds with partial fractures or breaks in the outer shell), and split (refers to seeds that are completely divided into two or more parts). Seed coat surfaces were classified into two categories viz., smooth (refers to even seed surface, which lacks textural irregularities) and rough (refers to uneven seed surface, which may exhibit traits such as rugose, muricate, tuberculate, reticulate, striate, or hairy textures). Seed appendages were classified into two categories viz., seed without appendages (refers to seeds without any additional structures or appendages) and seed with appendages (refers to seeds with additional structures or appendages attached like awns, spins, hook, barbed, wings, hairs and teeth).

3.2.4 Seed germination Experiment

Following hand sorting, the soil samples were thoroughly mixed to ensure a homogenous distribution of the seeds. Subsequently, soil samples were transferred into earthen pots measuring 30 × 25 cm, accompanied by a detailed description of the collected samples following Roberts (1981), Ninot et al. (2008), and Erfanzadeh et al. (2013). The earthen pots were placed on shelves to germinate within the greenhouse with natural light conditions and subjected to two germination experiments within- (a) natural environmental conditions (SGN-short grassland given natural treatment; TGN-tall grassland given natural treatment) and (b) flooding environmental conditions (SGF-short grassland given flooding treatment; TGF-tall grassland given flooding treatment). In the natural environmental conditions, pots were designated as “natural”, where soil samples were exposed to natural light and periodic water sprinkling to maintain consistent moisture levels, except during rainy periods, and were allowed to undergo the germination process.

In flooding treatment, pots were designated as “flooding”, where soil samples were exposed to natural light. Before subjecting the sample to regular water sprayings, the flooding pots were kept inundated up to 3-5 cm water level for three months to imitate the flood inundation period of KNP grasslands. In the first four to six weeks of natural and flooding experiment's, emergent seedlings were marked with coloured toothpicks to denote the week of emergence. After four to six weeks, all existing seedlings were identified, counted and removed. New seedlings were removed weekly, and soil samples were thoroughly mixed again to stimulate seed germination. Pots were checked twice weekly, which involved identifying, counting, and removing seeds and continuing the process until no new emergence was observed. After eight months, when there was no further seed germination, the pots were left to dry for two weeks (Erfanzadeh et al., 2013), which exposed deeper buried seeds in the samples to crumble to the light. After watering, the samples were checked for another two weeks for new seedling's emergence. There was one final seedling census before discarding the soil samples.

3.2.5 Data analysis

Seed abundance was determined by summing up the number of seeds sorted and germinated from the soil seed bank. Following Silva and Overbeck (2020) and, Wang et al. (2022) the seed bank density (seedling/m²) was calculated using the following equation:

$$\text{Seed density} = \left(\frac{\text{Total number of seeds}}{\text{Total number of soil samples}} \right) \times \left(\frac{1 \text{ per meter square}}{\text{Area of soil cores (per meter square)}} \right)$$

Then, the surface area of a single soil sample was calculated using the following formula:

$$\text{Area of soil cores} = (\pi r^2 \times 4), \text{ where } \pi=3.14, \text{ diameter}=7.5, \text{ radius}=3.75 \text{ and} \\ \text{number of soil core}=4$$

Therefore, the area of the single composite sample was 0.02 m² (area of soil core=3.14×3.75×3.75×4=176.63 cm²=0.02 m²). Data normality was checked using a

non-parametric test, Kolmogorov-Smirnov test. Mann-Whitney and Kruskal-Wallis tests were performed using the SPSS 20.0 statistical package to derive significant differences. Pairwise similarities in the plant species composition in experimental sites were estimated using the Bray-Curtis similarity index, ranging from 0 (no similarity) to 1 (complete similarity) using PAST3 (Bray & Curtis, 1957).

3.3 Results

3.3.1 Seed abundances and densities: Irrespective of experiments

In riverine alluvial grasslands, a total mean of 10924.29 ± 1333.32 seedlings with a seed density of $8,590 \text{ seeds/m}^2$ were recorded (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (14045.50 ± 1118.22) and density ($D=11045 \text{ seeds/m}^2$) were recorded during the dry season (Mann-Whitney, $P < 0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall= 7113.83 ± 846.74 , dry season= 9130.5 ± 625.58 and wet season= 5097.17 ± 493.14 ; Kruskal-Wallis, $P < 0.05$) and density (overall= 16782 seeds/m^2 , dry season= 21539 seeds/m^2 and wet season= 12024 seeds/m^2 ; Kruskal-Wallis, $P < 0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P < 0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P < 0.05$) (Appendix Table 3.7).

In natural treatment, a total mean of 7603.25 ± 1025.76 seedlings with a seed density of $11,958 \text{ seeds/m}^2$ were recorded in riverine alluvial grasslands (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (10001.50 ± 887.87) and density ($D=15729 \text{ seeds/m}^2$) were recorded during the dry season (Mann-Whitney, $P < 0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall= 5034.79 ± 649.34 , dry season= 6578.58 ± 503.01 and wet season= 3491.00 ± 354.67 ; Kruskal-Wallis, $P < 0.05$) and density (overall= 23755

seeds/m², dry season=31038 seeds/m² and wet season=16471 seeds/m²; Kruskal-Wallis, $P<0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7).

In flooding treatment of the riverine alluvial grasslands, a total mean of 3321.04 ± 309.55 seedlings with a seed density of 5,223 seeds/m² were recorded (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (4044.00 ± 236.88) and density ($D=6360$ seeds/m²) were recorded during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall= 2079.04 ± 198.72 , dry season= 2551.92 ± 126.37 and wet season= 1606.17 ± 138.69 ; Kruskal-Wallis, $P<0.05$) and density (overall=9809 seeds/m², dry season=12040 seeds/m² and wet season=7578 seeds/m²; Kruskal-Wallis, $P<0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7). Compared to flooding treatment, significantly high mean seed abundances and densities were recorded in natural treatment, irrespective of the seasons (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). Between natural and flooding treatments, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.8).

3.3.1.1 Short grassland

A total mean of 6925.54 ± 741.66 seedlings with a seed density of 10,892 seeds/m² were recorded from SG (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (8602.50 ± 719.09) and density ($D=13529$ seeds/m²) were recorded during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.4). Among

the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall=4422.63±465.54, dry season=5492.17±421.16 and wet season=3353.08±267.20; Kruskal-Wallis, $P<0.05$) and density (overall=20866 seeds/m², dry season=25913 seeds/m² and wet season=15820 seeds/m²; Kruskal-Wallis, $P<0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7).

In SGN, a total mean of 4882.71±598.45 seedlings with a seed density of 15,358 seeds/m² were recorded (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (6241.92±579.53) and density (D=19633 seeds/m²) were recorded during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.4). Among the three soil layers, the upper layer showed significantly highest mean seed abundance (overall=3186.54±377.30, dry season=4054.00±342.36 and wet season=2319.08±213.20; Kruskal-Wallis, $P<0.05$) and density (overall=30069 seeds/m², dry season=38254 seeds/m² and wet season=21883 seeds/m²; Kruskal-Wallis, $P<0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7).

In SGF, a total mean of 2042.83±145.74 seedlings with a seed density of 6,426 seeds/m² were recorded (Appendix Table 3.3). Compared to the wet season, a significantly high mean seed abundance (2360.58±149.39) and density (D=7425 seeds/m²) were recorded during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall=1236.08±89.84, dry season=1438.17±86.57 and wet season=1034.00±54.26; Kruskal-Wallis, $P<0.05$) and density (overall=11664 seeds/m², dry season=13571

seeds/m² and wet season=9757 seeds/m²; Kruskal-Wallis, $P<0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7). Compared to SGF, significantly high mean seed abundances and densities were recorded in SGN, irrespective of the seasons (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). Between SGN and SGF, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.8).

3.3.1.2 Tall grassland

A total mean of 3998.75 ± 596.33 seedlings with a seed density of 6,289 seeds/m² were recorded from TG (Appendix Table 3.3). Compared to the wet season, a significantly high mean seed abundance (5443.00 ± 403.97) and density ($D=8560$ seeds/m²) were recorded during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall= 2691.21 ± 386.18 , dry season= 3638.33 ± 211.18 and wet season= 1744.08 ± 230.93 ; Kruskal-Wallis, $P<0.05$) and density (overall= 12697 seeds/m², dry season= 17166 seeds/m² and wet season= 8229 seeds/m²; Kruskal-Wallis, $P<0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7).

In TGN, a total mean of 2720.54 ± 430.34 seedlings with a seed density of 8,557 seeds/m² were recorded (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (3759.58 ± 314.10) and density ($D=11825$ seeds/m²) were recorded during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly

highest mean seed abundance (overall=1848.25±275.70, dry season=2524.58±168.22 and wet season=1171.92±146.52; Kruskal-Wallis, $P<0.05$) and density (overall=17440 seeds/m², dry season=23822 seeds/m² and wet season=11058 seeds/m²; Kruskal-Wallis, $P<0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7).

In TGF, a total mean of 1305.29±177.91 seedlings with a seed density of 4,020 seeds/m² were recorded (Appendix Table 3.3). Compared to the wet season, high mean seed abundance (1737.58±103.36) and density (D=5295 seeds/m²) were recorded during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.4). Among the three soil layers, the upper layer showed significantly highest mean seed abundance (overall=856.50±116.59, dry season=1140.83±47.91 and wet season=572.17±85.13; Kruskal-Wallis, $P<0.05$) and density (overall=7954 seeds/m², dry season=10510 seeds/m² and wet season=5399 seeds/m²; Kruskal-Wallis, $P<0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7). Compared to TGF, significantly high mean seed abundances and densities were recorded in TGN, irrespective of the seasons (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). Between TGN and TGF, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.8).

3.3.2 Seed abundances and densities: Hand Sorting Experiment

In riverine alluvial grasslands, a total mean of 705.08±90.87 seedlings with a seed density of 554 seeds/m² were recorded (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (928.17±64.26) and density (D=730

seeds/m²) were recorded during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall=466.92±58.79, dry season=612.08±37.38 and wet season=321.75±26.16; Kruskal-Wallis, $P<0.05$) and density (overall=1101 seeds/m², dry season=1444 seeds/m² and wet season=759 seeds/m²; Kruskal-Wallis, $P<0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.5).

Seed condition, surface and appendages recorded in riverine alluvial grasslands —

Among the different seed conditions, whole seeds dominated the seed bank with high mean seed abundance (overall=478.88±61.72, dry season=630.00±44.44 and wet season=327.75±23.96) and density (overall=377 seeds/m², dry season=495 seeds/m² and wet season=258 seeds/m²) irrespective of the seasons. Compared to the wet season, higher mean seed abundances and densities were recorded during the dry season for whole, cracked and split seed conditions. Irrespective of the seasons, whole seeds dominated the seed bank of the upper, middle and lower soil layers. A high mean abundance of whole seeds were recorded from the upper soil layer (overall=317.54±41.06, dry season=418.75±26.77 and wet season=216.33±17.94), followed by the middle soil layer (overall=107.63±16.09, dry season=145.58±14.78 and wet season=69.67±5.42) and lower soil layer (overall=53.71±4.87, dry season=65.67±3.42 and wet season=41.75±1.93). Similarly, high densities of whole seeds were recorded from the upper soil layer (overall=749 seeds/m², dry season=988 seeds/m² and wet season=510 seeds/m²), followed by the middle soil layer (overall=254 seeds/m², dry season=343 seeds/m² and wet season=164 seeds/m²) and lower soil layer (overall=127 seeds/m², dry season=155 seeds/m² and wet season=98 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of whole seeds were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

With respect to seed surface, smooth surface seeds dominated the seed bank with high mean seed abundance (overall=423.21±52.31, dry season=550.42±38.49 and wet season=296.00±22.34) and density (overall=333 seeds/m², dry season=433 seeds/m² and wet season=233 seeds/m²) irrespective of the seasons. Compared to the wet season, higher seed abundances and densities of seeds with smooth and rough surfaces were recorded during the dry season. Irrespective of the seasons, smooth surface seeds dominated the seed bank of the upper, middle and lower soil layers. A high mean abundance of seeds with smooth surfaces were recorded from the upper soil layer (overall=257.21±33.00, dry season=337.08±23.84 and wet season=177.33±16.11), followed by the middle soil layer (overall=107.96±13.04, dry season=139.92±9.65 and wet season=76.00±4.40) and lower soil layer (overall=58.04±6.68, dry season=73.42±6.36 and wet season=42.67±3.16). Similarly, high densities of seeds with smooth surfaces were recorded from the upper soil layer (overall=607 seeds/m², dry season=795 seeds/m² and wet season=418 seeds/m²), followed by the middle soil layer (overall=255 seeds/m², dry season=330 seeds/m² and wet season=179 seeds/m²) and lower soil layer (overall=137 seeds/m², dry season=173 seeds/m² and wet season=101 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of seeds with smooth surfaces were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

Irrespective of the seasons, the seeds without appendages dominated the seed bank with high mean seed abundance (overall=553.96±73.52, dry season=730.92±58.90 and wet season=377.00±29.70) and density (overall=436 seeds/m², dry season=575 seeds/m² and wet season=296 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of seeds were recorded during the dry season for both seeds with and without appendages. Irrespective of the seasons, seeds without appendages dominated the seed bank of the upper, middle and lower soil layers. A high mean seed abundances of seeds without appendages were recorded from the upper soil layer (overall=357.04±46.82, dry season=470.00±35.14 and wet season=244.08±22.08), followed by the middle soil layer (overall=132.08±18.57, dry season=175.25±18.36 and wet season=88.92±5.54) and lower soil layer (overall=64.83±8.47, dry season=85.67±6.00 and wet season=44.00±3.03). Similarly, a high density of seeds

without appendages were recorded from the upper soil layer (overall=842 seeds/m², dry season=1109 seeds/m² and wet season=576 seeds/m²), followed by the middle soil layer (overall=312 seeds/m², dry season=413 seeds/m² and wet season=210 seeds/m²) and lower soil layer (overall=153 seeds/m², dry season=202 seeds/m² and wet season=104 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of seeds without appendages were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

In the natural treatment, a total mean of 368.54±49.38 seedlings with a seed density of 580 seeds/m² were recorded (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (487.58±38.77) and density (D=767 seeds/m²) were recorded during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall=243.63±31.41, dry season=320.42±21.18 and wet season=166.83±15.01; Kruskal-Wallis, $P<0.05$) and density (overall=1149 seeds/m², dry season=1512 seeds/m² and wet season=787 seeds/m²; Kruskal-Wallis, $P<0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7).

Seed condition, surface and appendages recorded in natural treatment — Among the different seed conditions, whole seeds dominated the seed bank with high mean seed abundance (overall=249.92±34.91, dry season=333.08±28.76 and wet season=166.75±15.79) and density (overall=393 seeds/m², dry season=524 seeds/m² and wet season=262 seeds/m²) irrespective of the seasons. Compared to the wet season, higher mean seed abundances and densities were recorded during the dry season for whole, cracked and split seed conditions. Irrespective of the seasons, whole seeds dominated the seed bank of the upper, middle and lower soil layers. A high mean abundance of whole seeds were recorded from the upper soil layer (overall=165.83±22.79, dry season=220.67±16.95 and wet season=111.00±11.50),

followed by the middle soil layer (overall=56.08±9.23, dry season=77.00±9.67 and wet season=35.17±3.53) and lower soil layer (overall=28.00±3.07, dry season= 35.42±2.36 and wet season=20.58±1.32). Similarly, high densities of whole seeds were recorded from the upper soil layer (overall=782 seeds/m², dry season=1041 seeds/m² and wet season=524 seeds/m²), followed by the middle soil layer (overall=265 seeds/m², dry season=363 seeds/m² and wet season=166 seeds/m²) and lower soil layer (overall=132 seeds/m², dry season=167 seeds/m² and wet season=97 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of whole seeds were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

With respect to seed surface, smooth surface seeds dominated the seed bank with high mean seed abundance (overall=220.33±28.57, dry season=288.00±24.45 and wet season=152.67±12.64) and density (overall=347 seeds/m², dry season=453 seeds/m² and wet season=240 seeds/m²) irrespective of the seasons. Compared to the wet season, higher seed abundances and densities of seeds with smooth and rough surfaces were recorded during the dry season. Irrespective of the seasons, smooth surface seeds dominated the seed bank of the upper, middle and lower soil layers. A high mean abundance of seeds with smooth surfaces were recorded from the upper soil layer (overall=135.08±18.25, dry season=178.83±14.58 and wet season=91.33±8.15), followed by the middle soil layer (overall=55.00±6.87, dry season=71.17±5.78 and wet season=38.83±3.56) and lower soil layer (overall=30.25±3.70, dry season=38.00±4.68 and wet season=22.50±1.43). Similarly, high densities of seeds with smooth surfaces were recorded from the upper soil layer (overall=637 seeds/m², dry season=844 seeds/m² and wet season=431 seeds/m²), followed by the middle soil layer (overall=259 seeds/m², dry season=336 seeds/m² and wet season=183 seeds/m²) and lower soil layer (overall=143 seeds/m², dry season=179 seeds/m² and wet season=106 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of seeds with smooth surfaces were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

Irrespective of the seasons, the seeds without appendages dominated the seed bank with high mean seed abundance (overall=289.08±40.32, dry season=384.92±33.98 and wet

season= 193.25 ± 17.55) and density (overall= 455 seeds/m^2 , dry season= 605 seeds/m^2 and wet season= 304 seeds/m^2). Compared to the wet season, higher mean seed abundances and densities of seeds were recorded during the dry season for both seeds with and without appendages. Irrespective of the season, seeds without appendages dominated the seed bank of the upper, middle and lower soil layers. A high mean seed abundances of seeds without appendages were recorded from the upper soil layer (overall= 185.00 ± 24.81 , dry season= 245.17 ± 17.55 and wet season= 124.83 ± 12.32), followed by the middle soil layer (overall= 69.67 ± 10.89 , dry season= 93.58 ± 12.60 and wet season= 45.75 ± 3.61) and lower soil layer (overall= 34.42 ± 4.91 , dry season= 46.17 ± 4.01 and wet season= 22.67 ± 2.09). Similarly, a high density of seeds without appendages were recorded from the upper soil layer (overall= 873 seeds/m^2 , dry season= 1157 seeds/m^2 and wet season= 589 seeds/m^2), followed by the middle soil layer (overall= 329 seeds/m^2 , dry season= 442 seeds/m^2 and wet season= 216 seeds/m^2) and lower soil layer (overall= 162 seeds/m^2 , dry season= 218 seeds/m^2 and wet season= 107 seeds/m^2). Compared to the wet season, higher mean seed abundances and densities of seeds without appendages were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

In flooding treatment, a total mean of 336.54 ± 41.68 seedlings with a seed density of 529 seeds/m^2 were recorded (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (440.58 ± 26.07) and density ($D=693 \text{ seeds/m}^2$) were recorded during the dry season (Mann-Whitney, $P < 0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall= 223.29 ± 27.49 , dry season= 291.67 ± 16.88 and wet season= 154.92 ± 11.17 ; Kruskal-Wallis, $P < 0.05$) and density (overall= 1054 seeds/m^2 , dry season= 1376 seeds/m^2 and wet season= 731 seeds/m^2 ; Kruskal-Wallis, $P < 0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P < 0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P < 0.05$) (Appendix Table 3.7).

Seed condition, surface and appendages recorded in flooding treatment — Among the different seed conditions, whole seeds dominated the seed bank with high mean seed abundance (overall=228.96±27.01, dry season=296.92±16.11 and wet season=161.00±8.20) and density (overall=360 seeds/m², dry season=467 seeds/m² and wet season=253 seeds/m²) irrespective of the seasons. Compared to the wet season, higher mean seed abundances and densities were recorded during the dry season for whole, cracked and split seed conditions. Irrespective of the seasons, whole seeds dominated the seed bank of the upper, middle and lower soil layers. A high mean abundance of whole seeds were recorded from the upper soil layer (overall=151.71±18.44, dry season=198.08±10.39 and wet season=105.33±6.70), followed by the middle soil layer (overall=51.54±6.94, dry season=68.58±5.12 and wet season=34.50±2.17) and lower soil layer (overall=25.71±1.93, dry season=30.25±1.67 and wet season=21.17±0.91). Similarly, high densities of whole seeds were recorded from the upper soil layer (overall=716 seeds/m², dry season=935 seeds/m² and wet season=497 seeds/m²), followed by the middle soil layer (overall=243 seeds/m², dry season=324 seeds/m² and wet season=163 seeds/m²) and lower soil layer (overall=121 seeds/m², dry season=143 seeds/m² and wet season=100 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of whole seeds were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

With respect to seed surface, smooth surface seeds dominated the seed bank with high mean seed abundance (overall=202.88±24.02, dry season=262.42±14.93 and wet season=143.33±10.29) and density (overall=319 seeds/m², dry season=413 seeds/m² and wet season=225 seeds/m²) irrespective of the seasons. Compared to the wet season, higher seed abundances and densities of seeds with smooth and rough surfaces were recorded during the dry season. Irrespective of the seasons, smooth surface seeds dominated the seed bank of the upper, middle and lower soil layers. A high mean abundance of seeds with smooth surfaces were recorded from the upper soil layer (overall=122.13±14.81, dry season=158.25±9.40 and wet season=86.00±8.07), followed by the middle soil layer (overall=52.96±6.44, dry season=68.75±4.91 and wet season=37.17±1.80) and lower soil layer (overall=27.79±3.24, dry season=35.42±2.35

and wet season= 20.17 ± 2.20). Similarly, high densities of seeds with smooth surfaces were recorded from the upper soil layer (overall=576 seeds/m², dry season=747 seeds/m² and wet season=406 seeds/m²), followed by the middle soil layer (overall=250 seeds/m², dry season=324 seeds/m² and wet season=175 seeds/m²) and lower soil layer (overall=131 seeds/m², dry season=167 seeds/m² and wet season=95 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of seeds with smooth surfaces were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

Irrespective of the season, the seeds without appendages dominated the seed bank with high mean seed abundance (overall= 264.88 ± 33.39 , dry season= 346.00 ± 25.81 and wet season= 183.75 ± 12.26) and density (overall=417 seeds/m², dry season=544 seeds/m² and wet season=289 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of seeds were recorded during the dry season for both seeds with and without appendages. Irrespective of the seasons, seeds without appendages dominated the seed bank of the upper, middle and lower soil layers. A high mean seed abundances of seeds without appendages were recorded from the upper soil layer (overall= 172.04 ± 22.18 , dry season= 224.83 ± 18.46 and wet season= 119.25 ± 9.82), followed by the middle soil layer (overall= 62.42 ± 7.81 , dry season= 81.67 ± 5.76 and wet season= 43.17 ± 2.17) and lower soil layer (overall= 30.42 ± 3.61 , dry season= 39.50 ± 2.12 and wet season= 21.33 ± 1.11). Similarly, a high density of seeds without appendages were recorded from the upper soil layer (overall=812 seeds/m², dry season=1061 seeds/m² and wet season=563 seeds/m²), followed by the middle soil layer (overall=294 seeds/m², dry season=385 seeds/m² and wet season=204 seeds/m²) and lower soil layer (overall=144 seeds/m², dry season=186 seeds/m² and wet season=101 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of seeds without appendages were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10). Compared to flooding treatment, high mean seed abundances and densities were recorded in natural treatment, irrespective of the seasons (Mann-Whitney, $P > 0.05$) (Appendix Table 3.8). Between natural and flooding treatments, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P < 0.05$) (Appendix Table 3.8).

3.3.2.1 Short grassland

A total mean of 227.42 ± 28.77 seedlings with a seed density of 358 seeds/m² were recorded from SG (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (295.92 ± 25.45) and density ($D=465$ seeds/m²) were recorded during the dry season (Mann-Whitney, $P < 0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall= 158.67 ± 22.19 , dry season= 212.42 ± 17.71 and wet season= 104.92 ± 7.63 ; Kruskal-Wallis, $P < 0.05$) and density (overall= 749 seeds/m², dry season= 1002 seeds/m² and wet season= 495 seeds/m²; Kruskal-Wallis, $P < 0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P < 0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P < 0.05$) (Appendix Table 3.7).

Seed condition, surface and appendages recorded in short grassland — Among the different seed conditions, whole seeds dominated the seed bank with high mean seed abundance (overall= 155.63 ± 19.10 , dry season= 201.50 ± 16.78 and wet season= 109.75 ± 4.31) and density (overall= 245 seeds/m², dry season= 317 seeds/m² and wet season= 173 seeds/m²) irrespective of the seasons. Compared to the wet season, higher mean seed abundances and densities were recorded during the dry season for whole, cracked and split seed conditions. Irrespective of the seasons, whole seeds dominated the seed bank of the upper, middle and lower soil layers. A high mean abundance of whole seeds were recorded from the upper soil layer (overall= 106.33 ± 14.61 , dry season= 142.00 ± 11.43 and wet season= 70.67 ± 4.08), followed by the middle soil layer (overall= 30.67 ± 3.55 , dry season= 38.67 ± 3.78 and wet season= 22.67 ± 1.38) and lower soil layer (overall= 18.63 ± 1.33 , dry season= 20.83 ± 1.90 and wet season= 16.42 ± 1.20). Similarly, high densities of whole seeds were recorded from the upper soil layer (overall= 502 seeds/m², dry season= 670 seeds/m² and wet season= 333 seeds/m²), followed by the middle soil layer (overall= 145 seeds/m², dry season= 182 seeds/m² and wet season= 107 seeds/m²) and lower soil layer (overall= 88

seeds/m², dry season=98 seeds/m² and wet season=77 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of whole seeds were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

With respect to seed surface, smooth surface seeds dominated the seed bank with high mean seed abundance (overall=140.42±15.29, dry season=176.33±14.37 and wet season=104.50±4.95) and density (overall=221 seeds/m², dry season=277 seeds/m² and wet season=164 seeds/m²) irrespective of the seasons. Compared to the wet season, higher seed abundances and densities of seeds with smooth and rough surfaces were recorded during the dry season. Irrespective of the seasons, smooth surface seeds dominated the seed bank of the upper, middle and lower soil layers. A high mean abundance of seeds with smooth surfaces were recorded from the upper soil layer (overall=87.71±11.49, dry season=114.83±10.36 and wet season=60.58±4.33), followed by the middle soil layer (overall=32.21±2.28, dry season= 38.00±1.00 and wet season=26.42±0.98) and lower soil layer (overall=20.50±1.95, dry season=23.50±3.09 and wet season=17.50±1.48). Similarly, high densities of seeds with smooth surfaces were recorded from the upper soil layer (overall=414 seeds/m², dry season=542 seeds/m² and wet season=286 seeds/m²), followed by the middle soil layer (overall=152 seeds/m², dry season=179 seeds/m² and wet season=125 seeds/m²) and lower soil layer (overall=97 seeds/m², dry season=111 seeds/m² and wet season=83 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of seeds with smooth surfaces were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

Irrespective of the season, the seeds without appendages dominated the seed bank with high mean seed abundance (overall=174.54±23.88, dry season=231.17±21.65 and wet season=117.92±7.48) and density (overall=275 seeds/m², dry season=364 seeds/m² and wet season=185 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of seeds were recorded during the dry season for both seeds with and without appendages. Irrespective of the seasons, seeds without appendages dominated the seed bank of the upper, middle and lower soil layers. High mean seed abundances of seeds without appendages were recorded from the upper soil layer

(overall=117.50±17.98, dry season=160.83±14.79 and wet season=74.17±6.15), followed by the middle soil layer (overall=36.21±40.00, dry season= 45.00±4.71 and wet season=27.42±1.04) and lower soil layer (overall=20.83±2.26, dry season=25.33±2.56 and wet season=16.33±1.93). Similarly, a high density of seeds without appendages were recorded from the upper soil layer (overall=554 seeds/m², dry season=759 seeds/m² and wet season=350 seeds/m²), followed by the middle soil layer (overall=171 seeds/m², dry season=212 seeds/m² and wet season=129 seeds/m²) and lower soil layer (overall=98 seeds/m², dry season=120 seeds/m² and wet season=77 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of seeds without appendages were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

In SGN, a total mean of 119.17±15.69 seedlings with a seed density of 375 seeds/m² were recorded (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (156.33±14.21) and density (D=492 seeds/m²) were recorded during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall=83.71±11.54, dry season=111.67±9.08 and wet season=55.75±4.20; Kruskal-Wallis, $P<0.05$) and density (overall=790 seeds/m², dry season=1054 seeds/m² and wet season=526 seeds/m²; Kruskal-Wallis, $P<0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7).

Seed condition, surface and appendages recorded in short grassland natural treatment— Among the different seed conditions, whole seeds dominated the seed bank with high mean seed abundance (overall=81.83±11.08, dry season=108.33±9.72 and wet season=55.33±3.17) and density (overall=257 seeds/m², dry season=341 seeds/m² and wet season=174 seeds/m²) irrespective of the seasons. Compared to the wet season, higher mean seed abundances and densities were recorded during the dry season for whole, cracked and split seed conditions. Irrespective of the seasons, whole seeds

dominated the seed bank of the upper, middle and lower soil layers. A high mean abundance of whole seeds were recorded from the upper soil layer (overall= 56.04 ± 7.97 , dry season= 75.58 ± 5.92 and wet season= 36.50 ± 2.68), followed by the middle soil layer (overall= 16.00 ± 2.36 , dry season= 21.17 ± 2.67 and wet season= 10.83 ± 1.00) and lower soil layer (overall= 9.79 ± 0.99 , dry season= 11.58 ± 1.51 and wet season= 8.00 ± 0.36). Similarly, high densities of whole seeds were recorded from the upper soil layer (overall=529 seeds/m², dry season=713 seeds/m² and wet season=344 seeds/m²), followed by the middle soil layer (overall=151 seeds/m², dry season=200 seeds/m² and wet season=102 seeds/m²) and lower soil layer (overall=92 seeds/m², dry season=109 seeds/m² and wet season=75 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of whole seeds were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

With respect to seed surface, smooth surface seeds dominated the seed bank with high mean seed abundance (overall= 73.71 ± 8.51 , dry season= 93.08 ± 8.96 and wet season= 54.33 ± 2.69) and density (overall=232 seeds/m², dry season=293 seeds/m² and wet season=171 seeds/m²) irrespective of the seasons. Compared to the wet season, higher seed abundances and densities of seeds with smooth and rough surfaces were recorded during the dry season. Irrespective of the seasons, smooth surface seeds dominated the seed bank of the upper, middle and lower soil layers. A high mean abundance of seeds with smooth surfaces were recorded from the upper soil layer (overall= 47.13 ± 6.23 , dry season= 61.50 ± 6.22 and wet season= 32.75 ± 2.14), followed by the middle soil layer (overall= 16.33 ± 1.42 , dry season= 19.83 ± 0.91 and wet season= 12.83 ± 0.65) and lower soil layer (overall= 10.25 ± 1.07 , dry season= 11.75 ± 1.90 and wet season= 8.75 ± 0.44). Similarly, high densities of seeds with smooth surfaces were recorded from the upper soil layer (overall=445 seeds/m², dry season=580 seeds/m² and wet season=309 seeds/m²), followed by the middle soil layer (overall=154 seeds/m², dry season=187 seeds/m² and wet season=121 seeds/m²) and lower soil layer (overall=97 seeds/m², dry season=111 seeds/m² and wet season=83 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of seeds with smooth surfaces were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

Irrespective of the seasons, the seeds without appendages dominated the seed bank with high mean seed abundance (overall= 92.00 ± 12.85 , dry season= 123.00 ± 10.44 and wet season= 61.00 ± 4.58) and density (overall= 289 seeds/m^2 , dry season= 387 seeds/m^2 and wet season= 192 seeds/m^2). Compared to the wet season, higher mean seed abundances and densities of seeds were recorded during the dry season for both seeds with and without appendages. Irrespective of the season, seeds without appendages dominated the seed bank of the upper, middle and lower soil layers. A high mean seed abundances of seeds without appendages were recorded from the upper soil layer (overall= 62.17 ± 9.11 , dry season= 84.67 ± 5.96 and wet season= 39.67 ± 3.75), followed by the middle soil layer (overall= 18.83 ± 2.51 , dry season= 24.42 ± 2.84 and wet season= 13.25 ± 0.67) and lower soil layer (overall= 11.00 ± 1.46 , dry season= 13.92 ± 1.72 and wet season= 8.08 ± 1.13). Similarly, a high density of seeds without appendages were recorded from the upper soil layer (overall= 587 seeds/m^2 , dry season= 799 seeds/m^2 and wet season= 374 seeds/m^2), followed by the middle soil layer (overall= 178 seeds/m^2 , dry season= 230 seeds/m^2 and wet season= 125 seeds/m^2) and lower soil layer (overall= 104 seeds/m^2 , dry season= 131 seeds/m^2 and wet season= 76 seeds/m^2). Compared to the wet season, higher mean seed abundances and densities of seeds without appendages were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

In SGF, a total mean of 108.25 ± 13.10 seedlings with a seed density of 340 seeds/m^2 were recorded (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (139.58 ± 11.33) and density ($D=439 \text{ seeds/m}^2$) were recorded during the dry season (Mann-Whitney, $P < 0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall= 74.96 ± 10.69 , dry season= 100.75 ± 8.79 and wet season= 49.17 ± 3.60 ; Kruskal-Wallis, $P < 0.05$) and density (overall= 707 seeds/m^2 , dry season= 951 seeds/m^2 and wet season= 464 seeds/m^2 ; Kruskal-Wallis, $P < 0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P < 0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities

were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7).

Seed condition, surface and appendages recorded in short grassland flooding treatment— Among the different seed conditions, whole seeds dominated the seed bank with high mean seed abundance (overall= 73.79 ± 8.08 , dry season= 93.17 ± 7.20 and wet season= 54.42 ± 1.57) and density (overall= 232 seeds/m^2 , dry season= 293 seeds/m^2 and wet season= 171 seeds/m^2) irrespective of the seasons. Compared to the wet season, higher mean seed abundances and densities were recorded during the dry season for whole, cracked and split seed conditions. Irrespective of the seasons, whole seeds dominated the seed bank of the upper, middle and lower soil layers. A high mean abundance of whole seeds were recorded from the upper soil layer (overall= 50.29 ± 6.75 , dry season= 66.42 ± 5.97 and wet season= 34.17 ± 1.85), followed by the middle soil layer (overall= 14.67 ± 1.28 , dry season= 17.50 ± 1.43 and wet season= 11.83 ± 0.48) and lower soil layer (overall= 8.83 ± 0.61 , dry season= 9.25 ± 0.76 and wet season= 8.42 ± 1.03). Similarly, high densities of whole seeds were recorded from the upper soil layer (overall= 475 seeds/m^2 , dry season= 627 seeds/m^2 and wet season= 322 seeds/m^2), followed by the middle soil layer (overall= 138 seeds/m^2 , dry season= 165 seeds/m^2 and wet season= 112 seeds/m^2) and lower soil layer (overall= 83 seeds/m^2 , dry season= 87 seeds/m^2 and wet season= 79 seeds/m^2). Compared to the wet season, higher mean seed abundances and densities of whole seeds were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

With respect to seed surface, smooth surface seeds dominated the seed bank with high mean seed abundance (overall= 66.71 ± 6.84 , dry season= 83.25 ± 5.49 and wet season= 50.17 ± 2.44) and density (overall= 210 seeds/m^2 , dry season= 262 seeds/m^2 and wet season= 158 seeds/m^2) irrespective of the seasons. Compared to the wet season, higher seed abundances and densities of seeds with smooth and rough surfaces were recorded during the dry season. Irrespective of the seasons, smooth surface seeds dominated the seed bank of the upper, middle and lower soil layers. A high mean abundance of seeds with smooth surfaces were recorded from the upper soil layer (overall= 40.58 ± 5.33 , dry season= 53.33 ± 4.27 and wet season= 27.83 ± 2.41), followed by the middle soil layer (overall= 15.88 ± 0.96 , dry season= 18.17 ± 0.62 and wet season= 13.58 ± 0.64) and lower

soil layer (overall= 10.25 ± 0.93 , dry season= 11.75 ± 1.19 and wet season= 8.75 ± 1.05). Similarly, high densities of seeds with smooth surfaces were recorded from the upper soil layer (overall= 383 seeds/m^2 , dry season= 503 seeds/m^2 and wet season= 263 seeds/m^2), followed by the middle soil layer (overall= 150 seeds/m^2 , dry season= 171 seeds/m^2 and wet season= 128 seeds/m^2) and lower soil layer (overall= 97 seeds/m^2 , dry season= 111 seeds/m^2 and wet season= 83 seeds/m^2). Compared to the wet season, higher mean seed abundances and densities of seeds with smooth surfaces were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

Irrespective of the seasons, the seeds without appendages dominated the seed bank with high mean seed abundance (overall= 82.54 ± 11.09 , dry season= 108.17 ± 11.26 and wet season= 56.92 ± 3.01) and density (overall= 260 seeds/m^2 , dry season= 340 seeds/m^2 and wet season= 179 seeds/m^2). Compared to the wet season, higher mean seed abundances and densities of seeds were recorded during the dry season for both seeds with and without appendages. Irrespective of the seasons, seeds without appendages dominated the seed bank of the upper, middle and lower soil layers. High mean seed abundances of seeds without appendages were recorded from the upper soil layer (overall= 55.33 ± 8.97 , dry season= 76.17 ± 8.92 and wet season= 34.50 ± 2.63), followed by the middle soil layer (overall= 17.38 ± 1.54 , dry season= 20.58 ± 2.02 and wet season= 14.17 ± 0.40) and lower soil layer (overall= 9.83 ± 0.85 , dry season= 11.42 ± 0.98 and wet season= 8.25 ± 0.85). Similarly, a high density of seeds without appendages were recorded from the upper soil layer (overall= 522 seeds/m^2 , dry season= 719 seeds/m^2 and wet season= 326 seeds/m^2), followed by the middle soil layer (overall= 164 seeds/m^2 , dry season= 194 seeds/m^2 and wet season= 134 seeds/m^2) and lower soil layer (overall= 93 seeds/m^2 , dry season= 108 seeds/m^2 and wet season= 78 seeds/m^2). Compared to the wet season, higher mean seed abundances and densities of seeds without appendages were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10). Compared to SGF, high mean seed abundances and densities were recorded in SGN, irrespective of the seasons (Mann-Whitney, $P > 0.05$) (Appendix Table 3.8). Between SGN and SGF, significant seasonal

differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.8).

3.3.2.2 Tall grassland

A total mean of 477.67 ± 62.40 seedlings with a seed density of 751 seeds/m² were recorded from TG (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (632.25 ± 39.62) and density ($D=994$ seeds/m²) were recorded during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall= 308.25 ± 36.88 , dry season= 399.67 ± 20.76 and wet season= 216.83 ± 18.58 ; Kruskal-Wallis, $P<0.05$) and density (overall= 1454 seeds/m², dry season= 1886 seeds/m² and wet season= 1023 seeds/m²; Kruskal-Wallis, $P<0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7).

Seed condition, surface and appendages recorded in tall grassland — Among the different seed conditions, whole seeds dominated the seed bank with high mean seed abundance (overall= 323.25 ± 42.86 , dry season= 428.50 ± 28.14 and wet season= 218.00 ± 19.87) and density (overall= 508 seeds/m², dry season= 674 seeds/m² and wet season= 343 seeds/m²) irrespective of the seasons. Compared to the wet season, higher mean seed abundances and densities were recorded during the dry season for whole, cracked and split seed conditions. Irrespective of the seasons, whole seeds dominated the seed bank of the upper, middle and lower soil layers. A high mean abundance of whole seeds were recorded from the upper soil layer (overall= 211.21 ± 26.71 , dry season= 276.75 ± 15.65 and wet season= 145.67 ± 14.89), followed by the middle soil layer (overall= 76.96 ± 12.58 , dry season= 106.92 ± 11.12 and wet season= 47.00 ± 4.12) and lower soil layer (overall= 35.08 ± 3.79 , dry season= 44.83 ± 1.64 and wet season= 25.33 ± 1.06). Similarly, high densities of whole seeds were recorded from the

upper soil layer (overall=997 seeds/m², dry season=1306 seeds/m² and wet season=687 seeds/m²), followed by the middle soil layer (overall=363 seeds/m², dry season=504 seeds/m² and wet season=222 seeds/m²) and lower soil layer (overall=166 seeds/m², dry season=212 seeds/m² and wet season=120 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of whole seeds were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

With respect to seed surface, smooth surface seeds dominated the seed bank with high mean seed abundance (overall=282.79±37.35, dry season=374.08±25.20 and wet season=191.50±17.87) and density (overall=445 seeds/m², dry season=588 seeds/m² and wet season=301 seeds/m²) irrespective of the seasons. Compared to the wet season, higher seed abundances and densities of seeds with smooth and rough surfaces were recorded during the dry season. Irrespective of the season, smooth surface seeds dominated the seed bank of the upper, middle and lower soil layers. A high mean abundance of seeds with smooth surfaces were recorded from the upper soil layer (overall=169.50±21.75, dry season=222.25±14.47 and wet season=116.75±11.96), followed by the middle soil layer (overall=75.75±10.86, dry season=101.92±8.84 and wet season=49.58±3.97) and lower soil layer (overall=37.54±5.08, dry season=49.92±3.65 and wet season=25.17±2.21). Similarly, high densities of seeds with smooth surfaces were recorded from the upper soil layer (overall=800 seeds/m², dry season=1049 seeds/m² and wet season=551 seeds/m²), followed by the middle soil layer (overall=357 seeds/m², dry season=481 seeds/m² and wet season=234 seeds/m²) and lower soil layer (overall=177 seeds/m², dry season=236 seeds/m² and wet season=119 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of seeds with smooth surfaces were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

Irrespective of the seasons, the seeds without appendages dominated the seed bank with high mean seed abundance (overall=379.42±49.87, dry season= 499.75±38.08 and wet season=259.08±22.45) and density (overall=597 seeds/m², dry season=786 seeds/m² and wet season=407 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of seeds were recorded during the dry season for both seeds with and without appendages. Irrespective of the seasons, seeds without appendages

dominated the seed bank of the upper, middle and lower soil layers. High mean seed abundances of seeds without appendages were recorded from the upper soil layer (overall=239.54±29.01, dry season=309.17±21.01 and wet season=169.92±15.94), followed by the middle soil layer (overall=95.88±14.63, dry season=130.25±13.76 and wet season=61.50±4.62) and lower soil layer (overall=44.00±6.47, dry season=60.33±3.67 and wet season=27.67±1.95). Similarly, a high density of seeds without appendages were recorded from the upper soil layer (overall=1130 seeds/m², dry season=1459 seeds/m² and wet season= 802 seeds/m²), followed by the middle soil layer (overall=452 seeds/m², dry season=615 seeds/m² and wet season=290 seeds/m²) and lower soil layer (overall=208 seeds/m², dry season=285 seeds/m² and wet season=131 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of seeds without appendages were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

In TGN, a total mean of 249.38±33.85 seedlings with a seed density of 784 seeds/m² were recorded (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (331.25±25.17) and density (D=1042 seeds/m²) were recorded during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall=159.92±20.02, dry season=208.75±12.79 and wet season=111.08±10.83; Kruskal-Wallis, $P<0.05$) and density (overall=1509 seeds/m², dry season=1970 seeds/m² and wet season=1048 seeds/m²; Kruskal-Wallis, $P<0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7).

Seed condition, surface and appendages recorded in tall grassland natural treatment

— Among the different seed conditions, whole seeds dominated the seed bank with high mean seed abundance (overall=168.08±23.95, dry season=224.75±19.32 and wet season=111.42±12.71) and density (overall=529 seeds/m², dry season=707 seeds/m² and wet season=350 seeds/m²) irrespective of the seasons. Compared to the wet season,

higher mean seed abundances and densities were recorded during the dry season for whole, cracked and split seed conditions. Irrespective of the seasons, whole seeds dominated the seed bank of the upper, middle and lower soil layers. A high mean abundance of whole seeds were recorded from the upper soil layer (overall=109.79±14.90, dry season=145.08±11.09 and wet season=74.50±9.11), followed by the middle soil layer (overall=40.08±6.99, dry season= 55.83±7.44 and wet season=24.33±2.67) and lower soil layer (overall=18.21±2.24, dry season= 23.83±1.03 and wet season=12.58±1.11). Similarly, high densities of whole seeds were recorded from the upper soil layer (overall=1036 seeds/m², dry season=1369 seeds/m² and wet season=703 seeds/m²), followed by the middle soil layer (overall=378 seeds/m², dry season=527 seeds/m² and wet season=230 seeds/m²) and lower soil layer (overall=172 seeds/m², dry season=225 seeds/m² and wet season=119 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of whole seeds were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

With respect to seed surface, smooth surface seeds dominated the seed bank with high mean seed abundance (overall=146.63±20.40, dry season=194.92±16.42 and wet season=98.33±10.86) and density (overall=461 seeds/m², dry season=613 seeds/m² and wet season=309 seeds/m²) irrespective of the seasons. Compared to the wet season, higher seed abundances and densities of seeds with smooth and rough surfaces were recorded during the dry season. Irrespective of the seasons, smooth surface seeds dominated the seed bank of the upper, middle and lower soil layers. A high mean abundance of seeds with smooth surfaces were recorded from the upper soil layer (overall=87.96±12.24, dry season=117.33±9.01 and wet season=58.58±6.57), followed by the middle soil layer (overall= 38.67±5.50, dry season=51.33±4.95 and wet season=26.00±3.12) and lower soil layer (overall=20.00±2.92, dry season=26.25±3.43 and wet season=13.75±1.38). Similarly, high densities of seeds with smooth surfaces were recorded from the upper soil layer (overall=830 seeds/m², dry season=1107 seeds/m² and wet season=553 seeds/m²), followed by the middle soil layer (overall=365 seeds/m², dry season=484 seeds/m² and wet season=245 seeds/m²) and lower soil layer (overall=189 seeds/m², dry season=248 seeds/m² and wet season=130 seeds/m²).

Compared to the wet season, higher mean seed abundances and densities of seeds with smooth surfaces were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

Irrespective of the seasons, the seeds without appendages dominated the seed bank with high mean seed abundance (overall= 197.08 ± 27.62 , dry season= 261.92 ± 24.21 and wet season= 132.25 ± 13.11) and density (overall= 620 seeds/m^2 , dry season= 824 seeds/m^2 and wet season= 416 seeds/m^2). Compared to the wet season, higher mean seed abundances and densities of seeds were recorded during the dry season for both seeds with and without appendages. Irrespective of the seasons, seeds without appendages dominated the seed bank of the upper, middle and lower soil layers. High mean seed abundances of seeds without appendages were recorded from the upper soil layer (overall= 122.83 ± 15.82 , dry season= 160.50 ± 12.08 and wet season= 85.17 ± 8.70), followed by the middle soil layer (overall= 50.83 ± 8.43 , dry season= 69.17 ± 9.93 and wet season= 32.50 ± 3.03) and lower soil layer (overall= 23.42 ± 3.58 , dry season= 32.25 ± 2.38 and wet season= 14.58 ± 1.46). Similarly, a high density of seeds without appendages were recorded from the upper soil layer (overall= 1159 seeds/m^2 , dry season= 1515 seeds/m^2 and wet season= 804 seeds/m^2), followed by the middle soil layer (overall= 480 seeds/m^2 , dry season= 653 seeds/m^2 and wet season= 307 seeds/m^2) and lower soil layer (overall= 221 seeds/m^2 , dry season= 304 seeds/m^2 and wet season= 138 seeds/m^2). Compared to the wet season, higher mean seed abundances and densities of seeds without appendages were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

In TGF, a total mean of 233.83 ± 30.39 seedlings with a seed density of 718 seeds/m^2 were recorded (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (312.08 ± 10.76) and density ($D=947 \text{ seeds/m}^2$) were recorded during the dry season (Mann-Whitney, $P < 0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall= 151.58 ± 17.92 , dry season= 197.42 ± 6.02 and wet season= 105.75 ± 7.84 ; Kruskal-Wallis, $P < 0.05$) and density (overall= 1400 seeds/m^2 , dry season= 1802 seeds/m^2 and wet season= 998 seeds/m^2 ; Kruskal-Wallis, $P < 0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal

differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7).

Seed condition, surface and appendages recorded in tall grassland flooding treatment— Among the different seed conditions, whole seeds dominated the seed bank with high mean seed abundance (overall= 158.42 ± 20.07 , dry season= 210.25 ± 6.07 and wet season= 106.58 ± 7.17) and density (overall= 488 seeds/m^2 , dry season= 641 seeds/m^2 and wet season= 335 seeds/m^2) irrespective of the seasons. Compared to the wet season, higher mean seed abundances and densities were recorded during the dry season for whole, cracked and split seed conditions. Irrespective of the seasons, whole seeds dominated the seed bank of the upper, middle and lower soil layers. A high mean abundance of whole seeds were recorded from the upper soil layer (overall= 103.04 ± 12.42 , dry season= 134.92 ± 2.88 and wet season= 71.17 ± 5.87), followed by the middle soil layer (overall= 38.42 ± 6.11 , dry season= 54.17 ± 2.32 and wet season= 22.67 ± 1.80) and lower soil layer (overall= 16.96 ± 1.66 , dry season= 21.17 ± 1.00 and wet season= 12.75 ± 0.37). Similarly, high densities of whole seeds were recorded from the upper soil layer (overall= 957 seeds/m^2 , dry season= 1242 seeds/m^2 and wet season= 672 seeds/m^2), followed by the middle soil layer (overall= 348 seeds/m^2 , dry season= 482 seeds/m^2 and wet season= 214 seeds/m^2) and lower soil layer (overall= 159 seeds/m^2 , dry season= 198 seeds/m^2 and wet season= 120 seeds/m^2). Compared to the wet season, higher mean seed abundances and densities of whole seeds were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

With respect to seed surface, smooth surface seeds dominated the seed bank with high mean seed abundance (overall= 140.96 ± 18.47 , dry season= 188.75 ± 2.54 and wet season= 93.17 ± 7.92) and density (overall= 428 seeds/m^2 , dry season= 564 seeds/m^2 and wet season= 293 seeds/m^2) irrespective of the seasons. Compared to the wet season, higher seed abundances and densities of seeds with smooth and rough surfaces were recorded during the dry season. Irrespective of the season, smooth surface seeds dominated the seed bank of the upper, middle and lower soil layers. A high mean abundance of seeds with smooth surfaces were recorded from the upper soil layer

(overall=82.88±9.84, dry season=107.58±3.57 and wet season=58.17±5.68), followed by the middle soil layer (overall=39.83±6.35, dry season= 56.08±3.16 and wet season= 23.58±1.41) and lower soil layer (overall=18.25±2.70, dry season=25.08±0.95 and wet season=11.42±1.38). Similarly, high densities of seeds with smooth surfaces were recorded from the upper soil layer (overall=769 seeds/m², dry season=990 seeds/m² and wet season=549 seeds/m²), followed by the middle soil layer (overall=350 seeds/m², dry season=477 seeds/m² and wet season=223 seeds/m²) and lower soil layer (overall=166 seeds/m², dry season=223 seeds/m² and wet season=108 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of seeds with smooth surfaces were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10).

Irrespective of the seasons, the seeds without appendages dominated the seed bank with high mean seed abundance (overall=188.42±24.14, dry season=250.00±9.93 and wet season=126.83±9.65) and density (overall=574 seeds/m², dry season=748 seeds/m² and wet season=399 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of seeds were recorded during the dry season for both seeds with and without appendages. Irrespective of the seasons, seeds without appendages dominated the seed bank of the upper, middle and lower soil layers. High mean seed abundances of seeds without appendages were recorded from the upper soil layer (overall=120.96±14.49, dry season=157.17±7.06 and wet season=84.75±7.47), followed by the middle soil layer (overall=46.54±6.77, dry season= 64.08±2.39 and wet season=29.00±1.82) and lower soil layer (overall=20.92±3.01, dry season=28.75±0.98 and wet season=13.08±0.52). Similarly, a high density of seeds without appendages were recorded from the upper soil layer (overall=1101 seeds/m², dry season=1403 seeds/m² and wet season=800 seeds/m²), followed by the middle soil layer (overall=425 seeds/m², dry season=576 seeds/m² and wet season=274 seeds/m²) and lower soil layer (overall=194 seeds/m², dry season=265 seeds/m² and wet season=123 seeds/m²). Compared to the wet season, higher mean seed abundances and densities of seeds without appendages were recorded in the upper, middle and lower soil layers during the dry season (Appendix Tables 3.9 and 3.10). Compared to TGF, high mean seed abundances and densities were recorded in TGN, irrespective of the seasons (Mann-

Whitney, $P>0.05$) (Appendix Table 3.8). Between TGN and TGF, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.8).

3.3.3 Seed abundances and densities: Seed Germination Experiment

In riverine alluvial grasslands, a total mean of 10219.21 ± 1251.36 seedlings with a seed density of $8,036 \text{ seeds/m}^2$ were recorded (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (13117.33 ± 1087.01) and density ($D=10315 \text{ seeds/m}^2$) were recorded during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly high mean seed abundance (overall= 6646.92 ± 792.19 , dry season= 8518.42 ± 604.96 and wet season= 4775.42 ± 477.09 ; Kruskal-Wallis, $P<0.05$) and density (overall= 15680 seeds/m^2 , dry season= 20095 seeds/m^2 and wet season= 11265 seeds/m^2 ; Kruskal-Wallis, $P<0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7). In terms of species composition, a total of 245 species belonging to 162 genera and 58 families were recorded (Appendix Tables 3.11 and 3.12). With respect to the soil layers, the highest number of species ($n=206$), genera ($n=141$) and families ($n=54$) were recorded from the upper layer (Appendix Table 3.12). Irrespective of the seasons and soil layers, the species belonging to the Poaceae family and growth form herbs dominated the grasslands (Appendix Tables 3.12 and 3.13). In terms of species, *Cynodon dactylon* contributed most to the mean seed abundance (overall= 847.08 ± 98.02 , dry season= 1079.50 ± 84.00 and wet season= 614.67 ± 42.07) and density (overall= 666 seeds/m^2 , dry season= 849 seeds/m^2 and wet season= 483 seeds/m^2) (Appendix Tables 3.14 and 3.15-3.17). Among the three soil layers, *Cynodon dactylon* contributed the highest to the mean seed abundance and density in the upper soil layer, followed by the middle and lower soil layers (Appendix Tables 3.14 and 3.15-3.17). Compared to the

wet season, *Cynodon dactylon* contributed most to the upper, middle and lower soil layers during the dry season.

In natural treatment, a total mean of 7234.71 ± 981.61 seedlings with a seed density of $11,378 \text{ seeds/m}^2$ were recorded (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (9513.92 ± 869.66) and density ($D=14963 \text{ seeds/m}^2$) were recorded during the dry season (Mann-Whitney, $P < 0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall= 4791.17 ± 620.38 , dry season= 6258.17 ± 492.19 and wet season= 3324.17 ± 345.09 ; Kruskal-Wallis, $P < 0.05$) and density (overall= 22605 seeds/m^2 , dry season= 29527 seeds/m^2 and wet season= 15684 seeds/m^2 ; Kruskal-Wallis, $P < 0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P < 0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P < 0.05$) (Appendix Table 3.7). In terms of species composition, a total of 208 species belonging to 135 genera and 51 families were recorded (Appendix Table 3.12). With respect to the soil layers, the highest number of species ($n=179$), genera ($n=121$) and families ($n=47$) were recorded from the upper layer (Appendix Table 3.12). Irrespective of the season and soil layers, the species belonging to the Poaceae family and growth form herbs dominated the grasslands (Appendix Tables 3.12 and 3.13). In terms of species, *Cynodon dactylon* contributed most to the mean seed abundance (overall= 582.58 ± 71.03 , dry season= 754.50 ± 56.39 and wet season= 410.67 ± 25.65) and density (overall= 916 seeds/m^2 , dry season= 1187 seeds/m^2 and wet season= 646 seeds/m^2) (Appendix Tables 3.14 and 3.18-3.20). Among the three soil layers, *Cynodon dactylon* contributed the highest to the mean seed abundance and density in the upper soil layer, followed by the middle and lower soil layers (Appendix Tables 3.14 and 3.18-3.20). Compared to the wet season, *Cynodon dactylon* contributed most to the upper, middle and lower soil layers during the dry season.

In flooding treatment, a total mean of 2984.50 ± 272.43 seedlings with a seed density of $4,694 \text{ seeds/m}^2$ were recorded (Appendix Table 3.3). Compared to the wet season,

significantly high mean seed abundance (3603.42 ± 226.30) and density ($D=5667$ seeds/m²) were recorded during the dry season (Mann-Whitney, $P < 0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall= 1855.75 ± 173.38 , dry season= 2260.25 ± 117.00 and wet season= 1451.25 ± 132.31 ; Kruskal-Wallis, $P < 0.05$) and density (overall= 8756 seeds/m², dry season= 10664 seeds/m² and wet season= 6847 seeds/m²; Kruskal-Wallis, $P < 0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P < 0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P < 0.05$) (Appendix Table 3.7). In terms of species composition, a total of 141 species belonging to 105 genera and 43 families were recorded (Appendix Table 3.12). With respect to the soil layers, the highest number of species ($n=125$), genera ($n=95$) and families ($n=42$) were recorded from the upper layer (Appendix Table 3.12). Irrespective of the seasons and soil layers, the species belonging to the Poaceae family and herbs growth form dominated the grasslands (Appendix Tables 3.12 and 3.13). In terms of species, *Cynodon dactylon* contributed most to the mean seed abundance (overall= 264.50 ± 28.19 , dry season= 325.00 ± 30.11 and wet season= 204.00 ± 18.99) and density (overall= 416 seeds/m², dry season= 511 seeds/m² and wet season= 321 seeds/m²) (Appendix Tables 3.14 and 3.21-3.23). Among the three soil layers, *Cynodon dactylon* contributed the highest to the mean seed abundance and density in the upper soil layer, followed by the middle and lower soil layers (Appendix Tables 3.14 and 3.21-3.23). Compared to the wet season, *Cynodon dactylon* contributed most to the upper, middle and lower soil layers during the dry season. Compared to flooding treatment, significantly high mean seed abundances and densities were recorded in natural treatment, irrespective of the seasons (Mann-Whitney, $P < 0.05$) (Appendix Table 3.8). Between natural and flooding treatments, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P < 0.05$) (Appendix Table 3.8).

3.3.3.1 Short grassland

A total mean of 6698.13 ± 716.31 seedlings with a seed density of $10,534 \text{ seeds/m}^2$ were recorded in SG (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (8306.58 ± 704.89) and density ($D=13064 \text{ seeds/m}^2$) were recorded during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall= 4263.96 ± 445.54 , dry season= 5279.75 ± 411.04 and wet season= 3248.17 ± 263.70 ; Kruskal-Wallis, $P<0.05$) and density (overall= 20118 seeds/m^2 , dry season= 24910 seeds/m^2 and wet season= 15325 seeds/m^2 ; Kruskal-Wallis, $P<0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7). In terms of species composition, a total of 160 species belonging to 108 genera and 45 families were recorded (Appendix Table 3.12). With respect to the soil layers, the highest number of species ($n=138$), genera ($n=96$) and families ($n=42$) were recorded from the upper layer (Appendix Table 3.12). Irrespective of the seasons and soil layers, the species belonging to the Poaceae family and herbs growth form dominated the short grassland (Appendix Tables 3.12 and 3.13). In terms of species, *Cynodon dactylon* contributed most to the mean seed abundance (overall= 702.83 ± 75.75 , dry season= 883.25 ± 64.83 and wet season= 522.42 ± 29.51) and density (overall= 1105 seeds/m^2 , dry season= 1389 seeds/m^2 and wet season= 822 seeds/m^2) (Appendix Tables 3.14 and 3.24-3.26). Among the three soil layers, *Cynodon dactylon* contributed the highest to the mean seed abundance and density in the upper soil layer, followed by the middle and lower soil layers (Appendix Tables 3.14 and 3.24-3.26). Compared to the wet season, *Cynodon dactylon* contributed most to the upper, middle and lower soil layers during the dry season.

In SGN, a total mean of 4763.54 ± 584.47 seedlings with a seed density of $14,983 \text{ seeds/m}^2$ were recorded (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (6085.58 ± 571.41) and density ($D=19142 \text{ seeds/m}^2$) were recorded during the dry season (Mann-Whitney, $P<0.05$) (Appendix

Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall=3102.83±366.82, dry season=3942.33±337.22 and wet season=2263.33±210.67; Kruskal-Wallis, $P<0.05$) and density (overall=29279 seeds/m², dry season=37201 seeds/m² and wet season=21357 seeds/m²; Kruskal-Wallis, $P<0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7). In terms of species composition, a total of 139 species belonging to 91 genera and 37 families were recorded (Appendix Table 3.12). With respect to the soil layers, the highest number of species (n=121), genera (n=82) and families (n=34) were recorded from the upper layer (Appendix Table 3.12). Irrespective of the seasons and soil layers, the species belonging to the Poaceae family and herbs growth form dominated the short grassland (Appendix Tables 3.12 and 3.13). In terms of species, *Cynodon dactylon* contributed most to the mean seed abundance (overall=494.42±55.84, dry season=631.58±40.66 and wet season=357.25±18.90) and density (overall=1555 seeds/m², dry season=1987 seeds/m² and wet season=1124 seeds/m²) (Appendix Tables 3.14 and 3.27-3.29). Among the three soil layers, *Cynodon dactylon* contributed the highest to the mean seed abundance and density in the upper soil layer, followed by the middle and lower soil layers (Appendix Tables 3.14 and 3.27-3.29). Compared to the wet season, *Cynodon dactylon* contributed most to the upper, middle and lower soil layers during the dry season.

In SGF, a total mean of 1934.58±135.02 seedlings with a seed density of 6085 seeds/m² were recorded (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (2221.00±144.66) and density (D=6986 seeds/m²) were recorded during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall=1161.13±80.45, dry season=1337.42±81.46 and wet season=984.83±53.36; Kruskal-Wallis, $P<0.05$) and density (overall=10957 seeds/m², dry season=12620 seeds/m² and wet season=9293 seeds/m²; Kruskal-Wallis, $P<0.05$) irrespective of the

seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7). In terms of species composition, a total of 98 species belonging to 77 genera and 39 families were recorded (Appendix Table 3.12). With respect to the soil layers, the highest number of species ($n=92$), genera ($n=72$) and families ($n=38$) were recorded from the upper layer (Appendix Table 3.12). Irrespective of the seasons and soil layers, the species belonging to the Poaceae family and herbs growth form dominated the short grassland (Appendix Tables 3.12 and 3.13). In terms of species, *Cynodon dactylon* contributed most to the mean seed abundance (overall= 208.42 ± 21.79 , dry season= 251.67 ± 27.47 and wet season= 165.17 ± 14.61) and density (overall= 656 , seeds/m², dry season= 792 seeds/m² and wet season= 520 seeds/m²) (Appendix Tables 3.14 and 3.30-3.32). Among the three soil layers, *Cynodon dactylon* contributed the highest to the mean seed abundance and density in the upper soil layer, followed by the middle and lower soil layers (Appendix Tables 3.14 and 3.30-3.32). Compared to the wet season, *Cynodon dactylon* contributed most to the upper, middle and lower soil layers during the dry season. Compared to SGF, significantly high mean seed abundances and densities were recorded in SGN, irrespective of the seasons (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). Between SGN and SGF, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.8).

3.3.3.2 Tall grassland

A total mean of 3521.08 ± 538.67 seedlings with a seed density of $5,538$ seeds/m² were recorded from TG (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (4810.75 ± 385.85) and density ($D=7566$ seeds/m²) were recorded during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall= 2382.96 ± 351.06 , dry season= 3238.67 ± 199.29 and wet season= 1527.25 ± 217.36 ; Kruskal-Wallis, $P<0.05$) and density (overall= 11243 seeds/m², dry season= 15280 seeds/m² and wet season= 7206 seeds/m²; Kruskal-Wallis,

$P<0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7). In terms of species composition, a total of 154 species belonging to 104 genera and 44 families were recorded (Appendix Table 3.12). With respect to the soil layers, the highest number of species ($n=131$), genera ($n=93$) and families ($n=41$) were recorded from the upper layer (Appendix Table 3.12). Irrespective of the seasons and soil layers, the species belonging to the Poaceae family and herbs growth form dominated the tall grassland (Appendix Tables 3.12 and 3.13). In terms of species, *Apluda mutica* contributed most to the mean seed abundance (overall= 178.00 ± 25.26 , dry season= 240.50 ± 13.42 and wet season= 115.50 ± 13.92) and density (overall= 280 seeds/m², dry season= 378 seeds/m² and wet season= 182 seeds/m²) (Appendix Tables 3.14 and 3.33-3.35). Irrespective of the season, *Apluda mutica* contributed the highest to the mean seed abundance and density in the upper soil layer. In the middle soil layer, *Imperata cylindrica* contributed the highest to the mean seed abundance and density overall and during the dry season and *Phyllanthus niruri* during the wet season (Appendix Tables 3.14 and 3.33-3.35). In the lower soil layer, *Apluda mutica* contributed the highest to the mean seed abundance and density throughout the year, *Phyllanthus niruri* during the dry season and *Imperata cylindrica* during the wet season.

In TGN, a total mean of 2471.17 ± 399.77 seedlings with a seed density of $7,773$ seeds/m² were recorded (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (3428.33 ± 304.04) and density ($D=10783$ seeds/m²) were recorded during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall= 1688.33 ± 256.88 , dry season= 2315.83 ± 162.09 and wet season= 1060.83 ± 138.40 ; Kruskal-Wallis, $P<0.05$) and density (overall= 15931 seeds/m², dry season= 21853 seeds/m² and wet season= 10010 seeds/m²; Kruskal-Wallis, $P<0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and

densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7). In terms of species composition, a total of 129 species belonging to 91 genera and 41 families were recorded (Appendix Table 3.12). With respect to the soil layers, the highest number of species ($n=114$), genera ($n=85$) and families ($n=38$) were recorded from the upper layer (Appendix Table 3.12). Irrespective of the season and soil layers, the species belonging to the Poaceae family and herbs growth form dominated the tall grassland (Appendix Tables 3.12 and 3.13). In terms of species, *Phyllanthus niruri* contributed most to the mean seed abundance (overall= 121.33 ± 17.42 , dry season= 163.75 ± 9.40 and wet season= 78.92 ± 11.30) and density (overall= 382 seeds/m², dry season= 515 seeds/m² and wet season= 248 seeds/m²) (Appendix Tables 3.14 and 3.36-3.38). Compared to the wet season, *Phyllanthus niruri* contributed most to the mean seed abundance and density during the dry season. In the upper soil layer, *Apluda mutica* contributed the highest to the mean seed abundance and density overall and in the dry season and *Phyllanthus niruri* in the wet season. In the middle soil layer, *Pouzolzia zeylanica* contributed the highest to the mean seed abundance and density overall and in the dry season and *Phyllanthus niruri* in the wet season (Appendix Tables 3.14 and 3.36-3.38). Irrespective of the seasons, *Phyllanthus niruri* contributed the highest to the mean seed abundance and density in the lower soil layer.

In TGF, a total mean of 1071.46 ± 149.15 seedlings with a seed density of $3,302$ seeds/m² were recorded (Appendix Table 3.3). Compared to the wet season, significantly high mean seed abundance (1425.50 ± 96.71) and density ($D=4348$ seeds/m²) were recorded during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.4). Among the three soil layers, the upper soil layer showed significantly highest mean seed abundance (overall= 704.92 ± 99.46 , dry season= 943.42 ± 43.37 and wet season= 466.42 ± 79.73 ; Kruskal-Wallis, $P<0.05$) and density (overall= 6555 seeds/m², dry season= 8708 seeds/m² and wet season= 4401 seeds/m²; Kruskal-Wallis, $P<0.05$) irrespective of the seasons (Appendix Tables 3.5 and 3.6). Among soil layers, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney,

$P<0.05$) (Appendix Table 3.5). Compared to the wet season, significantly higher mean seed abundances and densities were recorded in the upper, middle and lower soil layers during the dry season (Mann-Whitney, $P<0.05$) (Appendix Table 3.7). In terms of species composition, a total of 86 species belonging to 64 genera and 29 families were recorded (Appendix Table 3.12). With respect to the soil layers, the highest number of species ($n=74$), genera ($n=57$) and families ($n=28$) were recorded from the upper layer (Appendix Table 3.12). Irrespective of the seasons and soil layers, the species belonging to the Poaceae family and herbs growth form dominated the tall grassland (Appendix Tables 3.12 and 3.13). In terms of species, *Apluda mutica* contributed most to the mean seed abundance (overall= 63.92 ± 7.41 , dry season= 82.08 ± 2.64 and wet season= 45.75 ± 5.39) and density (overall= 201 seeds/m^2 , dry season= 258 seeds/m^2 and wet season= 144 seeds/m^2) (Appendix Tables 3.14 and 3.39-3.41). Compared to the wet season, *Apluda mutica* contributed the most to the mean seed abundance and density during the dry season. Among the three soil layers, *Apluda mutica* contributed the highest to the mean seed abundance and density in the upper soil layer, followed by the middle and lower soil layers (Appendix Tables 3.13 and 3.22). Compared to the wet season, *Apluda mutica* contributed most to the upper, middle and lower soil layers during the dry season. Compared to TGF, significantly high mean seed abundances and densities were recorded in TGN, irrespective of the seasons (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). Between TGN and TGF, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.8).

3.3.4 Comparison between SG and TG experimental sites

In riverine alluvial grasslands, compared to TG, significantly high mean seed abundances and densities were recorded in SG, irrespective of the seasons (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). Between SG and TG, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). In the hand sorting experiment, compared to SG, significantly high mean seed abundances and densities were recorded in TG, irrespective of the seasons (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). Between SG and TG, significant seasonal differences were recorded in mean seed abundances

and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). Contrary, in the seed germination experiment, compared to TG, significantly high mean seed abundances and densities were recorded in SG, irrespective of the seasons (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). Between SG and TG, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.8).

In natural treatment, compared to TGN, significantly high mean seed abundances and densities were recorded in SGN, irrespective of the seasons (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). Between TGN and SGN, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). In hand sorting experiment, compared to SGN, significantly high mean seed abundances and densities were recorded in TGN, irrespective of the seasons (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). Between SGN and TGN, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). Contrary, in the seed germination experiment compared to TGN, significantly high mean seed abundances and densities were recorded in SGN, irrespective of the seasons (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). Between SGN and TGN, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.8).

In flooding treatment, compared to TGF, significantly high mean seed abundances and densities were recorded in SGF, irrespective of the seasons (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). Between SGF and TGF, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). In hand sorting, compared to SGF, significantly high mean seed abundances and densities were recorded in TGF, irrespective of the seasons (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). Between SGF and TGF, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). Contrary, in seed germination compared to TGF, significantly high seed mean seed abundance and densities were recorded in SGF, irrespective of the seasons (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). Between SGF and TGF,

significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.8).

3.3.5 Plant Species Composition: Similarities between experimental sites

Among sites (SGN, SGF, TGN and TGF), significantly high mean seed abundances and densities were recorded in SGN, irrespective of the seasons (Kruskal-Wallis, $P<0.05$) (Appendix Table 3.8). Among sites, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). In hand sorting, among sites, significantly high mean seed abundances and densities were recorded in TGN, irrespective of the seasons (Kruskal-Wallis, $P<0.05$) (Appendix Table 3.8). Among sites, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). In seed germination, among sites, significantly high mean seed abundances and densities were recorded in SGN, irrespective of the seasons (Kruskal-Wallis, $P<0.05$) (Appendix Table 3.8). Among sites, significant seasonal differences were recorded in mean seed abundances and densities (Mann-Whitney, $P<0.05$) (Appendix Table 3.8). Between SG and TG, in terms of species composition, high similarities were recorded during the dry season compared to the wet season ($BC_{ij}=0.43$). Irrespective of the seasons, among the three soil layers, the upper soil layer showed more similarities in the species composition between short and tall grassland (overall=0.43, dry season=0.45 and wet season=0.39) (Appendix Table 3.42). High similarities were recorded between SGN and SGF during the wet season ($BC_{ij}=0.62$) compared to the dry season. Irrespective of the seasons, among the three soil layers, the lower soil layer showed more similarities in the species composition between SGN and SGF (overall=0.70, dry season=0.64 and wet season=0.79) (Appendix Table 3.42). Between SGN and TGN, compared to the wet season, high similarities were recorded during the dry season ($BC_{ij}=0.43$). Among the three soil layers, the upper soil layer showed more similarities in the species composition between SGN and TGN overall ($BC_{ij}=0.43$) and in the dry season ($BC_{ij}=0.45$) and the lower layer in the wet season ($BC_{ij}=0.40$). Between SGN and TGF, there were no differences in the similarities recorded during the dry ($BC_{ij}=0.23$) and the wet season ($BC_{ij}=0.23$). Irrespective of the seasons, among the three soil layers, the lower soil layer showed more similarities in the species

composition between SGN and TGF (overall=0.25, dry season=0.25 and wet season=0.25) (Appendix Table 3.42). High similarities were recorded between SGF and TGN during the wet season ($BC_{ij}=0.49$) compared to the dry season. Irrespective of the seasons, among the three soil layers, the lower soil layer showed more similarities in the species composition between SGF and TGN (overall=0.52, dry season=0.53 and wet season=0.47) (Appendix Table 3.42). High similarities were recorded between SGF and TGF during the dry season ($BC_{ij}=0.43$) compared to the wet season. Irrespective of the seasons, among the three soil layers, the upper soil layer showed more similarities in the species composition between SGF and TGF (overall=0.44, dry season=0.45 and wet season=0.41) (Appendix Table 3.42). High similarities were recorded between TGN and TGF during the wet season ($BC_{ij}=0.63$) compared to the dry season. Irrespective of the seasons, among the three soil layers, the lower soil layer showed more similarities in the species composition between TGN and TGF (overall=0.68, dry season=0.65 and wet season=0.74) (Appendix Table 3.42). With respect to the species composition of upper, middle and lower soil layers, irrespective of the seasons, the riverine alluvial grassland, natural and flooding treatments showed the highest pairwise overlap between middle and lower soil layers and the lowest overlap between upper and lower soil layers (Appendix Table 3.43). Similarly, with their natural and flooding treatments, the short and tall grasslands showed the highest pairwise overlap between the middle and lower soil layers and the lowest overlap between the upper and lower soil layers (Appendix Table 3.43).

3.4 Discussion

In tropical grasslands, the seasonal cycle of flooding and drying directly influences the community structure and species distribution (Bao et al., 2014; Bao et al., 2018). Flooding potentially introduces new species and redistributes existing propagules (Bao et al., 2018). The saturated soils and inundation levels induced by floods restrict the emergence and survivorship of species not adapted to flooded conditions (Bao et al., 2018). The present chapter provides insights into the physical characteristics of seed banks in riverine alluvial grasslands. Additionally, it provides experimental validation that changing flooding and drying conditions play a crucial role in defining the seed

bank vegetation composition. Dense seed banks have often been observed in regularly disturbed areas like tropical wet grasslands exposed to flooding (van der Valk & Davis, 1979; Yang & li, 2013). This study demonstrated that, in riverine alluvial grasslands, the seed abundance and density vary from 1,68,546 (11,045 seeds/m²) to 93,637 (6,136 seeds/m²) from the dry to the wet season. In SG and TG, the seed abundance and density vary from 1,03,230 (13,529 seeds/m²) to 62,983 (8,254 seeds/m²) and from 65,316 (8,560 seeds/m²) to 30,654 (4,017 seeds/m²), respectively from the dry to the wet season. The seed bank abundance and densities recorded from the present study are in accordance with previous studies that had been conducted in the tropical grasslands of America, Europe and Asia, where seed abundance ranges from 2,578 to 45,019 and density ranges from 9,720 seeds/m² to 61,796 seeds/m² (Havrdová et al., 2015; Vieira et al., 2015; Bao et al., 2017; Mall et al., 2019; Silva & Overbeck, 2020).

Irrespective of the seasons, the highest seed abundance and densities were recorded from the upper soil layer, which decreased with an increase in soil depth in both SG and TG. This pattern was observed in tropical grasslands of Asia and America, as species dominant in aboveground vegetation tend to have a greater abundance of seeds located nearer to the soil surface (Mall et al., 2019; Silva & Overbeck, 2020). The decline in seed bank abundance and densities at greater depths is likely attributed to various environmental factors like organic matter and litter, moisture content, seed rain, seed availability, germination, seed predation or seed viability (Mall et al., 2019). In both SG and TG, compared to the wet season, high seed abundances and densities were recorded during the dry season. One of the potential reasons for this might be flooding events in tropical grasslands, where floods notably increase seed abundance and densities (Bao et al., 2018). For the present study, dry season soil samples collection was carried out just after the flood (November and January), and wet season soil samples were collected before flooding (April and July). The abundance of the soil seed bank was observed to be influenced by various factors, including the sampling time, altitude, slope, depth, plant communities, plant life form and soil environmental conditions such as moisture levels, aeration, fertility, and the presence of soil microorganisms (Li et al. 2011; Mall et al., 2019).

The results of the hand sorting experiment revealed that irrespective of the seasons, the high seed abundance and densities were recorded in TG compared to SG, probably due to the small seed size, making them imperceptible to the naked eye. Schmiede et al. (2009) documented that small and round shaped seeds characterize tropical alluvial grasslands. Irrespective of the seasons, both SG and TG seed features revealed a high mean abundance of seeds characterized by whole seed conditions, smooth seed surfaces, and without seed appendages. Research on the physical attributes of seed banks in tropical grasslands is scanty. Existing literature has only documented a small set of seed characteristics, such as shape, size, and weight (Holzel & Otte, 2004; Schmiede et al., 2009). Nonetheless, the findings of this chapter align with the experimental study conducted by Ninota et al. (2008), where they observed that grassland seeds, whether on the surface or buried, predominantly exhibited morphological characteristics such as ovoid, rhomboidal, turbinate, lenticular, and reniform shapes. Furthermore, these seeds typically possessed a smooth surface and lacked any appendages. The findings of this chapter suggest that both the SG and TG seed banks consist of robust and healthy seeds, as the majority of the seeds are found in their intact form (whole seeds), with fewer being cracked or split.

The seed germination experiment results revealed that irrespective of the seasons and treatments (natural and flooding), the soil bank composition of both SG and TG was dominated by herbs and the family Poaceae. The vegetation composition of the tropical grasslands in Kaziranga prominently features herbaceous growth forms and representatives from the Poaceae family (Sharma et al., 2023). Similar seed bank characteristics have been observed in floodplain grasslands of America, where flooding facilitates the recolonization of gaps by increasing and accelerating the recruitment of herbs and graminoids seedlings (Bao et al., 2014; de Souza et al., 2016). Seedlings kept emerging until the end of the five months of assessment, indicating that the viable seed bank had not been exhausted. The evaluated seed bank has both terrestrial and aquatic plants. All identified species had already been listed in the flora of KNP (Hajra & Jain, 1994; Baruah & Baruah, 2000; Baruah & Baruah, 2006). Contrarily to hand sorting, in the germination experiment, irrespective of the seasons, the high seed abundance and densities were recorded in SG compared to TG, probably due to the high germination

rate of some dominant pioneer species like *Cynodon dactylon*, *Lindernia crustacea*, *Polygonum plebeium* and *Phyllanthus niruri* (Bao et al., 2014). Interestingly, the TG soil seed bank was dominated by *Apluda mutica* and some dominant pioneer species like *Phyllanthus niruri*, *Cynodon dactylon*, *Pouzolzia zeylanica*, *Christella parasitica* and *Imperata cylindrica* (Choudhury et al., 2017). In contrast, the predominant aboveground vegetation consists of *Saccharum* spp. (Sharma et al., 2023). This is likely due to their slow growth rate, necessitating four months to establish their full canopy (Allison et al., 2007).

In general, the seed germination process accelerated with increasing soil moisture in flooded areas compared to non-inundated soils (Bao et al., 2018). Contrary to this, the present study found that natural treatments consistently exhibited higher seed abundance and density irrespective of the seasons than flooding treatments in both SG and TG. In tropical grasslands, species require a variety of species-specific optimal environmental conditions for germination, which are generally limited by abiotic factors like light and water levels (Bao et al., 2018). The results were consistent with studies conducted in tropical grasslands of America, which reported higher species abundance and densities of seedlings in non-inundated soil compared to submerged soils (Bao et al., 2017). Irrespective of the seasons and treatments (natural and flooding), the species composition of SG is dominated by *Cynodon dactylon* and TG is dominated by *Apluda mutica*. Interestingly, some macrophytes were exclusively found in flooded treatments of SG (e.g., *Aeschynomene aspera*, *Azolla pinnata*, *Ceratopteris thalictroides*, *Eichhornia crassipes*, *Equisetum debile*, *Limnobium laevigatum*, *Marsilea quadrifolia*, *Monochoria hastata*, *Nymphoides cristata*, *Pistia stratiotes*, *Potentilla kleiniana*, *Salvinia natans*, and *Spirodela polyrrhiza*) and TG (e.g., *Azolla pinnata*). These aquatic species were also reported from waterbodies (*beels*) of KNP (Baruah & Baruah, 2000). In such periodically flooded areas, the coexistence of terrestrial, aquatic and amphibious plant species seeds in soil banks is quite common (Bao et al., 2014; Bao et al., 2017).

The results of this chapter revealed that irrespective of the seasons, flooding enhances similarity among soil layer species composition in both SG and TG (except between UL-ML in the dry season in TG). The results were supported by an experimental study

conducted in tropical grasslands of America, where the high similarity in vegetation composition was recorded during the flood period (wet) compared to drought (dry) (Bao et al., 2014). On higher ground, where the duration of flood is lower or absent, seeds will not have the conditions necessary to develop, reproduce, and replenish the seed banks (Bao et al., 2014). In periods of drought, there was low similarity among species and an increase in the emergence of grasses (Bao et al., 2014). Regardless of the season, SG and TG showed low vegetation composition similarities due to the dominance of different species.

Additionally, the findings of this chapter revealed that irrespective of the seasons, the natural treatment in both SG (*Solanum viarum*) and TG (*Flemingia lineata*, *Solanum viarum* and *Chromolaena odorata* only in the dry season) encourages the growth of woody seedlings, whereas such growth was absent in the flooding treatment for both SG and TG. Other woody species that are considered weeds in tropical grasslands of KNP, such as *Mimosa* spp. were present in the aboveground vegetation but did not emerge from the seed bank (Sharma et al., 2023). This could result from the experimental conditions, as flooding suppresses seed germination or seedling growth of woody species (de Souza et al., 2016). Also, irrespective of the seasons and treatments, invasive like *Ageratum conyzoides* was found in SG, while *Eichhornia crassipes* was exclusively observed only in flooded conditions. In TG, invasives like *Ageratum conyzoides*, *Merremia umbellata*, and *Mikania micrantha* were consistently seen in both natural and flooding treatments, irrespective of the seasons. In TG, *Chromolaena odorata* was exclusively recorded during the dry season in the natural treatment. These woody and invasive species identified in the study by Sharma et al. (2023) possess the capacity to significantly alter the plant vegetation composition and structure of the tropical grasslands of Kaziranga. As a result, it is advised to conduct species-specific studies documenting their biology, particularly with respect to their seed bank characteristics.

3.5 Conclusion

In conclusion, it is evident that soil seed bank studies in tropical grasslands remain a crucial yet underexplored area of research. The present study aims to contribute

significantly to filling this gap. The present chapter emphasizes that research on seed banks, particularly pertaining to the physical attributes of seeds that determine their persistence and viability, is relatively scarce in tropical grasslands. As a result, it is recommended that further scientific research needs to be undertaken in this field. Examining the impact of introduced flood and drought conditions on the seed bank has revealed that, although flooding reduces seed bank abundance and densities, it plays a vital role in structuring seed bank composition and species distribution of tropical grasslands. As post-floods (during the dry season), this study recorded high seed abundance and densities in all SG and TG soil layers. This chapter revealed that the tropical grasslands of KNP harbour aquatic and terrestrial plant seedlings; hence, they store both types of species for any forthcoming dry or wet condition (Bao et al., 2014). Flooding also influences the germination strategies of some species. This study documented that the germination of specific macrophytes was exclusively observed in the flooded pots of both SG and TG. This chapter unveiled that SG plant communities show a higher potential for restoration using the seed bank compared to TG. This is attributed to the fact that the seed bank composition in SG primarily comprises seedlings from the existing vegetation, whereas, in TG, the composition differs from the aboveground vegetation (Sharma et al., 2023). Moreover, the SG seed bank holds potential seeds of forage plants like *Cynodon dactylon* and *Hemarthria compressa*, which are valuable for herbivores. On the other hand, in the TG, dominant species such as *Saccharum* spp. displays limited seed density and abundance, primarily attributable to their low germination rate. Therefore, to sustain the resilience of remaining TG plant communities, it is recommended to prioritize resprouting and vegetative propagation of important tall grass species like *Saccharum* spp. This is a prominent feature in fire-prone ecosystems, where below-ground structures like roots are crucial for enabling successful resprouting (Ferreira et al., 2015). This study revealed that, although flood decreases seed abundance and densities, it enhances plant species similarity among soil layers in SG and TG. Additionally, the seed bank plant species composition in SG differs from TG due to the presence of distinct dominant species. Within these tropical grasslands, *Mikania micrantha* and *Mimosa* spp. have been reported as invasive species (Sharma et al., 2023). Therefore, it is advisable to thoroughly investigate these species alongside other documented invasive and woody species in the present study. In the

forthcoming years, it is anticipated that there will be a rise in both extreme temperature and precipitation events in tropical grasslands (Kiss et al., 2018). As a result, alterations in inundation periods, whether they involve an increase or decrease, will profoundly affect the seed bank composition of these landscapes. This change could lead to the gradual loss of important species groups over time. To effectively manage and conserve desirable species within a seed bank, it is imperative to scrutinize seed banks, ensuring successful germination and subsequent seedling establishment, as emphasized by Mall et al. (2019). Nonetheless, in-depth research is still required regarding soil seed banks, bud banks, seed dispersal, and their impacts on vegetation dynamics, particularly pertaining to the population dynamics of individual plant species. Such studies would lead to a more precise evaluation of vegetation patterns in the context of grassland management, thereby aiding in formulating effective restoration strategies for deteriorated grasslands (Silva & Overbeck, 2020).

CHAPTER 4

PLANT SPECIES COMPOSITION AND STRUCTURE OF RIVERINE ALLUVIAL GRASSLANDS

4.1 Introduction

Tropical grasslands are a dynamic and heterogeneous environmental resource often composed of a complex mosaic of plant communities (Toogood et al., 2008; Toogood & Joyce, 2009). The structure and function of these plant communities vary spatially and temporally with the type of herbivore grazers, frequency and intensity of management practices (e.g., burning), edaphic conditions and marked climatic variations (fluctuations in precipitation, flooding and temperature) (Lehmkuhl, 1989; Oosterheld et al., 1999; Toogood et al., 2008; Toogood & Joyce, 2009; Joyce et al., 2016; Buisson et al., 2018). The changing intensity and frequency of the aforementioned factors can largely govern the vegetation characteristics (composition, structure and diversity) of tropical grassland plant communities. Mega- and meso-herbivores can strongly influence plant community structure and modify vegetation characteristics by controlling species colonization and extinction rates (Olf & Ritchie, 1998), and altering soil nutrient properties through defoliation, trampling, dung, and urine depositions (Olf & Ritchie, 1998; Altesor et al., 2005). Experimental grazing exclusion (controlled grazing) from tropical grasslands alters plant community compositions (Burns et al., 2009), reduces plant species richness (Altesor et al., 2005), enhances plant species diversity (Chaneton & Facelli, 1991; Bezbarua, 2007), promotes woody encroachment (Smart et al., 1985) and proliferation of invasive species (Potter et al., 2021), and improves soil macro-nutrient (C, N, P, and K) content (Hatton & Smart, 1984; Singh et al., 1991). Prescribed or experimental burning removes aboveground biomass and enhances soil macro-nutrient (C, N, P, and K) content through volatilization and ash deposition (Harrington, 1974; Singh et al., 1991; Sankaran, 2016; Pathak et al., 2017), consequently impacting vegetation characteristics by altering plant community composition (heterogeneous) (Kumar et al., 2015), reduce plant species richness (Koerner et al., 2014), increasing plant species diversity (Adams

et al., 1982), and limiting woody growth and invasive species (Lonsdale & Miller, 1993; Clark & Wilson, 2001; Nerlekar et al., 2022).

According to the Convention on Biological Diversity, the biological invasion of alien species is a major threat to biodiversity conservation, second only to habitat destruction (Nath et al., 2019). In tropical grasslands, invasive species with high plasticity of germination-related capability modify plant community composition by replacing native flora and altering soil nutrient conditions (Clark & Wilson, 2001; Afreen et al., 2018; Srivastava & Raghubanshi, 2021). Invasive manual uprooting is an ecologically effective technique used to restore invaded native grassland vegetation, as it effectively decreases the invasive and woody cover, recovers native species, and promotes high plant species richness and diversity (Guido & Piller, 2017; Nerlekar et al., 2022; Sinha et al., 2022). Studies examining the impact of experimental invasive uprooting on edaphic conditions in tropical grasslands are limited, wherein non-invaded areas have higher macro-soil nutrient (C, N, P, and K) content than invaded areas (Choudhury, 2017; Srivastava & Raghubanshi, 2021).

Most of the aforementioned experimental studies assessing the impact of herbivory and management practices, such as controlled burning and invasive removal, on tropical grassland vegetation characteristics and soil nutrient content, have emerged from Africa and America, with very few studies from Asia. To fulfill this gap, the present chapter aims to provide the effect of grazing and management practices (burning and invasive removal) on plant species composition of these subtropical riverine alluvial grasslands of Kaziranga National Park (KNP). These grasslands are vulnerable to climatic events like seasonal flooding and subjected to combinations of herbivory, and management practices such as prescribed burning and manual uprooting of globally noxious invasive, *Mikania micrantha* and *Mimosa* spp. (Vasu, 2003; Vasu & Singh, 2015). However, the lack of scientific-validated experimental studies based on the outcomes of the effect of mega- and meso-herbivore grazing and current management practices are creating hurdles in their conservation and management. Therefore, baseline information generated from the present chapter will aid management authorities in formulating and upgrading current management practices.

In view of this, the chapter aims to provide answers to the following research questions:

- 1) Within short (SG) and tall grasslands (TG) in KNP- a) what is the seasonal vegetation characteristics (composition, structure, woody individuals, invasive occurrence and diversity indices) and b) what is the seasonal soil macro-nutrient (C, N, P and K) content?
- 2) Is there any similarity in the species composition between SG and TG?
- 3) Do environmental variables such as rainfall (RF), maximum temperature (MAXT), minimum temperature (MINT) and soil nutrient (C, N, P, and K) content influence plant species distribution in SG and TG?

4.2 Methodology

4.2.1 Experimental design

The locations for experimental sites (ES) were selected based on the duration of accessibility. For heterogeneous sampling, the locations were selected in three different ranges of KNP, namely central (Kohora), eastern (Agoratoli), and western (Bagori). Due to limited resources, only 15 exclosures of size 10m×10m with fixed chain link iron fencing and a mesh size of 0.05m×0.05m were constructed. The data was collected from 30 ES, inside (n=15) and outside (n=15) of all fenced exclosures (Appendix Table 4.1). Inside ES represents the areas where mega- and meso-herbivores were excluded (henceforth referred to as herbivore exclusion), while the outside ES represents the areas with free access to mega- and meso-herbivores (henceforth referred to as herbivore inclusion) (Appendix Table 4.1). The impact of ongoing management interventions was studied by subjecting (a) three herbivore exclusion ES to controlled annual burning at the end of February; consequently, the data was not collected for March to allow burned areas to recover, and (b) two herbivore exclusion ES to monthly invasive removal via manual uprooting of invasives *Mimosa* spp. and *Mikania micrantha*. ES were categorized into herbivore exclusion in short grassland (HES, n=6), herbivore inclusion in short grassland (HIS, n=6), herbivore exclusion in tall grassland (HET, n=4), herbivore inclusion in tall grassland (HIT, n=9), herbivore exclusion in tall grassland with burning (HETB, n=3), and herbivore exclusion in tall grassland with invasive removal (HETIR, n=2).

4.2.2 Field sampling

Vegetation and soil samples were collected for two years, from January 2014 to December 2015 (excluding the flood period from August to October). Based on rainfall based hierarchical clustering, the sampling period was divided into the dry (November to March) and the wet seasons (April to July) (Figure 2.2). For vegetation composition and structure analysis, three random quadrates (1m×1m) were laid in each ES (inside and outside the 15 exclosures), to collect abundance data (Mueller-Dombois & Ellenberg, 1974). Overall, 1152 plots were sampled, including 612 in the dry season and 540 in the wet season (Appendix Table 4.2). A species-area curve was plotted for each category of ES, to determine the adequate sampling efforts required to study vegetation composition and structure (Figure 4.1). In the species-area curve, the number of plots laid and the mean number of plants recorded from each ES were plotted (Colwell et al., 2012). The plant species were identified using ‘Botany of Kaziranga and Manas’ by Hajra and Jain (1994). For soil sampling, three random soil samples (15 cm deep) were collected from three different sides of each ES after removing the vegetation layer using a soil auger (length=15 cm, diameter=7.5 cm) (Chaturvedi & Sankar, 2006). The soil samples were air-dried for 2-3 days, sieved (2 mm mesh) to remove the stone and root particles, and packed in zip-lock bags for laboratory analysis. To make one composite sample, three soil samples collected from the same location were pooled together (Chaturvedi & Sankar, 2006). A total of 390 composite soil samples (dry season=210; wet season=180) were prepared and analyzed using standard protocols (Appendix Tables 4.2 and 4.3). RF, MAXT and MINT data was collected from January 2014 to December 2015 (2014-15, Assam Forest Department and Figure 2.3).

4.2.3 Soil Laboratory Analysis

Standard methods were used to estimate the Organic carbon (C), Nitrogen (N), Phosphorous (P), and Potassium (K) content of the soil (Allen et al., 1974; Chaturvedi & Sankar, 2006). One of the widely used methods, the Walkley-Black method, was used to determine soil organic carbon. Kjeldahl method was used to estimate the Nitrogen content, in which Auto Kjeldahl Nitrogen Analyzer (Foss Analytical 2003a) instrument was used for the analysis (Chaturvedi & Sankar, 2006). Phosphorus and

Potassium content was estimated using the UV Visible Spectrophotometer and Flame Photometer, respectively (Appendix Table 4.3).

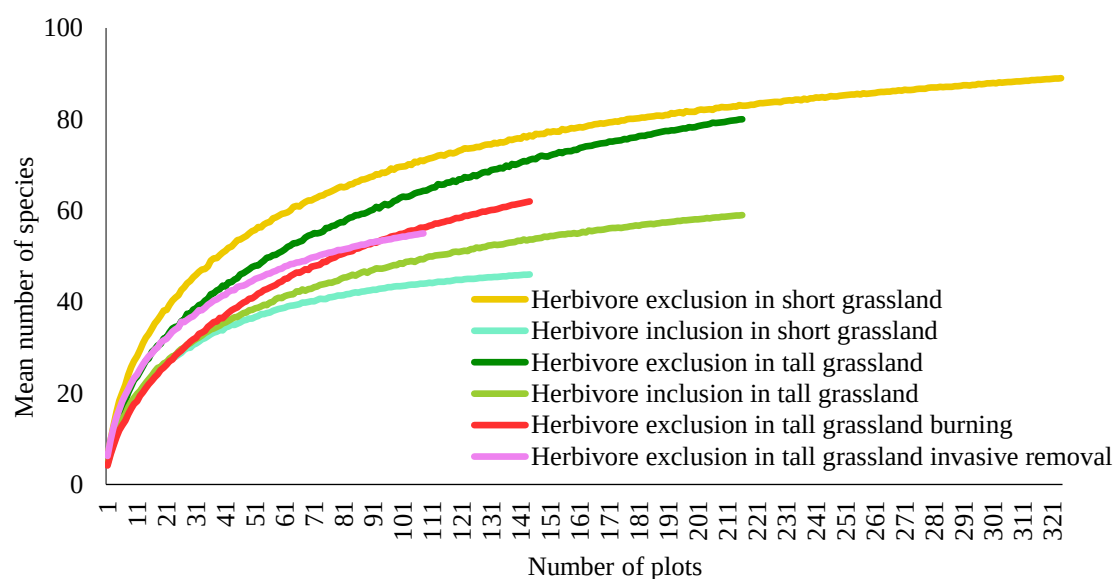


Figure 4.1. Species-area curve for experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India. (Herbivore exclusion in short grassland: N-324; Herbivore inclusion in short grassland N-144; Herbivore exclusion in tall grassland N-216; Herbivore inclusion in tall grassland N-216; Herbivore exclusion in tall grassland burning N-144; Herbivore exclusion in tall grassland invasive removal N-108).

4.2.4 Data analysis

4.2.4.1 Plant community structure

The Two-way Indicator Species Analysis (TWINSpan) was carried out using TWINSpan, PC-ORD (version 4.20) to identify and classify homogenous groups of vegetation into plant communities (Hill, 1979; Gauch & Whittaker, 1981; McCune & Mefford, 1999). TWINSpan was performed based on the presence or absence data of the plant species with respect to the quadrates. Based on hierarchical division, the TWINSpan constructs a two-way table representing the relationships between the samples and species within the dataset were obtained (Hill, 1979). At each division, TWINSpan identifies the indicator pseudo species divided into positive and negative subgroups. A pattern of binary digits (0 and 1) in the margins was used to indicate major

divisions in the data. Based on traditional vegetation classification, the plant communities were segregated and named after the dominant species (Atri, 1995). Based on the TWINSpan results, the density, frequency, abundance and abundance to frequency ratio (A/F) of each species in each plant community was calculated (Curtis & McIntosh, 1950) (Appendix Table 4.4). A/F values indicate whether the distribution pattern is regular ($A/F < 0.025$), random ($A/F = 0.025-0.05$) or contagious ($A/F > 0.05$) (Evans, 1953; David & Moore, 1954; Curtis & Cottam, 1956). Based on abundance data, the frequency of occurrence of invasive species was estimated (from removed invasives in HETIR). Diversity indices viz., Richness (S), Evenness (E), Shannon-Weiner (H'), and Simpson's dominance (D), were calculated using TWINSpan, PC-ORD (version 4.20) (Simpson, 1949; Margalef, 1958; Shannon & Weaver, 1963; Hill, 1973). Mann-Whitney and Kruskal-Wallis tests were performed to derive significant differences using SPSS (version 22). Additionally, for multiple comparisons, Bonferroni corrections were performed (Kwak et al., 2020).

4.2.4.2 Similarity index

Bray-Curtis similarity index was used to estimate the pairwise similarities in plant species composition between each category of ES, which ranges from 0 (no similarity) to 1 (complete similarity) (Bray & Curtis, 1957). Non-metric multidimensional scaling (NMDS) based on Bray-Curtis similarity index with 3-D ordination plots was used to visualize the similarities in the species composition of each ES. The permutation test permANOVA (permutational multivariate analysis of variance) with 999 permutations was performed to test the null hypothesis of no differences between ES (Anderson & Walsh, 2013). Data analysis was carried out using PAST and R (version 2.5-7) (Hammer et al., 2001; Oksanen et al., 2020).

4.2.4.3 Relationship between vegetation and environmental parameters

Canonical correspondence analysis (CCA) was performed to elucidate the relationship between sites and species with their environmental parameters (C, N, P, K, RF, MAXT and MINT) (ter Braak & Verdonschot, 1995). CCA is a direct gradient analysis, which systematically arranges each species occurrence along with a best-suited environmental variable, describing the habitat preference of each taxa via an ordination diagram (ter Braak & Verdonschot, 1995). For CCA analysis, site-wise species data and

environmental parameters were standardized, from 0 to 1, following Legendre and Legendre (1998). Following Cao et al. (2001), rare species occurring in each ES were not excluded, as they might be sensitive to habitat, herbivory and management interventions. For CCA, significant variables were identified using permANOVA with 999 permutations and after Bonferroni corrections. The data analysis was carried out using R (version 2.5-7) (Oksanen et al., 2020).

4.3 Results

4.3.1 Plant species composition, structure and soil nutrient content: SG and TG

In grasslands, a total of 142 plant species belonging to 47 families were recorded (Tables 4.1-4.2 and Appendix Table 4.5). Compared to the dry season, a high number of plant species ($n=134$) and families ($n=46$) were recorded in the wet season (Tables 4.1 and 4.2). Irrespective of seasons, grasslands were dominated by the Poaceae family and herbs growth form. Plant communities were dominated by *Saccharum* spp., *Cynodon dactylon*, *Hemarthria compressa* and *Carex vesicaria*, and showed contagious distribution ($A/F \geq 0.05$) (Table 4.3). Compared to the dry season, a higher number of woody individuals were recorded during the wet season ($n=1715$) (Appendix Table 4.6). Compared to the wet season, a high occurrence of *Mimosa* spp. and *Mikania micrantha* was recorded in the dry season (28.33%) (Figure 4.2). Seasonally, individually high *Mimosa* spp. was recorded in the wet season (15.43%), and *Mikania micrantha* was recorded in the dry season (21.67%). Compared to the dry season, significantly high plant species richness ($S=6.4$, Mann-Whitney, $P<0.05$) and diversity ($H'=1.24$, Mann-Whitney, $P<0.05$) were recorded in the wet season (Table 4.4 and Appendix Table 4.7). Compared to the dry season, a significantly high soil C (3.30%), N (0.15%), P (0.13%), and K (0.68%) content (Mann-Whitney, $P<0.05$) were recorded in the wet season (Table 4.5 and Appendix Table 4.7).

4.3.1.1 Short grassland

In SG, a total of 96 plant species belonging to 35 families were recorded (Tables 4.1 and 4.2). Compared to the dry season, a high number of plant species ($n=83$) and families ($n=32$) were recorded in the wet season (Tables 4.1 and 4.2). Irrespective of seasons, SG was dominated by the Poaceae family and herbs growth form. Plant

communities were dominated by *Cynodon dactylon*, *Hemarthria compressa* and *Carex vesicaria*, and showed contagious distribution ($A/F \geq 0.05$) (Appendix Table 4.8). Compared to the dry season, a higher number of woody individuals ($n=62$) were recorded during the wet season (Appendix Table 4.6). Invasion of *Mimosa* spp. and *Mikania micrantha* were not recorded in SG. Compared to the dry season, significantly high species richness ($S=6.9$, Mann-Whitney, $P<0.05$) and diversity ($H'=1.33$, Mann-Whitney, $P<0.05$) were recorded during the wet season (Tables 4.4 and Appendix Table 4.7). Compared to the dry season, a significantly high soil C (2.47%, Mann-Whitney, $P<0.05$), N (0.12%, Mann-Whitney, $P<0.05$), P (0.08%, Mann-Whitney, $P<0.05$), and K content (SG=0.56%, Mann-Whitney, $P<0.05$), were recorded in the wet season (Table 4.5 and Appendix Table 4.7).

4.3.1.2 Tall grassland

In TG, a total of 104 plant species belonging to 38 families were recorded (Tables 4.1 and 4.2). Compared to the dry season, a high number of species ($n=98$) and families ($n=36$) were recorded in the wet season (Tables 4.1 and 4.2). Irrespective of seasons, TG were dominated by the Poaceae family and herbs growth form. Plant communities in TG were dominated by *Saccharum* spp., and showed contagious distribution ($A/F \geq 0.05$) (Appendix Table 4.9). Compared to the dry season, a higher number of woody individuals were recorded during the wet season ($n=1653$) (Appendix Table 4.6). Compared to the wet season, a high occurrence of *Mimosa* spp. and *Mikania micrantha* (28.33%) was recorded during the dry season. Seasonally, individually *Mimosa* spp. showed high occurrence in the wet season (15.43%), and *Mikania micrantha* was in the dry season (21.67%) (Figure 4.2). Compared to the dry season, a significantly high species richness ($S=6.0$, Mann-Whitney, $P<0.05$) and diversity ($H'=1.18$, Mann-Whitney, $P<0.05$) were recorded during the wet season (Tables 4.4 and Appendix Table 4.7). Compared to the dry season, a significantly high soil C (3.85%, Mann-Whitney, $P<0.05$), N (0.17%, Mann-Whitney, $P<0.05$), P (TG=0.17%, Mann-Whitney, $P<0.05$), and K (0.76%, Mann-Whitney, $P<0.05$) content, were recorded in the wet season (Table 4.5 and Appendix Table 4.7).

Table 4.1. Plant species composition of riverine alluvial grasslands recorded during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Season	Species	Genus	Families	Number of species (n)														
					Group		Class			Growth Form							Life cycle		
					An	Pt	M	Di	F	Grass	Sedges	Climber	Herb	Fern	Shrub	Tree	Ann	Per	Deci
HES	Overall	89	79	32	86	3	29	57	3	20	7	3	51	3	5	0	43	46	0
	Dry	51	46	19	50	1	13	37	1	11	2	3	30	1	4	0	25	26	0
	Wet	77	70	30	75	2	27	48	2	18	7	1	46	2	3	0	39	38	0
HIS	Overall	46	44	23	45	1	11	34	1	9	2	1	30	1	3	0	23	23	0
	Dry	30	29	16	30	0	7	23	0	5	2	0	21	0	2	0	14	16	0
	Wet	43	41	21	42	1	11	31	1	9	2	1	28	1	2	0	22	21	0
Total (SG)	Overall	96	85	35	93	3	31	62	3	22	7	3	55	3	6	0	46	50	0
	Dry	57	52	22	56	1	14	42	1	12	2	3	34	1	5	0	28	29	0
	Wet	83	75	32	80	3	29	51	3	20	7	1	49	3	3	0	42	41	0
HET	Overall	80	72	32	78	2	23	55	2	13	7	8	37	2	11	2	26	52	2
	Dry	45	45	26	43	2	15	28	2	8	4	5	15	2	9	2	6	37	2
	Wet	69	61	28	67	2	18	49	2	11	6	7	31	2	10	2	24	43	2
HIT	Overall	59	57	30	56	3	13	43	3	8	4	7	24	3	11	2	16	41	2
	Dry	42	41	25	40	2	11	29	2	6	4	4	16	2	8	2	10	30	2
	Wet	50	49	25	47	3	13	34	3	8	4	7	17	3	9	2	12	36	2
HETB	Overall	62	56	30	58	4	21	37	4	13	6	6	27	4	5	1	17	44	1
	Dry	29	29	17	27	2	11	16	2	6	4	3	9	2	4	1	5	23	1
	Wet	51	47	29	47	4	17	30	4	11	4	6	21	4	4	1	13	37	1
HETIR	Overall	55	49	26	53	2	16	37	2	10	5	5	28	2	5	0	19	36	0
	Dry	35	33	17	33	2	12	21	2	7	4	3	14	2	5	0	10	25	0
	Wet	46	41	25	44	2	14	30	2	9	4	5	21	2	5	0	14	32	0
Total (TG)	Overall	104	92	38	100	4	25	75	4	15	7	8	55	4	13	2	36	66	2
	Dry	70	67	33	68	2	19	49	2	11	5	7	33	2	10	2	19	49	2
	Wet	98	86	36	94	4	23	71	4	14	7	8	51	4	12	2	35	61	2
Total (SG & TG)	Overall	142	125	47	136	6	41	95	6	26	10	8	75	6	15	2	57	83	2
	Dry	96	89	38	93	3	24	69	3	16	5	7	51	3	12	2	36	58	2
	Wet	134	119	46	128	6	39	89	6	25	10	8	70	6	13	2	53	79	2

SG- short grassland, TG- tall grassland, HES- herbivore exclusion in short grassland, HIS- herbivore inclusion in short grassland, HET-herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB-herbivore exclusion in tall grassland burning and HETIR- herbivore exclusion in tall grassland invasive removal, An-angiosperms, Pt-pteridophytes, M-Monocot, Di- Dicot, F-Fern, Ann-annual, Per-perennial, Deci-deciduous and n-number of species.

Table 4.2. Dominant plant families recorded from riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Overall		Dry season		Wet season	
	Family	n	Family	n	Family	n
HES	Poaceae	20	Poaceae	11	Poaceae	18
	Compositae	15	Compositae	11	Compositae	13
	Cyperaceae	7	Amaranthaceae	4	Cyperaceae	7
	Amaranthaceae	4	Polygonaceae	4	Amaranthaceae	4
	Polygonaceae	4	Acanthaceae	2	Caryophyllaceae	3
HIS	Poaceae	9	Compositae	5	Poaceae	9
	Compositae	8	Poaceae	5	Compositae	8
	Amaranthaceae	4	Amaranthaceae	3	Amaranthaceae	4
	Polygonaceae	3	Brassicaceae	2	Polygonaceae	3
	Brassicaceae	2	Caryophyllaceae	2	Brassicaceae	2
Total (SG)	Poaceae	22	Poaceae	12	Poaceae	20
	Compositae	15	Compositae	12	Compositae	13
	Cyperaceae	7	Amaranthaceae	4	Cyperaceae	7
	Polygonaceae	5	Polygonaceae	4	Amaranthaceae	4
	Amaranthaceae	4	Acanthaceae	2	Polygonaceae	4
HET	Poaceae	13	Poaceae	8	Poaceae	11
	Compositae	7	Cyperaceae	4	Compositae	6
	Cyperaceae	7	Compositae	3	Cyperaceae	6
	Amaranthaceae	5	Apocynaceae	2	Amaranthaceae	5
	Apiaceae	3	Caryophyllaceae	2	Euphorbiaceae	3
HIT	Poaceae	8	Poaceae	6	Poaceae	8
	Compositae	7	Compositae	5	Compositae	6
	Cyperaceae	4	Cyperaceae	4	Cyperaceae	4
	Leguminosae	4	Euphorbiaceae	2	Leguminosae	4
	Lamiaceae	3	Lamiaceae	2	Lamiaceae	3
HETB	Poaceae	13	Poaceae	6	Poaceae	11
	Compositae	6	Compositae	4	Cyperaceae	4
	Cyperaceae	6	Cyperaceae	4	Compositae	3
	Leguminosae	4	Leguminosae	2	Leguminosae	3
	Apiaceae	2	Apiaceae	1	Caryophyllaceae	2
HETIR	Poaceae	10	Poaceae	7	Poaceae	9
	Compositae	6	Compositae	6	Cyperaceae	4
	Cyperaceae	5	Cyperaceae	4	Compositae	3
	Polygonaceae	4	Amaranthaceae	2	Polygonaceae	3
	Amaranthaceae	3	Lamiaceae	2	Amaranthaceae	2
Total (TG)	Poaceae	15	Poaceae	11	Poaceae	14
	Compositae	12	Compositae	9	Compositae	10
	Cyperaceae	7	Cyperaceae	5	Cyperaceae	7
	Amaranthaceae	6	Amaranthaceae	3	Amaranthaceae	6
	Apiaceae	5	Lamiaceae	3	Apiaceae	5
Total (SG & TG)	Poaceae	26	Poaceae	16	Poaceae	25
	Compositae	19	Compositae	15	Compositae	17
	Cyperaceae	10	Cyperaceae	5	Cyperaceae	10
	Amaranthaceae	6	Amaranthaceae	4	Amaranthaceae	6
	Leguminosae	6	Caryophyllaceae	4	Leguminosae	6

HES- herbivore exclusion in short grassland, HIS- herbivore inclusion in short grassland, HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal and n- number of plant species.

Table 4.3. Overall and seasonal plant communities recorded from riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Season	Plant community	Division level			Dominating species	Density (m ⁻²)	F (%)	A	A/F
		N	n	Eigen					
Overall	GL-PC1: <i>Saccharum</i> spp.- <i>Mikania micrantha</i> - <i>Scleria terrestris</i>	133	68	0.22	<i>Saccharum</i> spp.	60.05	100	60.05	0.6
					<i>Mikania micrantha</i>	8.06	51.13	15.76	0.31
					<i>Scleria terrestris</i>	7.98	43.61	18.31	0.42
	GL-PC2: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Alpinia nigra</i>	234	77	0.17	<i>Saccharum</i> spp.	58.07	100	58.07	0.58
					<i>Merremia umbellata</i>	17.06	90.17	18.92	0.21
					<i>Alpinia nigra</i>	4.33	59.4	7.29	0.12
	GL-PC3: <i>Saccharum</i> spp.- <i>Christella parasitica</i> - <i>Alpinia nigra</i>	128	49	0.21	<i>Saccharum</i> spp.	47.73	100	47.73	0.48
					<i>Christella parasitica</i>	8.15	69.53	11.72	0.17
					<i>Alpinia nigra</i>	4.95	68.75	7.2	0.1
	GL-PC4: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Flemingia lineata</i>	86	43	0.21	<i>Saccharum</i> spp.	52.99	100	52.99	0.53
					<i>Merremia umbellata</i>	10.56	74.42	14.19	0.19
					<i>Flemingia lineata</i>	4.7	83.72	5.61	0.07
	GL-PC5: <i>Saccharum</i> spp.- <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i>	102	58	0.25	<i>Saccharum</i> spp.	64.35	100	64.35	0.64
					<i>Hemarthria compressa</i>	16.42	60.78	27.02	0.44
					<i>Cynodon dactylon</i>	14.01	69.61	20.13	0.29
	GL-PC6: <i>Carex vesicaria</i> - <i>Hemarthria compressa</i> - <i>Lindernia crustacea</i>	71	39	0.34	<i>Carex vesicaria</i>	80.1	100	80.1	0.8
					<i>Hemarthria compressa</i>	62.24	100	62.24	0.62
					<i>Lindernia crustacea</i>	8.38	66.2	12.66	0.19
	GL-PC7: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Setaria pumila</i>	75	50	0.21	<i>Hemarthria compressa</i>	80.12	100	80.12	0.8
					<i>Cynodon dactylon</i>	37.95	100	37.95	0.38
					<i>Setaria pumila</i>	26.37	89.33	29.52	0.33
	GL-PC8: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Carex vesicaria</i>	99	41	0.17	<i>Cynodon dactylon</i>	46.12	100	46.12	0.46
					<i>Hemarthria compressa</i>	43.06	92.93	46.34	0.5
					<i>Carex vesicaria</i>	7.37	25.25	29.2	1.16
	GL-PC9: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Polygonum plebeium</i>	159	64	0.17	<i>Cynodon dactylon</i>	61.47	100	61.47	0.61
					<i>Hemarthria compressa</i>	48.87	99.37	49.18	0.49
					<i>Polygonum plebeium</i>	5.04	39.62	12.71	0.32

Season	Plant community	Division level			Dominating species	Density (m ⁻²)	F (%)	A	A/F
		N	n	Eigen					
Dry	GL-PC10: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Paspalum conjugatum</i>	65	56	0.2	<i>Hemarthria compressa</i>	82.55	100	82.55	0.83
					<i>Cynodon dactylon</i>	62.8	100	62.8	0.63
					<i>Paspalum conjugatum</i>	12.72	56.92	22.35	0.39
	GL-PC1: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Christella parasitica</i>	108	38	0.18	<i>Saccharum</i> spp.	38.64	100	38.64	0.39
					<i>Merremia umbellata</i>	15.25	97.22	15.69	0.16
					<i>Christella parasitica</i>	4.41	47.22	9.33	0.2
	GL-PC2: <i>Saccharum</i> spp.- <i>Christella parasitica</i> - <i>Alpinia nigra</i>	120	49	0.18	<i>Saccharum</i> spp.	36.73	100	36.73	0.37
					<i>Christella parasitica</i>	4.36	42.5	10.25	0.24
					<i>Alpinia nigra</i>	3.58	59.17	6.06	0.1
	GL-PC3: <i>Saccharum</i> spp.- <i>Mikania micrantha</i> - <i>Alpinia nigra</i>	79	38	0.27	<i>Saccharum</i> spp.	34.38	100	34.38	0.34
					<i>Mikania micrantha</i>	11.46	69.62	16.45	0.24
					<i>Alpinia nigra</i>	4.95	58.23	8.5	0.15
	GL-PC4: <i>Saccharum</i> spp.- <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i>	52	33	0.27	<i>Saccharum</i> spp.	44.62	100	44.62	0.45
					<i>Cynodon dactylon</i>	13.1	65.38	20.03	0.31
					<i>Hemarthria compressa</i>	10.88	51.92	20.96	0.4
	GL-PC5: <i>Carex vesicaria</i> - <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i>	49	23	0.33	<i>Carex vesicaria</i>	55.51	100	55.51	0.56
					<i>Hemarthria compressa</i>	44.16	93.88	47.04	0.5
					<i>Cynodon dactylon</i>	13.41	42.86	31.29	0.73
	GL-PC6: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Setaria pumila</i>	51	30	0.22	<i>Hemarthria compressa</i>	52.86	100	52.86	0.53
					<i>Cynodon dactylon</i>	38.2	100	38.2	0.38
					<i>Setaria pumila</i>	13.04	47.06	27.71	0.59
	GL-PC7: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Paspalum conjugatum</i>	112	41	0.22	<i>Hemarthria compressa</i>	42.96	95.54	44.97	0.47
					<i>Cynodon dactylon</i>	42.02	100	42.02	0.42
					<i>Paspalum conjugatum</i>	4.28	18.75	22.81	1.22
	GL-PC8: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Polygonum plebeium</i>	41	31	0.2	<i>Cynodon dactylon</i>	61.44	100	61.44	0.61
					<i>Hemarthria compressa</i>	54.17	100	54.17	0.54
					<i>Polygonum plebeium</i>	6.59	53.66	12.27	0.23
Wet	GL-PC1: <i>Saccharum</i> spp.- <i>Scleria terrestris</i> - <i>Alpinia nigra</i>	110	70	0.27	<i>Saccharum</i> spp.	85.44	100	85.44	0.85
					<i>Scleria terrestris</i>	9.78	47.27	20.69	0.44
					<i>Alpinia nigra</i>	8.62	73.64	11.7	0.16
	GL-PC2: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Paspalum conjugatum</i>	62	58	0.25	<i>Saccharum</i> spp.	71.23	100	71.23	0.71
					<i>Merremia umbellata</i>	14.02	83.87	16.71	0.2

Season	Plant community	Division level			Dominating species	Density (m ⁻²)	F (%)	A	A/F
		N	n	Eigen					
	GL-PC3: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Alpinia nigra</i>	118	52	0.25	<i>Paspalum conjugatum</i>	12.92	54.84	23.56	0.43
					<i>Saccharum</i> spp.	77.01	100	77.01	0.77
					<i>Merremia umbellata</i>	17.24	80.51	21.41	0.27
					<i>Alpinia nigra</i>	5.74	70.34	8.16	0.12
	GL-PC4: <i>Saccharum</i> spp.- <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i>	34	37	0.25	<i>Saccharum</i> spp.	67.32	100	67.32	0.67
					<i>Hemarthria compressa</i>	24.18	61.76	39.14	0.63
					<i>Cynodon dactylon</i>	19.74	82.35	23.96	0.29
	GL-PC5: <i>Carex vesicaria</i> - <i>Hemarthria compressa</i> - <i>Lindernia crustacea</i>	35	33	0.35	<i>Carex vesicaria</i>	96.2	100	96.2	0.96
					<i>Hemarthria compressa</i>	76.77	100	76.77	0.77
					<i>Lindernia crustacea</i>	10.86	85.71	12.67	0.15
	GL-PC6: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Setaria pumila</i>	47	49	0.25	<i>Hemarthria compressa</i>	96.64	100	96.64	0.97
					<i>Cynodon dactylon</i>	44.06	100	44.06	0.44
					<i>Setaria pumila</i>	27.26	91.49	29.79	0.33
	GL-PC7: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Paspalum conjugatum</i>	46	50	0.24	<i>Hemarthria compressa</i>	93.07	100	93.07	0.93
					<i>Cynodon dactylon</i>	72.09	100	72.09	0.72
					<i>Paspalum conjugatum</i>	11.67	56.52	20.65	0.37
	GL-PC8: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Polygonum plebeium</i>	88	55	0.24	<i>Cynodon dactylon</i>	71.26	100	71.26	0.71
					<i>Hemarthria compressa</i>	50.28	100	50.28	0.5
					<i>Polygonum plebeium</i>	4.89	37.5	13.03	0.35

GL- grassland, PC- plant community, F (%) - frequency in percentages, N-Number of plots, n-number of species, A-abundance and A/F- Abundance to frequency ratio.

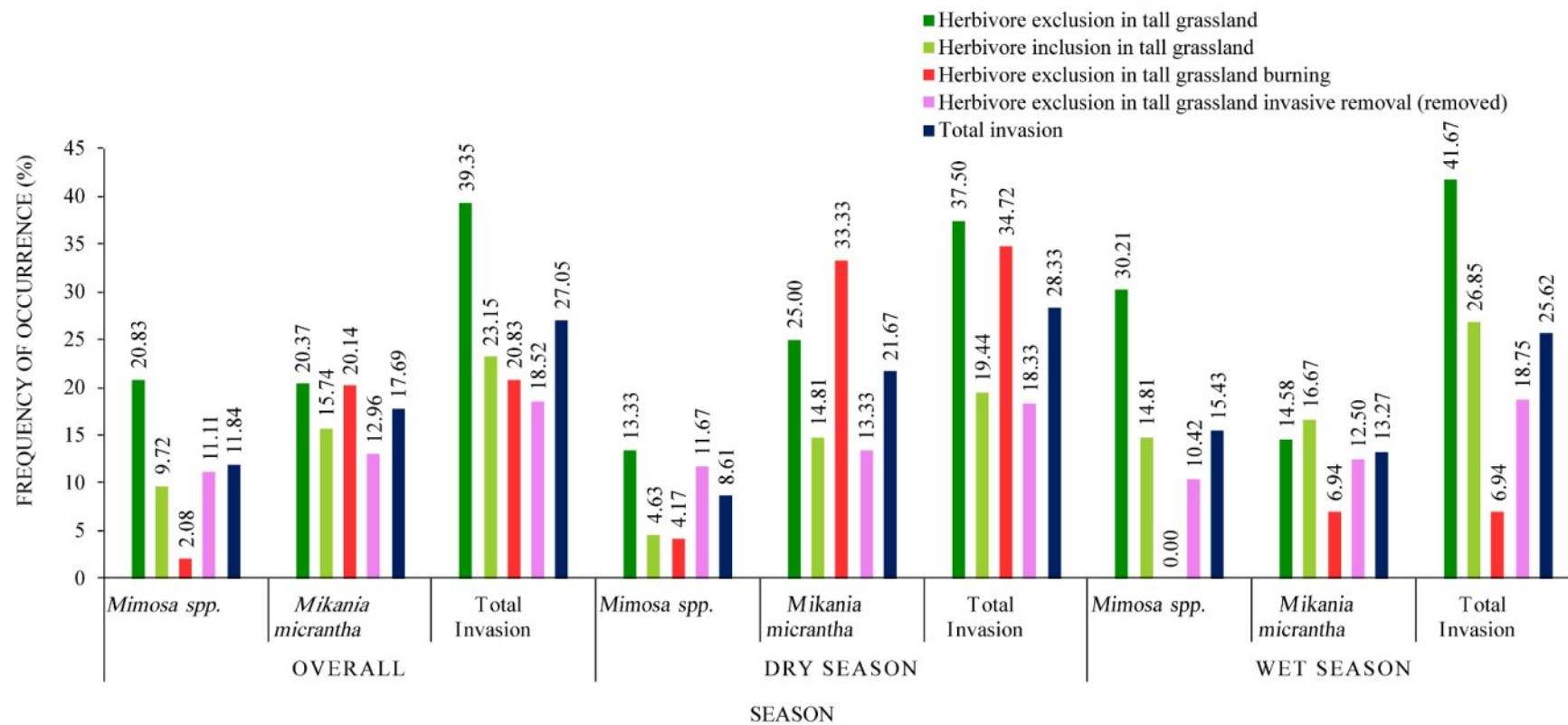


Figure 4.2. Graph showing the occurrence of invasive (in percentages) in tall grassland experimental sites during 2014-15 in Kaziranga National Park, Assam, India.

Table 4.4. Diversity indices recorded from riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Diversity indices	Season	Experimental sites						Kruskal-Wallis (sites)			SG	TG	Mann-Whitney		Total (SG & TG)
		HES	HIS	HET	HIT	HETB	HETIR	χ^2	df	P			U	P	
Species richness	Overall	6.1	4.5	5.7	4.7	4.2	6.2	23.47	5	0.00*	5.6	5.1	699.50	0.33	5.3
	Dry	4.8	3.8	4.8	3.7	3.8	5.3	16.27	5	0.01*	4.5	4.3	228.50	0.83	4.4
	Wet	7.8	5.2	6.9	5.6	4.5	7.4	23.06	5	0.00*	6.9	6.0	133.00	0.30	6.4
Species evenness	Overall	0.73	0.77	0.72	0.76	0.65	0.68	18.98	5	0.00*	0.74	0.71	560.50	0.02*	0.72
	Dry	0.75	0.78	0.74	0.75	0.72	0.72	5.09	5	0.40	0.76	0.74	165.00	0.10	0.75
	Wet	0.69	0.76	0.70	0.76	0.57	0.63	21.28	5	0.01*	0.71	0.68	105.00	0.06	0.69
Shannon diversity	Overall	1.22	1.10	1.21	1.11	0.89	1.20	26.97	5	0.00*	1.18	1.11	637.50	0.12	1.14
	Dry	1.09	0.99	1.13	0.95	0.94	1.17	14.59	5	0.01*	1.06	1.04	230.50	0.86	1.05
	Wet	1.38	1.22	1.32	1.27	0.84	1.23	19.50	5	0.00*	1.33	1.18	103.00	0.06	1.24
Simpson dominance	Overall	0.62	0.60	0.60	0.58	0.47	0.57	27.39	5	0.00*	0.62	0.56	462.00	0.00*	0.58
	Dry	0.60	0.57	0.59	0.53	0.52	0.58	11.56	5	0.04*	0.59	0.55	168.00	0.11	0.57
	Wet	0.65	0.64	0.62	0.64	0.43	0.56	22.51	5	0.00*	0.65	0.57	69.00	0.00*	0.60

SG- short grassland, TG-tall grassland, HES- herbivore exclusion in short grassland, HIS- herbivore inclusion in short grassland, HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal, χ^2 - chi-square value, *df*- degree of freedom, *U*- Mann-Whitney test value and *indicates significant result at $P<0.05$.

4.3.1.3 Comparison between Short and tall grassland

Among SG and TG, a high number of species and families were recorded in TG, overall (104 and 38, respectively) and in the dry (70 and 33, respectively) and wet seasons (98 and 36, respectively) (Tables 4.1 and 4.2). Plant communities in SG were dominated by *Cynodon dactylon*, *Hemarthria compressa* and *Carex vesicaria*, while in TG, dominated by *Saccharum* spp., and both SG and TG showed contagious distribution ($A/F \geq 0.05$) (Appendix Tables 4.8 and 4.9). Compared to the SG, a higher number of woody individuals were recorded in the TG, overall ($n=2756$), and in dry ($n=1103$) and wet seasons ($n=1653$) (Appendix Table 4.6). Between SG and TG, high species richness and diversity were recorded for SG, overall ($S=5.6$, Mann-Whitney, $P>0.05$ and $H'=1.18$, Mann-Whitney, $P>0.05$), and in the dry ($S=4.5$, Mann-Whitney, $P>0.05$ and $H'=1.06$, Mann-Whitney, $P>0.05$), and wet ($S=6.9$, Mann-Whitney, $P>0.05$ and $H'=1.33$, Mann-Whitney,

$P > 0.05$) seasons (Table 4.4). Between SG and TG, significant seasonal differences were recorded in species richness and diversity (Mann-Whitney, $P < 0.05$) (Appendix Table 4.10). Compared to SG, the significantly high soil C, N, P, and K contents were recorded in TG, overall (C=3.36%, N=0.15%, P=0.13%, and K=0.67%; Mann-Whitney, $P < 0.05$), in the dry (C=2.96%, N=0.13%, P=0.09%, and K=0.60%; Mann-Whitney, $P < 0.05$) and wet (C=3.85%, N=0.17%, P=0.17% and K=0.76%; Mann-Whitney, $P < 0.05$) seasons (Table 4.5). Between SG and TG, significant seasonal differences were recorded in soil C, N, P, and K contents (Mann-Whitney, $P < 0.05$) (Appendix Table 4.10).

Table 4.5. Soil nutrient content (in percentages) recorded from experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Soil nutrient parameters (in %)	Season	Experimental sites						Kruskal-Wallis (sites)			SG	TG	Mann-Whitney		Total (SG & TG)
		HES	HIS	HET	HIT	HETB	HETIR	χ^2	df	P			U	P	
Carbon	Overall	1.98	1.67	3.25	2.92	3.80	3.48	52.94	5	0.00*	1.91	3.36	76.00	0.00*	2.78
	Dry	1.51	1.14	2.87	2.53	3.32	3.00	39.10	5	0.00*	1.45	2.96	0.00	0.00*	2.36
	Wet	2.57	2.21	3.74	3.31	4.40	4.08	32.82	5	0.00*	2.47	3.85	2.00	0.00*	3.30
Nitrogen	Overall	0.11	0.10	0.14	0.13	0.17	0.16	50.77	5	0.00*	0.11	0.15	82.00	0.00*	0.13
	Dry	0.10	0.09	0.13	0.12	0.14	0.14	35.26	5	0.00*	0.10	0.13	0.00	0.00*	0.12
	Wet	0.12	0.11	0.16	0.15	0.20	0.19	34.99	5	0.00*	0.12	0.17	0.00	0.00*	0.15
Phosphorus	Overall	0.07	0.06	0.11	0.09	0.16	0.14	37.20	5	0.00*	0.06	0.13	215.00	0.00*	0.10
	Dry	0.05	0.04	0.08	0.06	0.11	0.11	23.83	5	0.00*	0.05	0.09	50.00	0.00*	0.08
	Wet	0.08	0.07	0.15	0.12	0.22	0.19	36.04	5	0.00*	0.08	0.17	0.00	0.00*	0.13
Potassium	Overall	0.49	0.45	0.62	0.57	0.79	0.71	48.85	5	0.00*	0.48	0.67	153.00	0.00*	0.59
	Dry	0.43	0.37	0.55	0.51	0.69	0.61	37.04	5	0.00*	0.42	0.60	2.00	0.00*	0.53
	Wet	0.57	0.52	0.69	0.63	0.92	0.84	35.90	5	0.00*	0.56	0.76	7.00	0.00*	0.68

SG- short grassland, TG-tall grassland, HES- herbivore exclusion in short grassland, HIS- herbivore inclusion in short grassland, HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal, χ^2 - chi-square value, df - degree of freedom, U - Mann-Whitney test value, %- in percentages and *indicates significant result at $P < 0.05$.

4.3.2 Plant species composition, structure and soil nutrient content: Experimental sites

4.3.2.1 Short grassland (HES and HIS)

In HES and HIS, 89 and 46 plant species, respectively and 32 and 23 families were recorded (Tables 4.1 and 4.2). Compared to the dry season, a high number of species and families were recorded in the wet season in both HES (n=77 and 30, respectively) and HIS (n=43 and 21, respectively) (Tables 4.1 and 4.2). Compared to HIS, a high number of species and families were recorded in HES overall (n=89 and 32, respectively) and in the dry (n=51 and 19, respectively) and wet (n=77 and 30, respectively) seasons. Irrespective of seasons, both HES and HIS were dominated by the Poaceae family and herbs growth form. Plant communities in these sites were dominated by *Cynodon dactylon*, *Hemarthria compressa* and *Carex vesicaria*, and showed contagious distribution ($A/F \geq 0.05$) (Appendix Tables 4.12-4.13). Seasonally, a higher number of woody individuals were recorded during the wet season in HES (n=49) and the dry season in HIS (n=21) (Appendix Table 4.6). Compared to HIS, a higher number of woody individuals were recorded from HES overall (n=79), and in dry (n=30) and wet (n=49) seasons. No invasives were recorded from HES and HIS. Compared to the dry season, a high species richness (HES=7.8, Mann-Whitney, $P < 0.05$ and HIS=5.2, Mann-Whitney, $P < 0.05$) and diversity (HES=1.38, Mann-Whitney, $P < 0.05$ and HIS=1.22, Mann-Whitney, $P > 0.05$) were recorded during the wet season in both HES and HIS (Table 4.4 and Appendix Table 4.7). Between HES and HIS, high species richness and diversity were recorded in HES overall ($S=6.1$, Mann-Whitney, $P > 0.05$ and $H'=1.22$, Mann-Whitney, $P > 0.05$), and in the dry ($S=4.8$, Mann-Whitney, $P > 0.05$ and $H'=1.09$, Mann-Whitney, $P > 0.05$) and wet ($S=7.8$, Mann-Whitney, $P > 0.05$ and $H'=1.38$, Mann-Whitney, $P > 0.05$) seasons (Table 4.4 and Appendix Table 4.11). Between HES and HIS, significant seasonal differences were recorded in species richness and diversity (Mann-Whitney, $P < 0.05$) (Appendix Table 4.10). Compared to the dry season, significantly high soil C (HES=2.57%, Mann-Whitney, $P < 0.05$; HIS=2.21%, Mann-Whitney, $P < 0.05$), N (HES=0.12%, Mann-Whitney, $P < 0.05$; HIS=0.11%, Mann-Whitney, $P < 0.05$), P (HES=0.08, Mann-Whitney, $P < 0.05$; HIS=0.07%, Mann-Whitney, $P < 0.05$), and K (HES=0.57, Mann-Whitney, $P < 0.05$;

HIS=0.52%, Mann-Whitney, $P<0.05$) contents were recorded in both HES and HIS during the wet season (Table 4.5 and Appendix Table 4.7). Between HES and HIS, high soil C, N, P and K contents were recorded in HES overall (C=1.98%, Mann-Whitney, $P>0.05$; N=0.11%, Mann-Whitney, $P>0.05$; P=0.07%, Mann-Whitney, $P>0.05$; K=0.49%, Mann-Whitney, $P>0.05$), and in the dry (C=1.51%, Mann-Whitney, $P>0.05$; N=0.10%, Mann-Whitney, $P>0.05$; P=0.05%, Mann-Whitney, $P>0.05$; K=0.43%, Mann-Whitney, $P>0.05$) and wet (C=2.57%, Mann-Whitney, $P>0.05$; N=0.12%, Mann-Whitney, $P>0.05$; P=0.08%, Mann-Whitney, $P>0.05$; K=0.57%, Mann-Whitney, $P>0.05$) seasons (Table 4.5 and Appendix table 4.11). Seasonally, between HES and HIS, significant differences were recorded in soil C, N, P, and K contents (Mann-Whitney, $P<0.05$) (Appendix Table 4.10).

4.3.2.2 Tall grassland (HET, HIT, HETIR and HETB)

In HET, HIT, HETIR and HETB, a total of 80, 59, 62 and 55 plant species were recorded, respectively and 32, 30, 30 and 26 families, respectively (Tables 4.1 and 4.2). Compared to the dry season, a high number of species and families were recorded in the wet season in TG sites viz., HET (n=69 and 28, respectively), HIT (n=50 and 25, respectively), HETB (n=51 and 29, respectively), and HETIR (n=46 and 25, respectively) (Tables 4.1 and 4.2). Among TG sites, HET showed a high number of species overall (n=80), in the dry season (n=45), and the wet seasons (n=69). The lowest number of species were recorded in HETIR, overall and in the wet season (n=55 and 46, respectively) and in the dry season in HETB (n=29). Similarly, HET showed a high number of families overall and in the dry season (32 and 26, respectively), while HETB in the wet season (n=29). Similarly, HETIR showed a low number of families overall (n=26) and in dry (n=17) and wet seasons (n=25). Irrespective of seasons, the Poaceae family and herbs growth form dominated TG sites. Plant communities were dominated by *Saccharum* spp. and showed contagious distribution ($A/F\geq 0.05$) (Appendix Tables 4.14-4.17). Seasonally, a higher number of woody individuals were recorded in HET (n=871), HIT (n=502) and HETB (n=140) during the wet season, and in HETIR (n=196) during the dry season (Appendix Table 4.6). Among TG sites, the highest number of woody individuals were recorded in HET overall (n=1418), and in the dry (n=547) and wet (n=871) seasons and low was recorded in HETB overall (n=251), and

in the dry (n=111) and wet (n=140) seasons. Seasonally, higher occurrence of *Mimosa* spp. and *Mikania micrantha* was recorded during the wet season in HET (41.67%), HIT (26.85%) and HETIR (18.75%), and during the dry season in HETB (34.72%) (Figure 4.2). Among TG sites, the highest occurrence of *Mimosa* spp. and *Mikania micrantha* was recorded from HET overall (39.35%) and in the dry (37.50%) and wet (41.67%) seasons; however, it was lowest in HETIR overall (18.52%) and in the dry season (18.33%), and in HETB in the wet season (6.94%). Seasonally, individually, a high occurrence of *Mimosa* spp. was recorded during the wet season in HET (30.21%) and HIT (14.81%), and during the dry season in HETB (4.17%) and HETIR (11.67%) (Figure 4.2). Occurrence of *Mimosa* spp. was high in HET overall (20.83%) and in the dry (13.33%) and wet (30.21%) seasons; however, it was low in HETB overall (2.08%) and in the dry season (4.17%), and absent in the wet season. Seasonally, individually, a high occurrence of *Mikania micrantha* was recorded in HET (25%), HETB (33.33%) and HETIR (13.33%) in the dry season and in HIT in the wet season (16.67%) (Figure 4.2). Occurrence of *Mikania micrantha* was high in HET (20.37%) overall, HETB (33.33%) in the dry season, and HIT (16.67%) in the wet season; however, it was low in HETIR overall (12.96 %) and in the dry season (13.33%), and in HETB in the wet season (6.94%). Compared to dry season, a high plant species richness was recorded for HET (S=6.9, Mann-Whitney, $P<0.05$), HIT (S=5.6, Mann-Whitney, $P<0.05$), HETB (S=4.5, Mann-Whitney, $P>0.05$) and HETIR (S=7.4, Mann-Whitney, $P<0.05$) in the wet season (Table 4.4 and Appendix Table 4.7). Among TG sites, a high plant species richness was recorded overall and in the dry and wet seasons in HETIR (S=6.2, 5.3 and 7.4, respectively; Kruskal-Wallis, $P<0.05$) and was recorded low overall and in the wet season in HETB (S=4.2 and 4.5, respectively; Kruskal-Wallis, $P<0.05$), and during the dry season in HIT (S=3.7, Kruskal-Wallis, $P<0.05$) (Table 4.4 and Appendix table 4.18). Seasonally, high species diversity was recorded for HET ($H'=1.32$, Mann-Whitney, $P<0.05$), HIT ($H'=1.27$, Mann-Whitney, $P<0.05$) and HETIR ($H'=1.23$, Mann-Whitney, $P>0.05$) during the wet season, and for HETB ($H'=0.94$, Mann-Whitney, $P>0.05$) during the dry season (Table 4.4 and Appendix Table 4.7). Among TG sites, high species diversity was recorded overall and in the dry season in HET ($H'=1.21$ and 1.32 , respectively; Kruskal-Wallis, $P<0.05$), and during the wet season in HETIR ($H'=1.17$; Kruskal-Wallis, $P<0.05$) and was recorded low, overall and in the

dry and wet seasons in HETB ($H'=0.89, 0.94$ and 0.84 , respectively; Kruskal-Wallis, $P<0.05$) (Table 4.4 and Appendix Table 4.18). Among TG sites, significant seasonal differences were recorded in plant species richness and diversity (Mann-Whitney, $P<0.05$) (Appendix Table 4.10). Seasonally, from dry to wet season, significantly high soil C, N, P and K content for HET (C=3.74%, N=0.16%, P=0.15% and K=0.69%; Mann-Whitney, $P<0.05$), HIT (C=3.31%, N=0.15%, P=0.12% and K=0.63%; Mann-Whitney, $P<0.05$), HETB (C=4.40%, N=0.20%, P=0.22% and K=0.92%; Mann-Whitney, $P<0.05$) and HETIR (C=4.08%, N=0.19%, P=0.19% and K=0.84%; Mann-Whitney, $P<0.05$) was recorded (Table 4.5 and Appendix Table 4.7). Among TG sites, high C (3.80%, 3.32% and 4.40%), N (0.17%, 0.14% and 0.20%), P (0.16%, 0.11% and 0.22%) and K (0.79%, 0.69% and 0.92%) contents were recorded in HETB overall, and in the dry and wet seasons, respectively (Table 4.5). Low C (2.92%, 2.53% and 3.31%), N (0.13%, 0.12% and 0.15%), P (0.09%, 0.06% and 0.12%) and K (0.57%, 0.51% and 0.63%) contents were recorded in HIT overall, and in the dry and wet seasons, respectively. Among TG sites, significant differences were recorded in soil C, N, P and K content overall and in the wet season (Kruskal-Wallis, $P<0.05$), and in C, N and K content during the dry season (Kruskal Wallis, $P<0.05$) (Appendix Table 4.18). Seasonally, among TG sites, significant differences were recorded in soil C, N, P and K content (Mann-Whitney, $P<0.05$) (Appendix Table 4.10).

4.3.2.3 Comparison between among six experimental sites (HES, HIS, HET, HIT, HETIR and HETB)

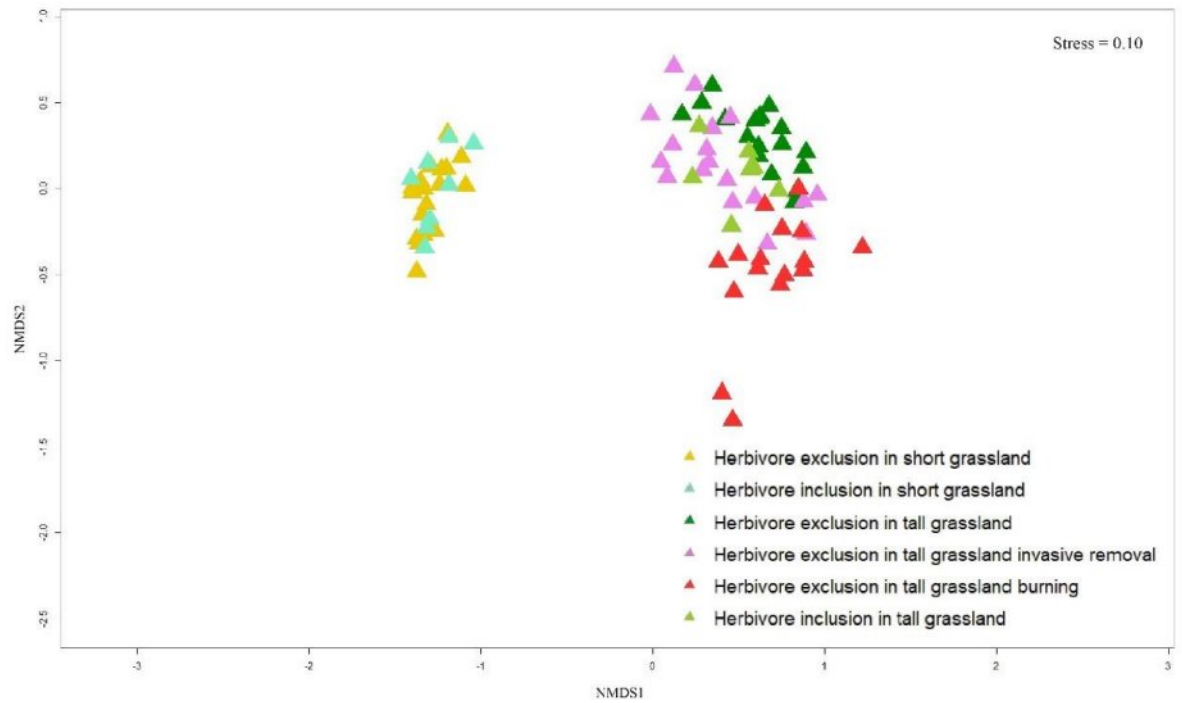
Among six ES, a high number of species were recorded in HES, overall, and in the dry and wet seasons ($n=89, 51$ and 77 , respectively), and low were recorded in HIS overall and in the wet season ($n=46$ and 43 , respectively) and in HETB during the dry season ($n=29$) (Table 4.1). A high number of families were recorded in HES, overall and in the wet season ($n=32$ and 30 , respectively) and in HET during the dry season ($n=26$) and low were recorded in HIS, overall, and in the dry and wet seasons ($n=23, 16$ and 21 , respectively) (Table 4.1). Among ES, the highest number of woody individuals were recorded from HET overall, and in the dry and wet seasons ($n=1418, 547$ and 871 , respectively), whereas the lowest was recorded in HIS ($n=34, 21$ and 13 , respectively) (Appendix Table 4.6). Among ES, a high species richness was recorded in HETIR,

overall and in the dry season ($S=6.2$ and 5.3 , respectively; Kruskal-Wallis, $P<0.05$) and in HES during the wet season ($S=7.8$, Kruskal-Wallis, $P<0.05$) and was low in HETB, overall and in the wet season ($S=4.2$ and 4.5 , respectively; Kruskal-Wallis, $P<0.05$) and in HIT during the dry season ($S=3.7$, Kruskal-Wallis, $P<0.05$) (Table 4.4). Among ES, high species diversity was recorded from HES overall and in the wet season ($H'=1.22$ and 1.38 ; Kruskal-Wallis, $P<0.05$), and in the dry season from HETIR ($H'=1.17$, Kruskal-Wallis, $P<0.05$) and low was recorded from HETB, overall and in the dry and wet ($H'=0.89$, 0.94 and 0.84 , respectively; Kruskal-Wallis, $P<0.05$) seasons (Table 4.4). Among ES, significant seasonal differences were recorded in species richness and diversity (Mann-Whitney, $P<0.05$) (Appendix Table 4.10). Among ES, significantly high C (3.80%, 3.32% and 4.40%; Kruskal-Wallis, $P<0.05$), N (0.17%, 0.14% and 0.20%; Kruskal-Wallis, $P<0.05$), P (0.16%, 0.11% and 0.22%; Kruskal-Wallis, $P<0.05$) and K (0.79%, 0.69% and 0.92%; Kruskal-Wallis, $P<0.05$) contents were recorded in HETB overall, and in dry and wet seasons, respectively and low C (1.67%, 1.14% and 2.21%; Kruskal-Wallis, $P<0.05$), N (0.10%, 0.09% and 0.11%; Kruskal-Wallis, $P<0.05$), P (0.06%, 0.04% and 0.07%; Kruskal-Wallis, $P<0.05$) and K (0.45%, 0.37% and 0.52%; Kruskal-Wallis, $P<0.05$) contents were recorded in HIS overall, and in the dry and wet seasons, respectively (Table 4.5). Seasonally, among ES, significant differences were recorded in C, N, P and K contents (Mann-Whitney, $P<0.05$) (Appendix Table 4.10).

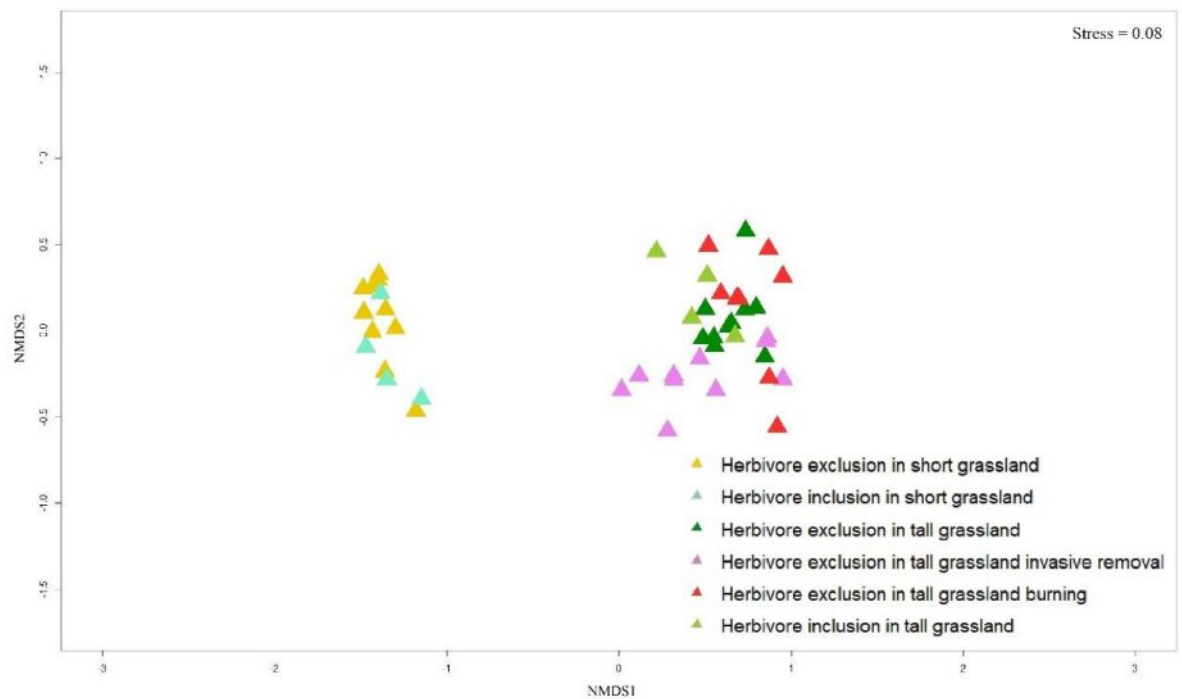
4.3.3 Plant Species Composition: Similarities between experimental sites

Compared to the dry season, high pairwise similarities between SG and TG species composition were recorded during the wet season ($BC_{ij} = 0.13$) (Appendix Table 4.19). Among ES, High pairwise similarities in species composition were recorded between HETIR and HIT overall ($BC_{ij} = 0.82$), HETB and HIT in the dry season ($BC_{ij} = 0.82$), and HET and HIT in the wet season ($BC_{ij} = 0.78$). High dissimilarity was recorded between HES and HETB overall, and in dry and wet seasons ($BC_{ij} = 0.03$, 0.01 and 0.04 , respectively). In NMDS ordination plots, permANOVA test indicated significant dissimilarities in species composition of ES overall (adonis pseudo $F_{1152} = 41.62$, $df = 5$, $R^2 = 0.72$, $P \leq 0.001$), and in dry (adonis pseudo $F_{612} = 40.51$, $df = 5$, $R^2 = 0.84$, $P \leq$

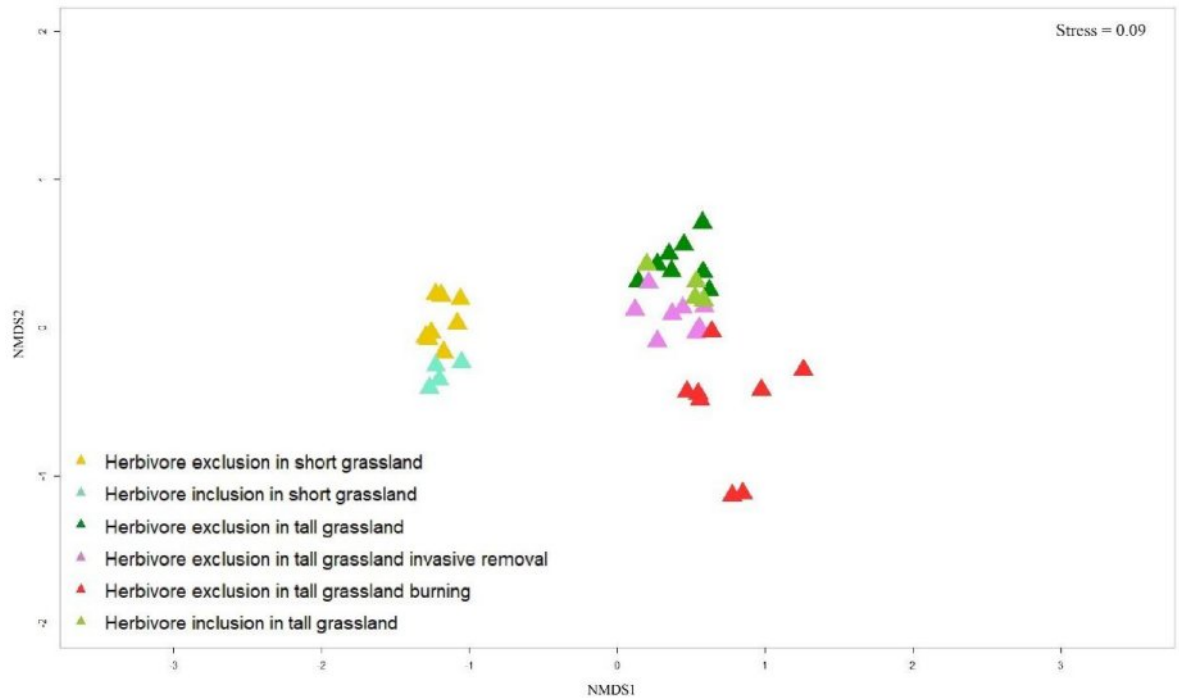
0.001) and wet (adonis pseudo $F_{540} = 24.76$, $df = 5$, $R^2 = 0.78$, $P \leq 0.001$) seasons (Figures 4.3a, b and c).



(a)



(b)

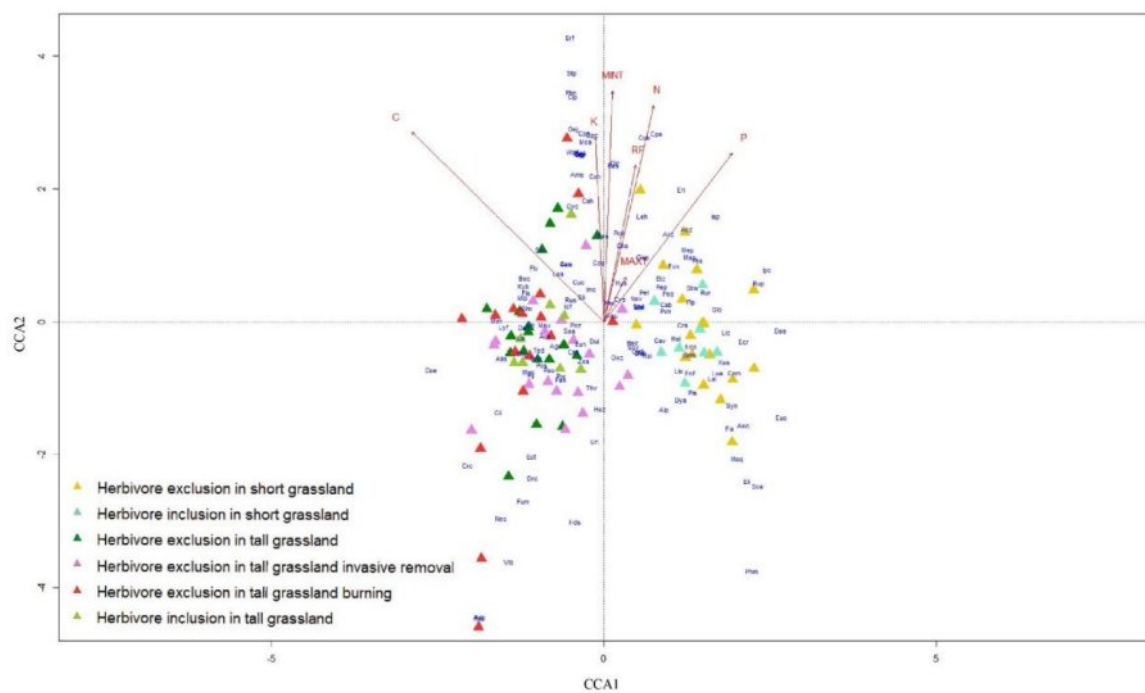


(c)

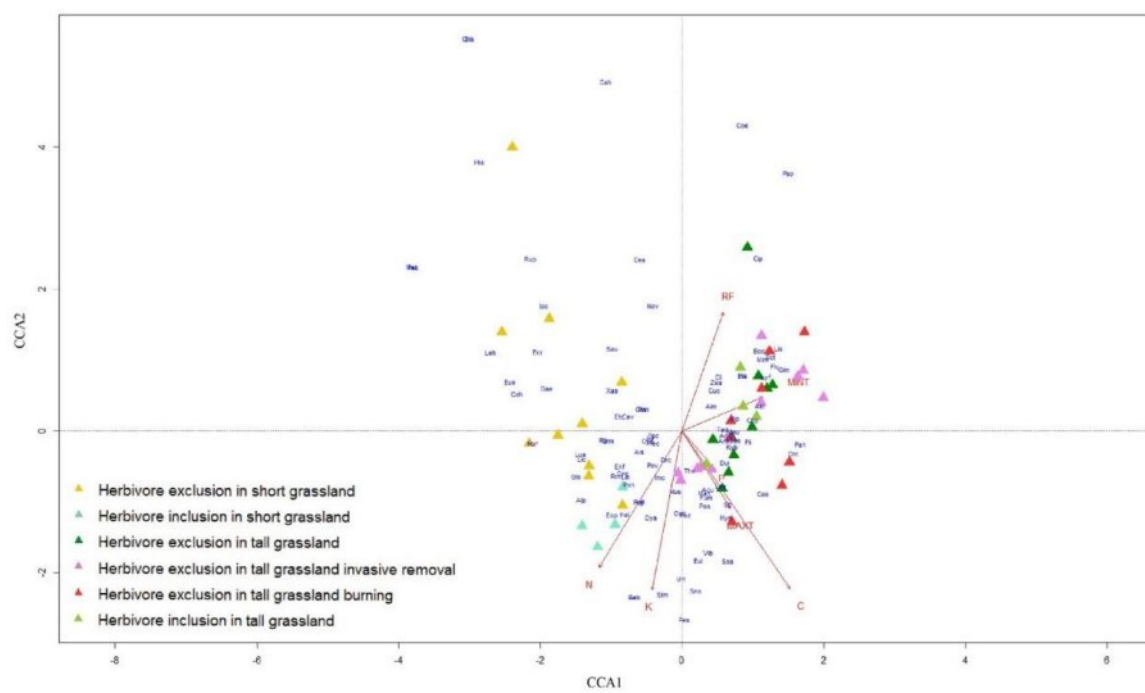
Figure 4.3. NMDS ordination plots depicting dissimilarities in plant species composition among experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park (a) overall (adonis pseudo $F_{1152}=41.62$, $df=5$, $R^2=0.72$, $P\leq 0.001$), (b) dry season (adonis pseudo $F_{612}=40.51$, $df=5$, $R^2=0.84$, $P\leq 0.001$), and (c) wet season (adonis pseudo $F_{540}=24.76$, $df=5$, $R^2=0.78$, $P\leq 0.001$).

4.3.4 Plant Species Composition: Influence of environmental factors on species distribution

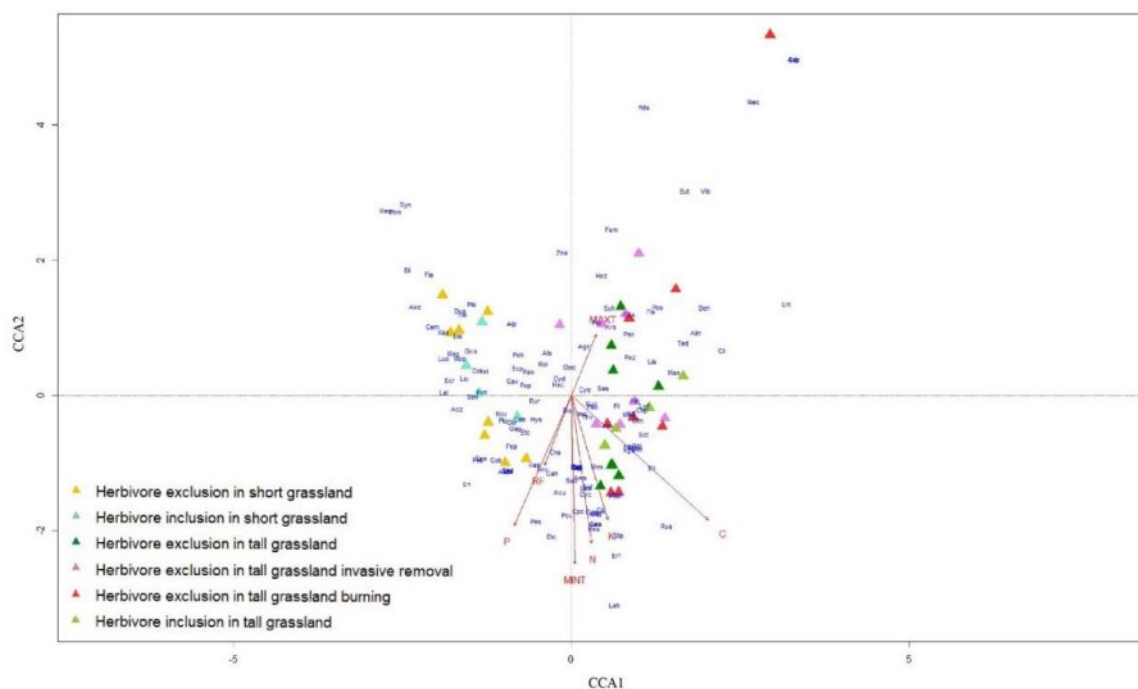
Two constrained axes explained 60% (CCA1 = 41%, CCA2 = 19%) of the total inertia (Appendix Table 4.20). CCA1 axis ($F = 4.07$, $P = 0.01$) was significantly related to C, N and P content (Appendix Table 4.21). SG sites and 68 species, primarily *Chromolaena odorata* and *Dactyloctenium aegyptium*, scored positively on CCA1 and showed affinity towards N and P. TG sites and 74 species, mostly *Colocasia esculenta* and *Crassocephalum crepidioides*, scored negatively on CCA1 and showed affinity towards C (Figure 4.4a). In the dry season, two constrained axes explained 68% (CCA1 = 41%, CCA2 = 27%) of the total inertia (Appendix Table 4.20). CCA1 axis ($F = 2.87$, $P = 0.01$) was significantly related to C and N (Appendix Table 4.21). SG sites and 52



(a)



(b)



(c)

Figure 4.4. CCA triplot showing the plant species distribution in the experimental sites of riverine alluvial grasslands along the environmental gradient (a) overall, (b) dry season, and (c) wet season. Abbreviations of environmental gradient: C-organic carbon, N-nitrogen, P-phosphorus, K-potassium, RF-rainfall, MINT-minimum temperature and MAXT-maximum temperature. For plant species abbreviations, refer to Appendix Table 4.5.

species, chiefly *Persicaria lapathifolia* and *Marsilea quadrifolia*, scored negatively on CCA1 and showed affinity towards N. TG sites and 44 species, primarily *Panicum notatum* and *Crassocephalum crepidioides*, scored positively on CCA1 and showed affinity towards C (Figure 4.4b). In the wet season, two constrained axes explained 69% (CCA1 = 44%, CCA2 = 25%) of the total inertia (Appendix Table 4.20). The CCA1 axis ($F = 2.86$, $P = 0.01$) was significantly related to C (Appendix Table 4.21). SG sites and 63 plant species, mostly *Marsilea quadrifolia* and *Physalis minima*, scored negatively on CCA1 and showed affinity towards C. TG sites and 71 plant species, mostly *Adiantum philippense* and *Senna tora*, scored positively on the CCA1 and showed affinity towards C (Figure 4.4c).

4.4 Discussion

Understanding the applicability of management practices, including herbivory, prescribed burning and invasive uprooting on tropical grasslands, will ensure the long-term conservation of these habitats and their associated fauna. The present chapter provides experimental validation that grazing, management practices and environmental parameters play a crucial role in defining the vegetation and soil characteristics of short and tall riverine alluvial grasslands. The analyses of this chapter revealed that the riverine alluvial grasslands composition of KNP mainly represents species belonging to the Poaceae family and herbs growth form. As a characteristic feature of these grasslands, members of the Poaceae family and herbs growth form dominate the area (Hajra & Jain, 1994; Khatri & Barua, 2011). The results showed that SG and TG differ in terms of community structure due to the dominance of short grasses viz., *Cynodon dactylon*, *Hemarthria compressa* and *Carex vesicaria*, in SG, and tall grasses, *Saccharum* spp., in TG. Intriguingly, the dominance of hydric wetland species, namely *Carex vesicaria*, in SG plant communities might be due to the prolonged inundation period, which facilitates both wetland and grassland plant community associations (Bezbarua, 2007; Newman, 2014; Sharma et al., 2023). Khatri and Barua (2011) found that in KNP, *Cynodon dactylon* and *Alternanthera* spp. formed the dominant plant assemblages in SG, and *Saccharum spontaneum*, *Phragmites karka*, *Miscanthus fuscus* and *Chrysopogon zizanioides* formed the dominant plant assemblages in TG. This change in the community structure in both SG and TG might be due to herbivory. In TG, burning and invasive uprooting may promote the dominance of *Saccharum* spp. over time (Khatri & Barua, 2011). In addition, previous studies conducted in similar SG habitats also reported plant community associations dominated by short grasses viz., *Cynodon dactylon*, *Axonopus compressus* and *Chrysopogon aciculatus* and hydric species like *Cyperus niveus* (Biswas & Mathur, 2003; Choudhury et al., 2017) and TG habitats dominated by tall grasses viz., *Phragmites karka*, *Saccharum narenga*, *Saccharum ravennae*, *Saccharum spontaneum*, *Themeda arundinacea*, *Themeda villosa*, *Arundo donax*, *Typha elephantina*, *Imperata cylindrica*, *Apluda mutica*, *Cymbopogon flexuosus*, *Chrysopogon zizanioides* and herbs like *Alpinia nigra* (Peet et al., 1999; Bezbarua, 2007; Choudhury et al., 2017). In the present

study, the dominance of *Mimosa* spp. and *Mikania micrantha* in plant communities was documented for the first time from the Kaziranga landscape, after just a span of seven years from the previous survey (2004-07 by Khatri & Barua, 2011), indicating that these invasives can potentially alter plant communities by dominating native species. Due to changing climatic and edaphic conditions, tropical grasslands are vulnerable to invasion; a study conducted in similar grasslands of Jaldapara Wildlife Sanctuary also reported dominance of two noxious invasive species *Mikania scandens* and *Chromolaena odorata*, in plant communities (Biswas & Mathur, 2003; Choudhury et al., 2016). The results of the present chapter revealed that irrespective of seasons, SG plant species richness and diversity were higher than TG. Probably high abundance of individual species in SG habitats might have supported high plant species richness and diversity in SG. The riverine grassland species richness recorded in the present study varies from 3.7 to 7.8, and diversity from 0.84 to 1.38. This chapter's results were in line with previous studies on riverine alluvial grasslands, which reported plant species richness range from 2.00 to 20.93 (Karki et al., 2000; Lahkar, 2008) and diversity from 1.97 to 2.85 (Karki et al., 2000; Bezbarua, 2007; Lahkar, 2008). As growth forms, grasses and herbs dominate these grasslands, they support low species diversity (Karki et al., 2000; Choudhury et al., 2017). Irrespective of seasons, TG supported higher woody and invasive species growth and soil C, N, P, and K content than SG. Low grazing pressure, high litter accumulation, root turnover and microbial activities might have enhanced TG's soil conditions, resulting in woody and invasive development (Hatton & Smart, 1984; Smart et al., 1985; Bezbarua, 2007; Bharali, 2010). In the present study, the grasslands soil C content ranges from 1.14 to 4.40%, N content from 0.09 to 0.20%, P content from 0.04 to 0.22%, and K content from 0.37 to 0.92%. The results from the present chapter are within the similar ranges reported by previous studies on the alluvial soil of Brahmaputra plains and KTR, where soil C content varies from 0.03 to 6.10%, N from 0.01 to 0.17%, P from 0.01 to 0.06%, and K ranges from 0.002 to 0.01% (Singh et al., 2004; Nath & Sarma, 2008; Bharali, 2010). The results from the present study were further confirmed by the standard nutrient content of mineral soil, like alluvial soils, where soil C ranges from 0.2 to 5%, N ranges from 0.1 to 0.5%, P ranges from 0.02 to 0.15%, and K ranges from 0.3 to 2% (Allen, 1974). The absence of invasives and low soil nutrients in SG sites may be due to their location near

water bodies, as a longer inundation period controls biological invasion and washes away soil nutrients during the flood-receding period (Bezbarua, 2007; Bharali, 2010). The commencement of monsoonal rains promotes species propagation in these grasslands; therefore, during the wet season, the present study results indicate an increased number of woody individuals and enhanced plant species richness and diversity and soil nutrient quality of both SG and TG habitats (Khatri & Barua, 2011). HES, HIS, HET and HIT had high species richness and diversity, woody individuals (except for HIS) and soil nutrient content in the wet season. HIS had fewer woody individuals in the wet season, indicating that herbivores are feeding on them, possibly due to the sprouting of new leaves and shoots. Undisturbed plant growth, high litter accumulation, root turnover and microbial activities probably contributed to the high species richness and diversity, woody species growth and invasive occurrence, and soil nutrient content in the absence of herbivores (Hatton & Smart, 1984; Smart et al., 1985; Chaneton & Facelli, 1991; Potter et al., 2021). Devi et al. (2022a) reported that mega- and meso-herbivores in KTR act as grazers and mixed feeders, consuming both woody and invasive species, and possibly reducing species diversity, woody individuals and invasive species. The wildlife census from 1966-2014 in KTR indicates an increasing population of herbivores (Yadava, 2014), which may regulate woody growth by reducing species diversity and soil nutrient content. Additionally, in the wet areas, the intermediate disturbance hypothesis predicts that moderately grazed areas result in higher plant species diversity compared to no-, low- and high-grazed areas (Milchunas et al., 1988; Gao & Carmel, 2020). In future, the applicability of the intermediate disturbance hypothesis with respect to mega- and meso-herbivores can be tested in the wet grasslands of KTR to implement and explore better management practices.

Burning (HETB) showed high species richness, woody individuals and soil nutrient content in the wet season, and high species diversity and invasive occurrence in the dry season, possibly because it promotes rapid regrowth of a few fire-adapted species. Grazing exclusion with burning decreases species richness and diversity and woody individuals, including invasive *Mimosa* spp., and enhances the soil nutrient content and proliferation of invasive *Mikania micrantha*. The present study's findings suggest that burning decreases species heterogeneity by reducing species richness and diversity, similar to the findings by Collins (1987) and Koerner et al (2014), and supports fire-

resistant invasives. The present study showed that burning with herbivore exclusion promotes the proliferation of herbaceous invasive *Mikania micrantha* in the dry season; possibly due to increasing soil nutrient content and the adaptation of species to fire (Swamy & Ramakrishnan, 1988). Intriguingly, burning with herbivore exclusion limits the growth of woody species, including invasive *Mimosa* spp., possibly due to its intolerance to fire (Lonsdale & Miller, 1993; Clark & Wilson, 2001). Burning with herbivore exclusion also enhances soil nutrient content, as it converts the vegetation and litter into ash and limits nutrient uptake by plants, resulting in increased nutrient mineralization, root turnover and soil microbial activities (Sankaran, 2016).

Post manual uprooting of invasive species (HETIR), high species richness and diversity and soil nutrient contents were recorded in the wet season, and high woody individuals and invasive occurrence in the dry season, indicating that low precipitation and high temperature may be promoting woody individuals and invasive proliferation in the dry season (Choudhury, 2017). Herbivore exclusion with invasive removal in TG limits the growth of woody and invasives *Mimosa* spp. and *Mikania micrantha*, and enhances species richness and diversity and soil nutrient content. Uprooting *Mimosa* spp. and *Mikania micrantha* with their entire root system limits their growth, promotes the growth of native species, and limits the nutrient uptake from the soil of woody vegetation and invasives, which further results in high litter accumulation and soil nutrient retention (Swamy & Ramakrishnan, 1988; Choudhury, 2017; Nerlekar et al., 2022).

NMDS ordination revealed distinct species composition in SG and TG, which may be attributed to differences in habitat type, soil nutrient conditions, and frequency and intensity of management practices. In both SG and TG, the highest pairwise similarities of HIT with HETIR (overall), HETB (dry season), and HET (wet season) indicate that despite the low species diversity and limited soil nutrient content, the species composition of HIT was similar to other ES. Irrespective of seasons, high dissimilarities between HES and HETB were possibly attributed to differences in the herbaceous vegetation and soil nutrient content. HES, with high species diversity and woody growth, showed low pairwise similarities with TG sites (0.01 to 0.17%) and HIS (0.39 to 0.42%). Thus, herbivore removal from SG alters vegetation composition and may accelerate other growth forms, including herbs and shrubs. The results from the present

study revealed that differences in soil C, N and P content define the species distribution patterns in SG and TG. Within SG, soil N and P content define species distribution. In TG, soil C content defines species distribution in both HET and HIT sites; C, N and P content in HETB and HETIR. This study supports the findings of Zelnik and Carni (2013), that edaphic parameters play a crucial role in defining species distribution in tropical grasslands (wet grasslands).

Additionally, our findings revealed that grazing exclusion from SG promotes the proliferation of invasives like *Ageratum conyzoides*, *Eichhornia crassipes*, *Merremia umbellata*, *Chromolaena odorata* and *Ipomoea carnea*. Whereas in TG, grazing, burning and invasive removal encourages the proliferation of invasives like *Ageratum conyzoides* and *Merremia umbellata*. Woody species like *Lippia alba* and *Solanum viarum* in SG, and *Mimosa* spp., *Flemingia lineata*, *Flueggea virosa*, *Bombax ceiba*, *Litsea salicifolia* and *Glochidion multiloculare* in TG, may potentially accelerate the grassland succession processes. A study conducted in the adjacent riverine alluvial grasslands of Manas National Park, found that a combination of prescribed burning and herbivory has resulted in the proliferation of woody invasives, including non-native *Chromolaena odorata* and natives like *Bombax ceiba* and *Leea asiatica* (Bezbarua, 2007). Therefore, it is recommended that the individualist biology of other invasive and woody species with respect to grazing and ongoing management interventions must be investigated to understand the ever-changing ecology and dynamics of riverine alluvial grasslands.

4.5 Conclusion

Grasslands, despite harbouring rich biodiversity and providing vital ecosystem services, have been largely ignored in sustainable development agendas. It is only recently that the United Nations Decade on Ecosystem Restoration (2021-2030) added ‘grasslands, shrublands and savannas’ to their focal ecosystems (Bardgett et al., 2021). To provide direction to restoration efforts targeted at conserving this rapidly degrading ecosystem, there is a need to provide scientific evidence regarding the management interventions adopted. KNP, one of the last remaining strongholds of the highly productive riverine alluvial grasslands and home to a thriving population of eight mega- and meso-herbivores, including the iconic one-horned rhino, are subject to annual

flooding, herbivory and management practices like burning and invasive uprooting. To meet the nutritional requirements of this large herbivore population that largely feeds on monocots to fulfil their dietary needs (Devi et al., 2022a), it is necessary to maintain the mosaic of short and tall grasslands in the Kaziranga landscape. However, unorganized management practices may alter grassland vegetation composition in favour of the development of other growth forms such as herbs, shrubs, and trees. On examining the impact of herbivory, burning and invasive uprooting via on-site experimentation, it was noted that flood-induced moist conditions in SG may have retarded the development of invasives, which are proliferating in TG and multiplying more in the dry season. Furthermore, it was observed that while herbivore exclusion improved species richness and diversity and soil nutrient content, it also promoted woody individuals in both SG and TG, and invasion in TG. Given the drastically higher presence of non-grass growth forms in herbivore inclusion SG sites versus herbivore exclusion, the conversion of SG to a non-grassy ecosystem will be rapid. In TG, burning decreased species richness and diversity and woody individuals, including invasive *Mimosa* spp., and enhanced soil nutrient content and proliferation of herbaceous invasive *Mikania micrantha*; while invasive uprooting promoted species diversity and soil nutrient content, and decreased woody individuals, *Mimosa* spp. and *Mikania micrantha*. Based on the experiments, slight modifications to the adaptive management practices, i.e., controlled herbivory, burning, and invasive uprooting, as suggested by IPCC (2022) to conserve grassland tropical ecosystems, are recommended. Short-term rotational grazing must be incorporated into the management regime for rewilding SG, and long-term rotational grazing for rewilding TG. Controlled burning must be carried out only in completely dry grassland patches, and in invaded patches post manual uprooting of fire-adapted invasives like *Mikania micrantha*. Additionally, manual uprooting of invasives must be carried out seasonally, during both dry and wet cycles. Compared to TG, less scientific and management focus has been given to SG, especially with respect to herbivory and invasive management. This study has provided evidence that if managed properly, the SG have the potential to provide more foraging ground and habitat not only to the mega- and meso-herbivores but also to other associated fauna. The successful implementation of the aforementioned recommendations is expensive, and adequate financial and human capital must be allotted.

CHAPTER 5

BIOMASS PRODUCTIVITY OF RIVERINE ALLUVIAL GRASSLANDS

5.1 Introduction

Biomass production is considered one of the most critical components of the global carbon cycle, and it is defined as “*the amount of biomass or organic matter produced per unit area over a time period by plants during photosynthesis*” (Scurlock et al., 2002; Yang et al., 2009; Dash & Barik, 2015). The rate at which plants produce biomass is termed “*biomass productivity*”, which is expressed as a “*change in dry weight per unit area per unit time*” (Dash & Barik, 2015). In any ecosystem, the aboveground biomass productivity (AGBP), which includes vegetation above the soil surface that contributes to forage availability, is one of the key determining factor limiting the mega- to meso-herbivores carrying capacity (Yang et al., 2009). Similarly, belowground biomass productivity (BGBP), which includes roots and rhizosphere below the soil surface, represents ecosystem stability and the organic matter pool of an ecosystem (Fiala, 2010; Fidelis et al., 2012). When respiratory losses are taken into account during this process, it is termed “*gross primary productivity*”, and the net organic matter stored in the tissues before the respiratory loss is referred to as “*net primary productivity*” (Dash & Barik, 2015).

Tropical grasslands and savannas account for about 1.05×10^{10} tons of organic matter production and rank second in contributing to total global net primary production (Lieth, 1975; Lauenroth, 1979; Singh, 1993). Climatic events like precipitation, temperature and soil nutrient conditions are key components that largely alter biomass production in tropical grasslands (Oesterheld et al., 1999; Fay et al., 2015). Some of the experimental studies conducted in Asia’s and Africa’s tropical grasslands provided evidence that an increase in precipitation in the wet season results in an increase in AGBP, while a decrease in precipitation in the dry season results in an increase in BGBP mainly due to low temperatures and changes in plant resource allocation strategies (Singh & Yadava, 1974; Fidelis et al., 2012; Pathak et al., 2018). Studies

conducted in the tropical grasslands also provided evidence that enhanced soil macro-nutrient contents such as C (organic carbon), nitrogen (N), phosphorus (P), and potassium (K) promote the productivity potential in grasslands (Sarmiento et al., 2006; Loeb et al., 2009; Fay et al., 2015).

Mega- and meso-herbivores, with their grazing, browsing and mixed feeding behaviour, defoliation, trampling, dung, and urine depositions, can influence the quality and quantity of AGBP via modifying vegetation characteristics (composition, structure and diversity) (Lehmkuhl, 1989; Olff & Ritchie, 1998; Altesor et al., 2005; Sharma et al., 2023). For example, the experimental studies conducted in the Serengeti-Mara ecosystem in the last 100 years have highlighted the importance of mega- and meso-herbivores in converting open grassland to dense woodland and back to grassland (Dublin, 1995; Devi et al., 2022a). Thus, in succession, both the absence and presence of mega and meso-herbivores play an important role (Sinclair, 1995; Augustine & McNaughton, 1998; Devi et al., 2022a). In tropical grasslands, mega- and meso-herbivores usually reduce the standing biomass and total annual productivity by foraging (Lehmkuhl, 1989). However, experimental studies conducted in the savannas of Serengeti National Park and Maasai-Mara in Africa provided scientific validation that compared to non-grazed areas, the grazed areas showed higher biomass productivity, as herbivory stimulated productivity by preventing vegetation senescence (McNaughton, 1976). In the tropical grasslands of America, experimental grazing exclusion provided evidence that foraging by herbivores enhances biomass productivity by eliminating dead biomass (Altesor et al., 2005). Other studies conducted in tropical grasslands also reported that grazing exclusion promotes the proliferation of invasive species (Potter et al., 2021).

In tropical grassland, management practices like burning govern the productivity potential and edaphic conditions (Lehmkuhl, 1989; Oesterheld et al., 1999; Rawat, 2005; Veldman et al., 2015; Buisson et al., 2018; Sharma et al., 2023). The prescribed burning practice, which refers to “*the intentional ignition of controlled burning in the landscape,*” is recognized to enhance forage biomass (palatability) and to reduce woody encroachment and proliferation of invasives in grasslands (Adams et al., 1982; Pathak et al., 2017). The effect of burning on production depends on many variables, such as

intensity, frequency, timing (seasons) and species fuel loads (Kucera & Ehrenreich, 1962; Daubenmire, 1968; Vogle, 1974; Abrams et al., 1986). Studies have revealed that the absence of burning from grasslands increases litter accumulation, reduces plant biomass and enhances woody invasion (Bragg & Hulbert, 1976; Abrams et al., 1986; Singh, 1993). Experimental studies conducted in the tropical grasslands of Asia revealed that compared to unburned areas, the burned areas showed high biomass accumulation (Singh, 1993; Pathak et al., 2017), as burning enhances soil nutrient content through volatilization and ash deposition (Harrington, 1974; Singh et al., 1991; Sankaran, 2016; Pathak et al., 2017) and consequently limits the growth of woody and invasive species (Lonsdale & Miller, 1993; Clark & Wilson, 2001). Thus, at the global scale, burning plays a crucial role in grassland management by arresting the successional processes, including the grasslands of South Asia (Daubenmire, 1968; Vogle, 1974; Adams et al., 1982; Lehmkuhl, 1989).

Forest restoration strategies such as afforestation, suppressing fire, and excluding large herbivores or soil fertilizers are commonly misapplied to manage tropical grasslands (Buisson et al., 2018). As compared to tropical forests, few studies on the primary productivity and energetics of tropical grassland have been reported (Singh & Yadava, 1974; Vourlitis et al., 2022). Due to the paucity of scientific evidence-based studies on tropical grasslands, it remains unclear what management regime works best for the management, restoration, and rewilding of tropical grasslands (Buisson et al., 2018). IPCC (2022) recommends controlled grazing, burning, and invasive uprooting as adaptive management strategies to mitigate the impact of ongoing natural and anthropogenic pressures on tropical grasslands.

Biological invasions impair thespian changes in global biological diversity, leading to a decline and the extinction of native species (Nath et al., 2019). According to the Convention on Biological Diversity (CBD) and Millennium Ecosystem Assessment (MEA, 2005), biological invasion is the second worst intimidation after land-use change (Nath et al., 2019; Dew et al., 2017). Due to high germination-related traits, invasive species can rapidly proliferate, spread, and establish in new environments (Dew et al., 2017; Afreen et al., 2018). These species can disrupt ecosystem functions, including biodiversity, productivity (forage availability for herbivores) and soil nutrient

cycles (Dew et al., 2017; Das et al., 2019). Drivers like habitat degradation and fragmentation, deforestation, population expansion, land use and land cover changes, urbanization and climate change are accelerating the invasion processes (Dew et al., 2017; Das et al., 2019; Nath et al., 2019). The rapid spread of invasive species in recent decades has become a significant concern in many sub-tropical and tropical grassland ecosystems (Dew et al., 2017; Das et al., 2019; Nath et al., 2019; Sinha et al., 2022). In tropical grassland ecosystems, factors like precipitation, soil nutrient conditions, changing intensities of management practices (burning), and anthropogenic pressures were identified as key predictors for invasion (Choudhury et al., 2016; Nath et al., 2019). Plant invasion can positively and negatively affect the ecosystem's primary productivity (Walker & Smith, 1997). The experimental study conducted in African tropical grasslands reported enhanced biomass production of *Chromolaena odorata*, the pan-tropical invasive exotic shrub, due to rapid growth and high seed production (Witkowski & Wilson, 2001). Similarly, another study conducted in the tropical grasslands of Africa reported enhanced biomass production of *Acacia nilotica*, a woody invasive species, in the absence of herbivory and burning (Skowno et al., 1999). The establishment of invasive species affects the ecological functioning of various ecosystems (Vilà et al., 2011; Afreen et al., 2018). Thus, preventive measures subject to invasive species havoc are a prime priority in biodiversity conservation (Hulme, 2009; Nath et al., 2019). Invasive manual uprooting is an ecologically effective technique used to restore invaded native tropical grassland vegetation, as it effectively decreases the invasive cover and recovers native species diversity, density and cover (Dew et al., 2017; Guido & Piller, 2017; Nerlekar et al., 2022; Sinha et al., 2022). Experimental studies conducted in tropical grasslands of Asia and Africa reported that manual uprooting of some of the noxious invasives like *Chromolaena odorata*, *Mimosa* spp. and *Mikania micarnta* have effectively reduced their densities and cover by promoting native species recovery (te Beest et al., 2012; Dew et al., 2017; Choudhury et al., 2017; Sinha et al., 2022).

Most of the aforementioned experimental studies assessing the impact of herbivory and management practices on tropical grassland productivity and soil nutrient conditions have emerged from Africa, with very few studies from Asia. The Asian riverine alluvial grasslands of Kaziranga National Park (KNP) are vulnerable to climatic events like

seasonal flooding and subjected to combinations of herbivory and management practices such as prescribed burning and manual uprooting of globally noxious invasive, specifically *Mikania micrantha* and *Mimosa* spp. (Sharma et al., 2023). However, the lack of scientific-validated experimental studies on the influence of mega- and meso-herbivores grazing and current management practices create hurdles in conserving and managing the tropical grasslands (Singh & Yadava, 1974; Lehmkhul, 1989). Thus, the present study was conducted to fulfill this gap, which aims to provide information on the impact of grazing and management practices such as burning and invasive uprooting on the biomass productivity of subtropical riverine alluvial grasslands of KNP. The baseline information generated from the present chapter will educate management authorities and aid in formulating and upgrading current management practices.

The chapter aims to provide answers to the following research questions:

- 1) What is the seasonal AGBP of SG (short grassland) and TG (tall grassland) in terms of (a) classes such as monocots, dicots and ferns, (b) growth forms such as grasses, sedges, climbers, herbs, ferns, shrubs and trees, (c) families, (d) species, and (e) life cycles such as annual, perennial and deciduous, and (f) *Mimosa* spp. and *Mikania micrantha* invasion?
- 2) What is the seasonal BGBP of SG and TG?
- 3) Is seasonal variation in environmental parameters such as rainfall (RF), maximum temperature (MAXT) and minimum temperature (MINT) and soil macro-nutrient parameters viz., C, N, P and K content responsible for the variation in seasonal AGBP and BGBP of SG and TG?

5.2 Methodology

5.2.1 Experimental design

The locations for experimental sites (ES) were selected based on the duration of accessibility. For heterogeneous sampling, the locations were selected in three different ranges of KNP, namely central (Kohora), eastern (Agoratoli), and western (Bagori). Due to limited resources, only 15 exclosures of size 10m×10m with fixed chain link iron fencing and a mesh size of 0.05m×0.05m were constructed. The data was collected

from 30 ES, inside (n=15) and outside (n=15) of all fenced exclosures (Appendix Table 4.1). Inside ES represents the areas where mega- and meso-herbivores were excluded (henceforth referred to as herbivore exclusion), while the outside ES represents the areas with free access to mega- and meso-herbivores (henceforth referred to as herbivore inclusion) (Appendix Table 4.1). The impact of ongoing management interventions was studied by subjecting (a) three herbivore exclusion ES to controlled annual burning at the end of February; consequently, the data was not collected for March to allow burned areas to recover, and (b) two herbivore exclusion ES to monthly invasive removal via manual uprooting of invasives *Mimosa* spp. and *Mikania micrantha*. ES were categorized into herbivore exclusion in short grassland (HES, n=6), herbivore inclusion in short grassland (HIS, n=6), herbivore exclusion in tall grassland (HET, n=4), herbivore inclusion in tall grassland (HIT, n=9), herbivore exclusion in tall grassland with burning (HETB, n=3), and herbivore exclusion in tall grassland with invasive removal (HETIR, n=2). The experimental exclosures constructed for the present study were designed to exclude the mega- and meso-herbivores only, but not the small rodents and birds, which may influence the vegetation structure and its functional traits (e.g., Howe & Brown, 1999). Further, post-flood senescent vegetation accumulation and sediment deposition inside exclosures may also influence the plant composition, biomass production, and soil nutrient contents (e.g., Van Oorschot et al., 1998; Deng et al., 2014).

5.2.2 Field sampling

Aboveground and belowground biomass data were collected for two years, from January 2014 to December 2015 (excluding the flood period from August to October). The sampling period was divided into the dry (November to March) and the wet seasons (April to July) (Figure 2.2). For Aboveground biomass estimation, the harvest method was used (Milner & Hughes, 1968) in which three random quadrates of 1m×1m were laid in each ES (inside and outside the 15 exclosures), and vegetation close to the soil surface was harvested in triplicates following Mishra (1968). Overall, 1152 plots were sampled, including 612 in the dry season and 540 in the wet season (Appendix Table 4.2). The harvested plants were sorted species-wise to derive abundance and placed in labelled paper bags with a detailed description of the site and the name of the species.

The plant species were identified using ‘Botany of Kaziranga and Manas’ by Hajra and Jain (1994). After that, each sample was weighed using a pan balance to record fresh weight. These samples were oven dried at 60 °C at the field site and again weighed to derive the dry weight.

For belowground biomass, the data was collected only from HIS and HIT exclosures and not from experimental sites viz., HES, HET, HETB and HETIR to avoid disturbing those exclosures. After harvesting aboveground vegetation from HIS and HIT sites, with the help of a spade, root and rhizomes material (monolith) was dug out from a 30 cm deep soil layer and collected in labelled polybags to collect belowground biomass data following Singh and Yadava (1974) and Fidelis et al. (2012). Overall, 360 plots of size 1m×1m and 30 cm deep (dry season= 180 and wet season=180) were dug to extract root material. After that, potholes created due to digging were refilled with soil from an adjacent area to equalize the soil surface and prevent any harm to wild animals. After that, roots were separated from the soil using a metallic sieve (mesh size of 2 mm) and washed under running water. After washing, the roots were kept on blotting papers to remove excess water for an hour. Later, roots were packed in labelled paper bags and weighed using a pan balance to record fresh weight. These packets were oven dried at 80 °C at the field site and again weighed to derive the dry weight. The aboveground and belowground productivity was estimated in g m⁻² using the following equation:

$$\text{Biomass productivity} = (\text{Wet weight} - \text{Dry weight})$$

For soil sampling, three random soil samples (15 cm deep) were collected from three different sides of each ES after removing the vegetation layer using a soil auger (length=15 cm, diameter=7.5 cm) (Chaturvedi & Sankar, 2006). The soil samples were air-dried for 2-3 days, sieved (2 mm mesh) to remove the stone and root particles, and packed in zip-lock bags for laboratory analysis. To make one composite sample, three soil samples collected from the same location were pooled together (Chaturvedi & Sankar, 2006). A total of 390 composite soil samples (dry season=210; wet season=180) were prepared (Appendix Tables 4.2). RF, MAXT and MINT data was collected from January 2014 to December 2015 (2014-15, Assam Forest Department).

5.2.3 Soil Laboratory Analysis

Standard methods were used to estimate the Organic carbon (C), Nitrogen (N), Phosphorous (P), and Potassium (K) content of the soil (Allen et al., 1974; Chaturvedi & Sankar, 2006). One of the widely used methods, the Walkley-Black method, was used to determine soil organic carbon. Kjeldahl method was used to estimate the Nitrogen content, in which Auto Kjeldahl Nitrogen Analyzer (Foss Analytical 2003a) instrument was used for the analysis (Chaturvedi & Sankar, 2006). Phosphorus and Potassium were estimated using a UV Visible Spectrophotometer and Flame Photometer, respectively (Appendix Tables 4.3).

5.2.4 Data analysis

Rainfall based hierarchical clustering was used to identify dry and wet seasons (Figure 2.2). For the sampling conducted throughout the study period, a species-area curve was plotted for each category of ES, to determine the adequate sampling efforts required to study AGBP and BGBP (Figure 4.1). In the species-area curve, the number of plots laid and the mean number of plants recorded from each ES were plotted (Colwell et al., 2012). The effect of environmental parameters (predictors) viz., C, N, P, K, RF, MINT, and MAXT on AGBP and BGBP was modelled using general linear models (GLM). The annual mean AGBP and BGBP of experimental sites viz., HES, HIS, HET, HIT, HETB and HETIR were taken as the response variable. Based on AICc statistics, only the best-fit models were selected. For GLM, the R package “MuMin” was used. The Kolmogorov-Smirnov test was performed to derive data normality. The Independent Samples t-Test, Mann-Whitney and Kruskal-Wallis tests were performed to derive significant differences. Additionally, for multiple comparisons, Bonferroni corrections were performed (Kwak et al., 2020). Data analysis was carried out using R (version 2.5-7) and SPSS version 22 (Oksanen et al., 2020).

5.3 Results

5.3.1 Aboveground Biomass Productivity: Grasslands, Short and Tall grasslands

5.3.1.1 Grasslands

The overall mean annual AGBP of grasslands was $33838.41 \pm 4754.32 \text{ g m}^{-2}$ (Table 5.1). Compared to the dry season, a significantly high mean annual AGBP was recorded during the wet season ($\bar{x} = 53400.40 \pm 4810.64 \text{ g m}^{-2}$, Mann-Whitney, $P < 0.05$) (Appendix

Table 5.1). Among classes, monocots contributed a significantly high mean annual AGBP overall, in dry and wet seasons ($\bar{x}=31625.14\pm4482.8 \text{ g m}^{-2}$, $16613.49\pm931.87 \text{ g m}^{-2}$ and $50389.70\pm4227.23 \text{ g m}^{-2}$, respectively; Kruskal Wallis, $P<0.05$); however, no seasonal difference was recorded among classes mean AGBP (Mann-Whitney, $P>0.05$) (Table 5.2 and Appendix Tables 5.2-5.3). Compared to the dry season, a significantly high mean annual AGBP of monocots were recorded during the wet season (Mann-Whitney, $P<0.05$) (Appendix Table 5.1). Among growth forms, grasses contributed significantly high mean annual AGBP overall, in dry and wet seasons ($\bar{x}=29162.98\pm4092.60 \text{ g m}^{-2}$, $15209.36\pm825.81 \text{ g m}^{-2}$ and $46605\pm3492.59 \text{ g m}^{-2}$, respectively; Kruskal Wallis, $P<0.05$) and a significant seasonal difference was recorded among growth forms mean annual AGBP (Mann-Whitney, $P<0.05$) (Table 5.3 and Appendix Tables 5.2-5.3). Compared to the dry season, a significantly high mean annual AGBP of grasses were recorded during the wet season (Mann-Whitney, $P<0.05$) (Appendix Table 5.1). Among families, Poaceae contributed the maximum to mean annual AGBP, overall, in dry and wet seasons ($\bar{x}=29162.98\pm4092.60 \text{ g m}^{-2}$, $15209.36\pm825.81 \text{ g m}^{-2}$ and $46605\pm3492.59 \text{ g m}^{-2}$, respectively) (Appendix Table 5.4). Compared to the dry season, a high mean annual AGBP of Poaceae was recorded during the wet season. Among species, *Saccharum* spp. contributed maximum to mean annual AGBP, overall, in dry and wet seasons ($\bar{x}=26058.76\pm3732.35 \text{ g m}^{-2}$, $13267.57\pm775.73 \text{ g m}^{-2}$ and $42047.74\pm3068.38 \text{ g m}^{-2}$, respectively) (Appendix Table 5.5). Compared to the dry season, a high mean annual AGBP of *Saccharum* spp. was recorded during the wet season. Among life cycles, perennials contributed a significantly high mean annual AGBP overall, in dry and wet seasons ($\bar{x}=33322.31\pm4659.73 \text{ g m}^{-2}$, $17927.38\pm1087.09 \text{ g m}^{-2}$ and $52565.98\pm4639.25 \text{ g m}^{-2}$, respectively; Kruskal Wallis, $P<0.05$) and a significant seasonal difference was recorded among life cycles mean annual AGBP (Mann-Whitney, $P<0.05$) (Table 5.3 and Appendix Tables 5.2 and 5.3). Compared to the dry season, a significantly high mean annual AGBP of perennials was recorded during the wet season (Mann-Whitney, $P<0.05$) (Appendix Table 5.1).

Table 5.1. Overall and seasonal aboveground biomass productivity (g m^{-2}) recorded from experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
HES	64445.98	3580.33±521.28	20059.04	2005.90±241.33	44386.95	5548.37±628.69
HIS	10536.21	1317.03±225.47	3355.68	838.92±127.00	7180.53	1795.13±262.14
Total (SG)	74982.20	4165.68±639.75	23414.72	2341.47±281.98	51567.48	6445.93±878.39
HET	94760.68	5264.48±729.57	29156.50	2915.65±311.04	65604.18	8200.52±732.34
HIT	49167.89	6145.99±1266.24	14060.79	3515.20±507.43	35107.10	8776.77±1615.82
HETB	227452.67	14215.79±1873.58	63751.09	7968.89±1265.70	163701.58	20462.70±1514.09
HETIR	162727.97	9040.44±1192.98	51505.13	5150.51±681.35	111222.84	13902.86±975.23
Total (TG)	534109.21	29672.73±4157.22	158473.51	15847.35±1067.67	375635.70	46954.46±3975.76
Total (SG & TG)	609091.40	33838.41±4754.32	181888.23	18188.82±1106.86	427203.17	53400.40±4810.64

SG- short grassland, TG- tall grassland, HES- herbivore exclusion in short grassland, HIS- herbivore inclusion in short grassland, HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal and SE- standard error.

Table 5.2. Overall and seasonal aboveground biomass productivity (g m^{-2}) in terms of classes (monocots, dicots and ferns) recorded from experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Seasons	Classes					
		Monocots		Dicots		Ferns	
		Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
HES	Overall	60090.54	3338.36±479.90	4354.28	241.90±47.26	1.17	0.39±0.16
	Dry	18889.53	1888.95±228.44	1169.26	116.93±18.55	0.25	0.25±0.00
	Wet	41201.01	5150.13±574.90	3185.02	398.13±73.33	0.92	0.46±0.24
HIS	Overall	9294.56	1161.82±206.97	1238.56	154.82±26.99	3.10	3.10±0.00
	Dry	2962.91	740.73±124.38	392.77	98.19±27.16	0.00	0.00
	Wet	6331.65	1582.91±257.35	845.79	211.45±22.92	3.10	3.10±0.00
Total (SG)	Overall	69385.10	3854.73±582.60	5592.83	310.71±62.79	4.26	1.42±0.96
	Dry	21852.44	2185.24±266.29	1562.03	156.20±23.67	0.25	0.25±0.00
	Wet	47532.66	5941.58±787.95	4030.80	503.85±105.14	4.02	2.01±1.31
HET	Overall	81324.67	4518.04±663.71	12534.45	696.36±114.46	901.56	50.09±10.53
	Dry	23403.31	2340.33±316.83	5258.33	525.83±45.74	494.87	49.49±10.76
	Wet	57921.36	7240.17±583.35	7276.12	909.52±237.79	406.70	50.84±20.50
HIT	Overall	41058.37	5132.30±1137.51	7325.46	915.68±126.44	784.06	98.01±18.94
	Dry	11117.06	2779.26±464.56	2678.62	669.65±94.03	265.12	66.28±17.43
	Wet	29941.31	7485.33±1459.91	4646.84	1161.71±159.41	518.94	129.74±26.44
HETB	Overall	219804.11	13737.76±1838.76	7334.98	458.44±155.23	313.58	20.91±3.44
	Dry	60291.97	7536.50±1198.99	3307.94	413.49±77.75	151.18	18.90±3.67
	Wet	159512.14	19939.02±1437.13	4027.04	503.38±310.88	162.40	23.20±6.30
HETIR	Overall	157680.21	8760.01±1175.36	4364.09	242.45±52.34	683.67	37.98±10.38
	Dry	49470.12	4947.01±713.07	1613.56	161.36±44.35	421.45	42.15±17.20
	Wet	108210.09	13526.26±943.37	2750.53	343.82±95.75	262.22	32.78±10.29
Total (TG)	Overall	499867.37	27770.41±3943.24	31558.97	1753.28±321.25	2682.87	149.05±25.47
	Dry	144282.46	14428.25±889.49	12858.44	1285.84±188.29	1332.61	133.26±32.37
	Wet	355584.91	44448.11±3488.55	18700.53	2337.57±647.42	1350.26	168.78±41.96
Total (SG & TG)	Overall	569252.47	31625.14±4482.80	37151.80	2063.99±366.55	2687.13	149.29±25.48
	Dry	166134.90	16613.49±931.87	14420.47	1442.05±194.57	1332.86	133.29±32.36
	Wet	403117.57	50389.70±4227.23	22731.33	2841.42±719.67	1354.27	169.28±41.97

SG- short grassland, TG- tall grassland, HES- herbivore exclusion in short grassland, HIS- herbivore inclusion in short grassland, HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal and SE- standard error.

Table 5.3. Overall and seasonal aboveground biomass productivity (g m⁻²) in terms of growth forms (grasses, sedges, climbers, herbs, ferns, shrubs and trees) recorded from experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

ES	Seasons	Growth forms													
		Grasses		Sedges		Climbers		Herbs		Ferns		Shrubs		Trees	
		Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
HES	Overall	43556.02	2419.78±295.24	16515.56	917.53±193.27	78.25	11.18±6.13	3815.44	211.97±42.83	1.17	0.39±0.16	479.55	29.97±11.34	0.00	0.00
	Dry	15231.80	1523.18±196.78	3657.73	365.77±49.14	11.58	3.86±1.86	1064.24	106.42±17.31	0.25	0.25±0.00	93.45	11.68±2.75	0.00	0.00
	Wet	28324.21	3540.53±301.80	12857.83	1607.23±279.11	66.67	16.67±10.32	2751.20	343.90±71.19	0.92	0.46±0.24	386.11	48.26±21.17	0.00	0.00
HIS	Overall	7088.58	886.07±155.30	2205.98	275.75±73.70	1.74	1.74±0.00	1059.22	132.40±29.83	3.10	3.10±0.00	177.59	22.20±6.38	0.00	0.00
	Dry	2359.29	589.82±85.69	603.63	150.91±69.88	0.00	0.00	276.06	69.01±29.76	0.00	0.00	116.71	29.18±10.61	0.00	0.00
	Wet	4729.29	1182.32±216.08	1602.35	400.59±100.37	1.74	1.74±0.00	783.17	195.79±24.24	3.10	3.10±0.00	60.88	15.22±6.71	0.00	0.00
Total (SG)	Overall	50644.60	2813.59±371.66	18721.54	1040.09±216.33	79.99	11.43±6.18	4874.66	270.81±58.43	4.26	1.42±0.96	657.14	38.66±11.70	0.00	0.00
	Dry	17591.09	1759.11±215.43	4261.35	426.14±63.94	11.58	3.86±1.86	1340.29	134.03±23.08	0.25	0.25±0.00	210.16	23.35±7.05	0.00	0.00
	Wet	33053.51	4131.69±483.18	14460.19	1807.52±312.58	68.42	17.10±10.33	3534.37	441.80±101.39	4.02	2.01±1.31	446.98	55.87±22.82	0.00	0.00
HET	Overall	76259.85	4236.66±654.20	165.15	16.52±5.93	5939.74	329.99±54.52	5614.55	311.92±33.79	901.56	50.09±10.53	5359.48	297.75±53.13	520.34	43.36±15.82
	Dry	21034.57	2103.46±327.03	42.89	10.72±3.30	2653.61	265.36±21.77	2465.40	246.54±16.85	494.87	49.49±10.76	2231.88	223.19±24.26	233.30	46.66±19.04
	Wet	55225.29	6903.16±581.71	122.26	20.38±9.67	3286.13	410.77±117.48	3149.15	393.64±63.77	406.70	50.84±20.50	3127.60	390.95±110.66	287.05	41.01±24.73
HIT	Overall	36121.22	4515.15±1014.03	657.98	94.00±55.38	3620.59	452.57±51.96	4943.39	617.92±118.17	784.06	98.01±18.94	2600.04	325.01±55.96	440.60	62.94±13.36
	Dry	9877.37	2469.34±480.02	60.24	20.08±0.94	1539.36	384.84±60.58	1353.91	338.48±37.47	265.12	66.28±17.43	815.13	203.78±46.64	149.65	49.88±18.91
	Wet	26243.85	6560.96±1333.38	597.74	149.44±91.35	2081.23	520.31±76.63	3589.48	897.37±108.16	518.94	129.74±26.44	1784.91	446.23±51.38	290.95	72.74±19.26
HETB	Overall	209388.84	13086.80±1747.32	558.91	39.92±10.05	4246.77	283.12±70.46	10158.54	634.91±172.11	313.58	20.91±3.44	672.16	56.01±34.86	2113.88	192.17±88.71
	Dry	56193.78	7024.22±1143.72	119.17	19.86±7.02	2350.81	293.85±57.41	4038.56	504.82±76.87	151.18	18.90±3.67	208.25	34.71±12.13	689.34	114.89±36.96
	Wet	153195.06	19149.38±1129.31	439.74	54.97±15.04	1895.95	270.85±142.77	6119.98	765.00±340.88	162.40	23.20±6.30	463.91	77.32±70.84	1424.54	284.91±193.11
HETIR	Overall	152519.06	8473.28±1155.17	161.66	14.70±4.58	1617.45	95.14±27.08	5590.36	310.58±55.37	683.67	37.98±10.38	2155.78	119.77±31.90	0.00	0.00
	Dry	47396.78	4739.68±739.47	38.19	7.64±2.71	313.18	34.80±8.42	2167.05	216.70±43.99	421.45	42.15±17.20	1168.49	116.85±42.26	0.00	0.00
	Wet	105122.28	13140.29±901.12	123.47	20.58±7.54	1304.27	163.03±47.19	3423.32	427.91±100.52	262.22	32.78±10.29	987.29	123.41±51.81	0.00	0.00
Total (TG)	Overall	474288.97	26349.39±3757.13	1543.71	96.48±29.59	15424.54	856.92±147.56	26306.85	1461.49±255.32	2682.87	149.05±25.47	10787.45	599.30±100.10	3074.82	180.87±64.42
	Dry	134502.49	13450.25±772.19	260.49	32.56±3.03	6856.96	685.70±112.41	10024.91	1002.49±166.19	1332.61	133.26±32.37	4423.75	442.38±58.13	1072.29	119.14±35.74
	Wet	339786.47	42473.31±3053.44	1283.21	160.40±50.75	8567.58	1070.95±294.79	16281.93	2035.24±476.64	1350.26	168.78±41.96	6363.70	795.46±198.56	2002.54	250.32±131.19
Total (SG & TG)	Overall	524933.56	29162.98±4092.60	20265.25	1125.85±236.86	15504.53	861.36±149.88	31181.51	1732.31±306.94	2687.13	149.29±25.48	11444.60	635.81±100.44	3074.82	180.87±64.42
	Dry	152093.58	15209.36±825.81	4521.85	452.18±61.66	6868.54	452.18±61.66	11365.21	1136.52±163.72	1332.86	133.29±32.36	4633.91	463.39±61.48	1072.29	119.14±35.74
	Wet	372839.98	46605.00±3492.59	15743.40	1967.93±343.66	8636.00	1079.50±300.20	19816.30	2477.04±573.67	1354.27	169.28±41.97	6810.69	851.34±192.62	2002.54	250.32±131.19

SG- short grassland, TG- tall grassland, HES- herbivore exclusion in short grassland, HIS- herbivore inclusion in short grassland, HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal, ES- experiment sites and SE- standard error.

Table 5.4. Overall and seasonal aboveground biomass productivity (g m^{-2}) in terms of life cycles (annuals, perennials and deciduous) recorded from experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Seasons	Life cycles					
		Annuals		Perennials		Deciduous	
		Total	Mean $\pm$ SE	Total	Mean $\pm$ SE	Total	Mean $\pm$ SE
HES	Overall	4103.29	227.96 $\pm$ 41.97	60342.69	3352.37 $\pm$ 483.39	0.00	0.00
	Dry	1126.99	112.70 $\pm$ 12.25	18932.05	1893.21 $\pm$ 237.33	0.00	0.00
	Wet	2976.31	372.04 $\pm$ 63.62	41410.64	5176.33 $\pm$ 575.18	0.00	0.00
HIS	Overall	1057.50	132.19 $\pm$ 33.50	9478.71	1184.84 $\pm$ 202.91	0.00	0.00
	Dry	214.77	53.69 $\pm$ 28.82	3140.91	785.23 $\pm$ 115.99	0.00	0.00
	Wet	842.73	210.68 $\pm$ 17.29	6337.80	1584.45 $\pm$ 268.75	0.00	0.00
Total (SG)	Overall	5160.80	286.71 $\pm$ 56.02	69821.40	3878.97 $\pm$ 587.83	0.00	0.00
	Dry	1341.76	134.18 $\pm$ 15.62	22072.96	2207.30 $\pm$ 276.18	0.00	0.00
	Wet	3819.04	477.38 $\pm$ 86.05	47748.44	5968.55 $\pm$ 801.72	0.00	0.00
HET	Overall	282.13	21.70 $\pm$ 6.08	93958.21	5219.90 $\pm$ 725.60	520.34	43.36 $\pm$ 15.82
	Dry	25.50	5.10 $\pm$ 2.20	28897.71	2889.77 $\pm$ 309.54	233.30	46.66 $\pm$ 19.04
	Wet	256.63	32.08 $\pm$ 7.84	65060.50	8132.56 $\pm$ 735.80	287.05	41.01 $\pm$ 24.73
HIT	Overall	346.16	49.45 $\pm$ 27.51	48381.12	6047.64 $\pm$ 1237.57	440.60	62.94 $\pm$ 13.36
	Dry	41.24	13.75 $\pm$ 12.02	13869.89	3467.47 $\pm$ 507.07	149.65	49.88 $\pm$ 18.91
	Wet	304.92	76.23 $\pm$ 44.94	34511.23	8627.81 $\pm$ 1565.91	290.95	72.74 $\pm$ 19.26
HETB	Overall	133.69	11.14 $\pm$ 2.38	225205.10	14075.32 $\pm$ 1852.37	2113.88	192.17 $\pm$ 88.71
	Dry	40.05	8.01 $\pm$ 2.97	63021.70	7877.71 $\pm$ 1243.06	689.34	114.89 $\pm$ 36.96
	Wet	93.64	13.38 $\pm$ 3.41	162183.40	20272.93 $\pm$ 1478.49	1424.54	284.91 $\pm$ 193.11
HETIR	Overall	292.14	19.48 $\pm$ 5.53	162435.83	9024.21 $\pm$ 1191.17	0.00	0.00
	Dry	93.58	13.37 $\pm$ 3.50	51411.55	5141.16 $\pm$ 681.53	0.00	0.00
	Wet	198.57	24.82 $\pm$ 9.84	111024.27	13878.03 $\pm$ 973.94	0.00	0.00
Total (TG)	Overall	1054.12	58.56 $\pm$ 16.83	529980.27	29443.35 $\pm$ 4112.90	3074.82	180.87 $\pm$ 64.42
	Dry	200.37	20.04 $\pm$ 5.19	157200.86	15720.09 $\pm$ 1040.77	1072.29	119.14 $\pm$ 35.74
	Wet	853.75	106.72 $\pm$ 30.14	372779.41	46597.43 $\pm$ 3876.23	2002.54	250.32 $\pm$ 131.19
Total (SG & TG)	Overall	6214.91	345.27 $\pm$ 71.48	599801.67	33322.31 $\pm$ 4659.73	3074.82	180.87 $\pm$ 64.42
	Dry	1542.12	154.21 $\pm$ 20.28	179273.82	17927.38 $\pm$ 1087.09	1072.29	119.14 $\pm$ 35.74
	Wet	4672.79	584.10 $\pm$ 112.19	420527.85	52565.98 $\pm$ 4639.25	2002.54	250.32 $\pm$ 131.19

SG- short grassland, TG- tall grassland, HES- herbivore exclusion in short grassland, HIS- herbivore inclusion in short grassland, HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal and SE- standard error.

5.3.1.2 Short grassland

The overall mean annual AGBP recorded for SG was $4165.68 \pm 639.75 \text{ g m}^{-2}$ (Table 5.1). Compared to the dry season, a significantly high mean annual AGBP was recorded during the wet season ($\bar{x} = 6445.93 \pm 878.39 \text{ g m}^{-2}$, Mann-Whitney, $P < 0.05$) (Appendix Table 5.1). Among classes, monocots contributed significantly high to mean annual AGBP overall, in dry and wet seasons ($\bar{x} = 3854.73 \pm 582.60 \text{ g m}^{-2}$, $2185.24 \pm 266.29 \text{ g m}^{-2}$ and $5941.58 \pm 787.95 \text{ g m}^{-2}$, respectively; Kruskal Wallis, $P < 0.05$); however, no seasonal difference was recorded among classes mean AGBP (Mann-Whitney, $P > 0.05$) (Table 5.2 and Appendix Tables 5.2-5.3). Compared to the dry season, a significantly high mean annual AGBP of monocots were recorded during the wet season (Mann-

Whitney, $P<0.05$) (Appendix Table 5.1). Among growth forms, grasses contributed a significantly high mean annual AGBP overall, in dry and wet seasons ($\bar{x}=2813.59\pm371.66 \text{ g m}^{-2}$, $1759.11\pm215.43 \text{ g m}^{-2}$ and $4131.69\pm483.18 \text{ g m}^{-2}$, respectively; Kruskal Wallis, $P<0.05$); however, no seasonal difference was recorded among growth forms mean AGBP (Mann-Whitney, $P>0.05$) (Table 5.3 and Appendix Tables 5.2 and 5.3). Compared to the dry season, a significantly high mean annual AGBP of grasses were recorded during the wet season (Mann-Whitney, $P<0.05$) (Appendix Table 5.1). Among families, Poaceae contributed maximum to mean annual AGBP overall, in dry and wet seasons ($\bar{x}=2813.59\pm371.66 \text{ g m}^{-2}$, $1759.11\pm215.43 \text{ g m}^{-2}$ and $4131.69\pm483.18 \text{ g m}^{-2}$, respectively) (Appendix Table 5.6). Compared to the dry season, a high mean annual AGBP of Poaceae was recorded during the wet season. Among species, *Hemarthria compressa* contributed the maximum to mean annual AGBP overall, in dry and wet seasons ($\bar{x}=1631.24\pm224.28 \text{ g m}^{-2}$, $976.21\pm127.54 \text{ g m}^{-2}$ and $2450.03\pm276.29 \text{ g m}^{-2}$, respectively) (Appendix Table 5.7). Compared to the dry season, a high mean annual AGBP of *Hemarthria compressa* was recorded during the wet season. Among life cycles, perennials contributed significantly high to mean annual AGBP overall, in dry and wet seasons ($\bar{x}=3878.97\pm587.83 \text{ g m}^{-2}$, $2207.30\pm276.18 \text{ g m}^{-2}$ and $5968.55\pm801.72 \text{ g m}^{-2}$, respectively; Kruskal Wallis, $P<0.05$); however, no seasonal difference was recorded among life cycles mean AGBP (Mann-Whitney, $P>0.05$) (Table 5.4 and Appendix Tables 5.2 and 5.3). Compared to the dry season, a significantly high mean annual AGBP of perennials were recorded during the wet season (Mann-Whitney, $P<0.05$) (Appendix Table 5.1). No invasion of *Mimosa* spp. and *Mikania micrantha* were recorded.

5.3.1.3 Tall grassland

The overall mean annual AGBP recorded for TG was $29672.73\pm4157.22 \text{ g m}^{-2}$ (Table 5.1). Compared to the dry season, a significantly high mean annual AGBP was recorded during the wet season ($\bar{x}=46954.46\pm3975.76 \text{ g m}^{-2}$, Mann-Whitney, $P<0.05$) (Appendix Table 5.1). Among classes, monocots contributed significantly high to the mean annual AGBP overall, in dry and wet seasons ($\bar{x}=27770.41\pm3943.24 \text{ g m}^{-2}$, $14428.25\pm889.49 \text{ g m}^{-2}$ and $44448.11\pm3488.55 \text{ g m}^{-2}$, respectively; Kruskal Wallis, $P<0.05$); however, no seasonal difference was recorded among classes mean AGBP (Mann-Whitney, $P>0.05$)

(Table 5.2 and Appendix Tables 5.2 and 5.3). Compared to the dry season, a significantly high mean annual AGBP of monocots were recorded during the wet season (Mann-Whitney, $P < 0.05$) (Appendix Table 5.1). Among growth forms, grasses contributed significantly high to mean annual AGBP overall, in dry and wet seasons ($\bar{x} = 26349.39 \pm 3757.13 \text{ g m}^{-2}$, $13450.25 \pm 772.19 \text{ g m}^{-2}$ and $42473.31 \pm 3053.44 \text{ g m}^{-2}$, respectively; Kruskal Wallis, $P < 0.05$); however, no seasonal difference was recorded among growth forms mean AGBP (Mann-Whitney, $P > 0.05$) (Table 5.3 and Appendix Tables 5.2-5.3). Compared to the dry season, a significantly high mean annual AGBP of grasses were recorded during the wet season (Mann-Whitney, $P < 0.05$) (Appendix Table 5.1). Among families, Poaceae contributed maximum to mean annual AGBP overall, in dry and wet seasons ($\bar{x} = 26349.39 \pm 3757.13 \text{ g m}^{-2}$, $13450.25 \pm 772.19 \text{ g m}^{-2}$ and $42473.31 \pm 3053.44 \text{ g m}^{-2}$, respectively) (Appendix Table 5.8). Compared to the dry season, a high mean annual AGBP of Poaceae was recorded during the wet season. Among species, *Saccharum* spp. contributed maximum to mean annual AGBP overall, in dry and wet seasons ($\bar{x} = 26041.07 \pm 3731.24 \text{ g m}^{-2}$, $13253.75 \pm 774.43 \text{ g m}^{-2}$ and $42025.21 \pm 3068.02 \text{ g m}^{-2}$, respectively) (Appendix Table 5.9). Compared to the dry season, a high mean annual AGBP of *Saccharum* spp. was recorded during the wet season. Among life cycles, perennials contributed significantly high to the mean annual AGBP overall, in dry and wet seasons ($\bar{x} = 29443.35 \pm 4112.90 \text{ g m}^{-2}$, $15720.09 \pm 1040.77 \text{ g m}^{-2}$ and $46597.43 \pm 3876.23 \text{ g m}^{-2}$, respectively; Kruskal Wallis, $P < 0.05$) and a significant seasonal difference was recorded among life cycles mean annual AGBP (Mann-Whitney, $P < 0.05$) (Table 5.4 and Appendix Tables 5.2 and 5.3). Compared to the dry season, a significantly high mean annual AGBP of perennials were recorded during the wet season (Mann-Whitney, $P < 0.05$) (Appendix Table 5.1). Overall, the mean annual AGBP of *Mimosa* spp. and *Mikania micrantha* was $327.71 \pm 62.03 \text{ g m}^{-2}$ (Appendix Table 5.10 and Graph 5.1). Compared to the wet season, a high mean AGBP of *Mimosa* spp. and *Mikania micrantha* was recorded during the dry season ($\bar{x} = 344.73 \pm 95.99 \text{ g m}^{-2}$, Mann-Whitney, $P > 0.05$) (Appendix Table 5.11). Individually, the overall mean annual AGBP of *Mimosa* spp. was $127.97 \pm 24.20 \text{ g m}^{-2}$ (Appendix Table 5.10 and Graph 5.1). Compared to the dry season, a high mean AGBP of *Mimosa* spp. was recorded during the wet season ($\bar{x} = 167.53 \pm 43.65 \text{ g m}^{-2}$, Mann-Whitney, $P > 0.05$) (Appendix Table 5.11). Individually, the overall mean annual AGBP of

Mikania micrantha was $206.85 \pm 55.95 \text{ g m}^{-2}$ (Appendix Table 5.10 and Graph 5.1). Compared to the wet season, a high mean AGBP of *Mikania micrantha* was recorded during the dry season ($\bar{x} = 261.19 \pm 95.29 \text{ g m}^{-2}$, Mann-Whitney, $P > 0.05$) (Appendix Table 5.11).

5.3.1.4 Comparison between short and tall grasslands

Compared to SG, a significantly high mean annual AGBP was recorded in TG overall, in the dry and wet seasons ($\bar{x} = 29672.73 \pm 4157.22 \text{ g m}^{-2}$, $15847.35 \pm 1067.67 \text{ g m}^{-2}$ and $46954.46 \pm 3975.76 \text{ g m}^{-2}$, respectively, Mann-Whitney, $P < 0.05$) (Appendix Table 5.12). Between SG and TG, there was a significant seasonal difference in the mean annual AGBP (Mann-Whitney, $P < 0.05$). Among classes, irrespective of seasons, monocots contributed significantly high to the mean annual AGBP in both SG and TG (Kruskal Wallis, $P < 0.05$) (Appendix Tables 5.2 and 5.3). Compared to SG, a significantly high mean annual AGBP of monocots were recorded in TG overall, in dry and wet seasons ($\bar{x} = 27770.41 \pm 3943.24 \text{ g m}^{-2}$, $14428.25 \pm 889.49 \text{ g m}^{-2}$ and $44448.11 \pm 3488.55 \text{ g m}^{-2}$, respectively; Mann-Whitney, $P < 0.05$) (Table 5.2 and Appendix Table 5.12). Between SG and TG, a significant seasonal difference was recorded in the mean annual AGBP of monocots (Mann-Whitney, $P < 0.05$). Among growth forms, irrespective of seasons, grasses contributed significantly high to the mean annual AGBP in both SG and TG (Kruskal Wallis, $P < 0.05$) (Appendix Tables 5.2-5.3). Compared to SG, a significantly high mean annual AGBP of grasses were recorded in TG overall, in dry and wet seasons ($\bar{x} = 26349.39 \pm 3757.13 \text{ g m}^{-2}$, $13450.25 \pm 772.19 \text{ g m}^{-2}$ and $42473.31 \pm 3053.44 \text{ g m}^{-2}$, respectively; Mann-Whitney, $P < 0.05$) (Table 5.3 and Appendix Table 5.12). Between SG and TG, a significant seasonal difference was recorded in the mean annual AGBP of grasses (Mann-Whitney, $P < 0.05$). Among families, irrespective of seasons, Poaceae contributed maximum to mean annual AGBP in both SG and TG (Appendix Tables 5.6 and 5.8). Compared to SG, a high mean annual AGBP of Poaceae was recorded in TG overall, in dry and wet seasons ($\bar{x} = 26349.39 \pm 3757.13 \text{ g m}^{-2}$, $13450.25 \pm 772.19 \text{ g m}^{-2}$ and $42473.31 \pm 3053.44 \text{ g m}^{-2}$, respectively). Among species, overall, in dry and wet seasons, *Hemarthria compressa* contributed the maximum to mean annual AGBP in SG while *Saccharum* spp. in TG (Appendix Tables 5.7 and 5.9).

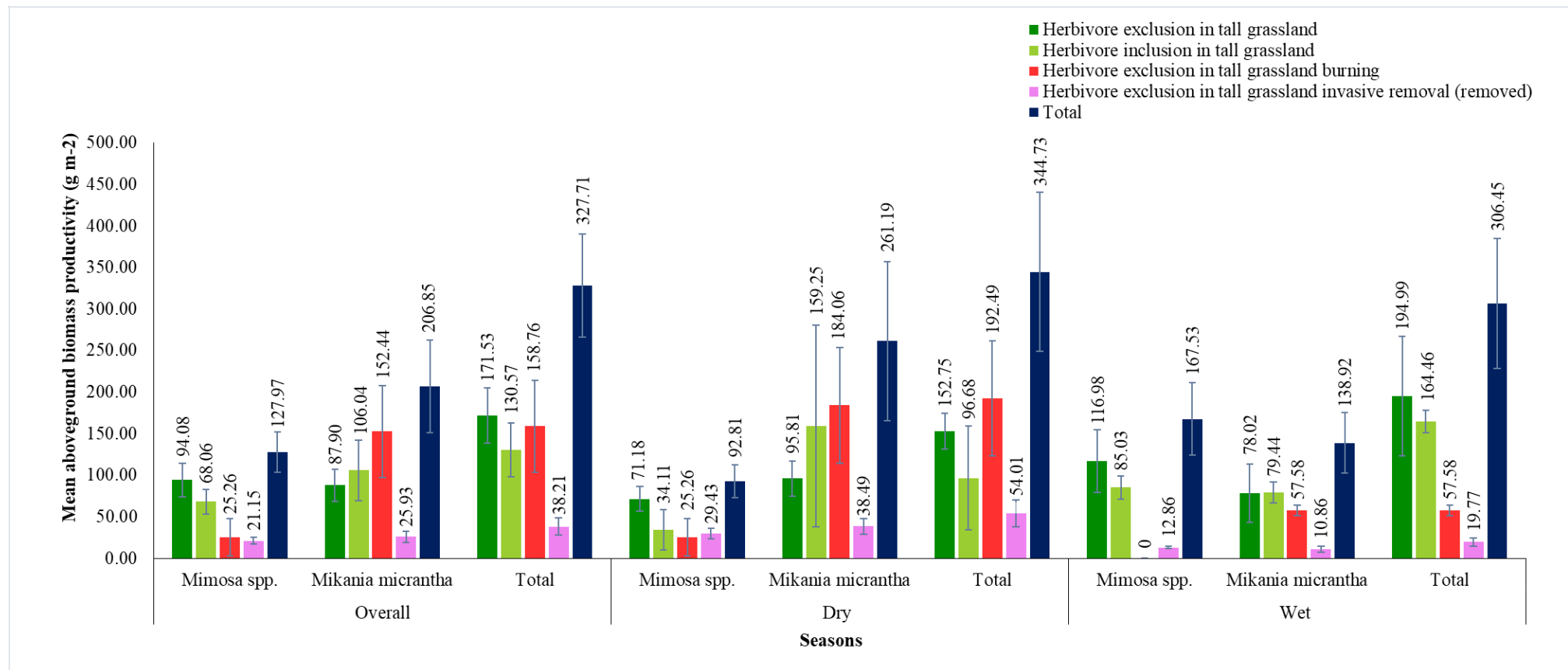


Figure 5.1. Graph showing the aboveground biomass productivity of invasives (in g m⁻²) in tall grassland experimental sites during 2014-15 in Kaziranga National Park, Assam, India.

Among life cycles, irrespective of seasons, perennials contributed significantly high to the mean annual AGBP in both SG and TG (Kruskal Wallis, $P<0.05$) (Appendix Tables 5.2-5.3). Compared to SG, a significantly high mean annual AGBP of perennials were recorded in TG overall, in dry and wet seasons ($\bar{x}=29443.35\pm4112.90$ g m⁻², 15720.09 ± 1040.77 g m⁻² and 46597.43 ± 3876.23 g m⁻², respectively; Mann-Whitney, $P<0.05$) (Table 5.4 and Appendix table 5.12). Between SG and TG, there was a significant seasonal difference in the mean annual AGBP of perennials (Mann-Whitney, $P<0.05$).

5.3.2 Aboveground Biomass Productivity: Experimental Sites

5.3.2.1 Short grassland: HES and HIS

The overall mean annual AGBP recorded for HES and HIS were 3580.33 ± 521.28 g m⁻² and 1317.03 ± 225.47 g m⁻², respectively (Table 5.1). Compared to the dry season, a significantly high mean annual AGBP was recorded during the wet season for both HES ($\bar{x}=5548.37\pm628.69$ g m⁻², Mann-Whitney, $P<0.05$) and HIS (1795.13 ± 262.14 g m⁻², Mann-Whitney, $P<0.05$) (Appendix Table 5.1). Compared to HIS, a high mean annual AGBP was recorded in HES overall, in dry and wet seasons ($\bar{x}=3580.33\pm521.28$ g m⁻², 2005.90 ± 241.33 g m⁻² and 5548.37 ± 628.69 g m⁻², respectively; Mann-Whitney, $P>0.05$) (Appendix Table 5.13). Between HES and HIS, there was a significant seasonal difference in mean annual AGBP (Mann-Whitney, $P<0.05$). Among classes, monocots contributed significantly high to the mean annual AGBP in both HES and HIS overall ($\bar{x}=3338.36\pm479.90$ g m⁻² and 1161.82 ± 206.97 g m⁻², respectively; Kruskal Wallis, $P<0.05$), in dry ($\bar{x}=1888.95\pm228.44$ g m⁻² and 740.73 ± 124.38 g m⁻², respectively; Kruskal Wallis, $P<0.05$), and wet ($\bar{x}=5150.13\pm574.90$ g m⁻² and 1582.91 ± 257.35 g m⁻², respectively; Kruskal Wallis, $P<0.05$) seasons; however, in both HES and HIS, no seasonal differences were recorded among mean annual AGBP of classes (Mann-Whitney, $P>0.05$) (Table 5.2 and Appendix Table 5.2 and 5.14). Compared to the dry season, a significantly high mean annual AGBP of monocots were recorded during the wet season in both HES and HIS (Mann-Whitney, $P<0.05$) (Appendix Table 5.1). Compared to the HIS, a high mean annual AGBP of monocots was recorded in HES, overall, in dry and wet seasons (Mann-Whitney, $P>0.05$) (Appendix Table 5.13). Between HES and HIS, a significant seasonal difference was

recorded in the mean annual AGBP of monocots (Mann-Whitney, $P < 0.05$). Among growth forms, grasses contributed significantly high to the mean annual AGBP in both HES and HIS overall ($\bar{x} = 2419.78 \pm 295.24 \text{ g m}^{-2}$ and $886.07 \pm 155.30 \text{ g m}^{-2}$, respectively; Kruskal Wallis, $P < 0.05$), in dry ($\bar{x} = 1523.18 \pm 196.78 \text{ g m}^{-2}$ and $589.82 \pm 85.69 \text{ g m}^{-2}$, respectively; Kruskal Wallis, $P < 0.05$) and wet ($\bar{x} = 3540.53 \pm 301.80 \text{ g m}^{-2}$ and $1182.32 \pm 216.08 \text{ g m}^{-2}$, respectively; Kruskal Wallis, $P < 0.05$) seasons; however, in both HES and HIS, no seasonal differences were recorded among mean annual AGBP of growth forms (Mann-Whitney, $P > 0.05$) (Table 5.3 and Appendix Table 5.2 and 5.14). Compared to the dry season, a significantly high mean annual AGBP of grasses were recorded during the wet season in both HES and HIS (Mann-Whitney, $P < 0.05$) (Appendix Table 5.1). Compared to HIS, a high mean annual AGBP of grasses was recorded in HES, overall, in dry and wet seasons (Mann-Whitney, $P > 0.05$) (Appendix Table 5.13). Between HES and HIS, a significant seasonal difference was recorded in the mean annual AGBP of grasses (Mann-Whitney, $P < 0.05$). Among families, Poaceae contributed maximum to mean annual AGBP in both HES and HIS overall ($\bar{x} = 2419.78 \pm 295.24 \text{ g m}^{-2}$ and $886.07 \pm 155.30 \text{ g m}^{-2}$, respectively), in dry ($\bar{x} = 1523.18 \pm 196.78 \text{ g m}^{-2}$ and $943.71 \pm 360.06 \text{ g m}^{-2}$, respectively) and wet ($\bar{x} = 3540.53 \pm 301.80 \text{ g m}^{-2}$ and $1182.32 \pm 216.08 \text{ g m}^{-2}$, respectively) seasons (Appendix Tables 5.15-5.16). Compared to the dry season, a high mean annual AGBP of Poaceae was recorded during the wet season in both HES and HIS. Compared to HIS, a high mean annual AGBP of Poaceae was recorded in HES overall, in dry and wet seasons. Among species, *Hemarthria compressa* contributed the maximum to mean annual AGBP in both HES and HIS overall ($\bar{x} = 1438.02 \pm 188.40 \text{ g m}^{-2}$ and $434.74 \pm 87.45 \text{ g m}^{-2}$, respectively), in dry ($\bar{x} = 857.12 \pm 121.90 \text{ g m}^{-2}$ and $297.73 \pm 58.78 \text{ g m}^{-2}$, respectively) and wet ($\bar{x} = 2164.15 \pm 185.69 \text{ g m}^{-2}$ and $571.75 \pm 140.43 \text{ g m}^{-2}$, respectively) seasons (Appendix Tables 5.17-5.18). Compared to the dry season, a high mean annual AGBP of *Hemarthria compressa* was recorded during the wet season in both HES and HIS. Compared to HIS, a high mean annual AGBP of *Hemarthria compressa* was recorded in HES overall, in dry and wet seasons. Among life cycles, perennials contributed significantly high mean annual AGBP in both HES and HIS overall ($\bar{x} = 3352.37 \pm 483.39 \text{ g m}^{-2}$ and $1184.84 \pm 202.91 \text{ g m}^{-2}$, respectively; Kruskal Wallis, $P < 0.05$), in dry ($\bar{x} = 1893.21 \pm 237.33 \text{ g m}^{-2}$ and $785.23 \pm 115.99 \text{ g m}^{-2}$, respectively; Kruskal Wallis,

$P<0.05$) and wet ($\bar{x}=5176.33\pm575.18$ g m⁻² and 1584.45 ± 268.75 g m⁻², respectively; Kruskal Wallis, $P<0.05$) seasons; however, in both HES and HIS, no seasonal differences were recorded among life cycles mean annual AGBP (Mann-Whitney, $P>0.05$) (Table 5.4 and Appendix Tables 5.2 and 5.14). Compared to the dry season, significantly high mean annual AGBP of perennials were recorded during the wet season in both HES and HIS (Mann-Whitney, $P<0.05$) (Appendix Table 5.1). Compared to HIS, a high mean annual AGBP of perennials were recorded in HES, overall, in dry and wet seasons (Mann-Whitney, $P>0.05$) (Appendix Table 5.13). Between HES and HIS, a significant seasonal difference was recorded in the mean annual AGBP of perennials (Mann-Whitney, $P<0.05$). In both HES and HIS, the invasion of *Mimosa* spp. and *Mikania micrantha* was not recorded.

5.3.2.2 Tall grassland: HET, HIT, HETB and HETIR

The overall mean annual AGBP recorded for HET, HIT, HETB, and HETIR were 5264.48 ± 729.57 g m⁻², 6145.99 ± 1266.24 g m⁻², 14215.79 ± 1873.58 g m⁻² and 9040.44 ± 1192.98 g m⁻², respectively (Table 5.1). Compared to the dry season, a significantly high mean annual AGBP was recorded during the wet season in all TG sites viz., HET ($\bar{x}=8200.52\pm732.34$ g m⁻², Mann-Whitney, $P<0.05$), HIT ($\bar{x}=8776.77\pm1615.82$ g m⁻², Mann-Whitney, $P<0.05$), HETB ($\bar{x}=20462.70\pm1514.09$ g m⁻², Mann-Whitney, $P<0.05$) and HETIR ($\bar{x}=13902.86\pm975.23$ g m⁻², Mann-Whitney, $P<0.05$) (Appendix Table 5.1). Among TG sites, a significantly high mean annual AGBP was recorded in HETB overall, in dry and wet seasons ($\bar{x}=14215.79\pm1873.58$ g m⁻², 7968.89 ± 1265.70 g m⁻² and 20462.70 ± 1514.09 g m⁻²; Kruskal Wallis, $P<0.05$), and low was recorded in HET overall, in dry and wet seasons ($\bar{x}=5264.48\pm729.57$ g m⁻², 2915.65 ± 311.04 g m⁻² and 8200.52 ± 732.34 g m⁻²; Kruskal Wallis, $P<0.05$) (Appendix Tables 5.12 and 5.13). Among TG sites, a significant seasonal difference was recorded in mean annual AGBP (Mann-Whitney, $P<0.05$).

Among classes, monocots contributed a significantly high mean annual AGBP overall, in dry and wet seasons in HET ($\bar{x}=4518.04\pm663.71$ g m⁻², 2340.33 ± 316.83 g m⁻² and 7240.17 ± 583.35 g m⁻², respectively; Kruskal Wallis, $P<0.05$), HIT ($\bar{x}=5132.30\pm1137.51$ g m⁻², 2779.26 ± 464.56 g m⁻² and 7485.33 ± 1459.91 g m⁻², respectively; Kruskal Wallis, $P<0.05$), HETB ($\bar{x}=13737.76\pm1838.76$ g m⁻²,

7536.50±1198.99 g m⁻² and 19939.02±1437.13 g m⁻², respectively; Kruskal Wallis, $P<0.05$) and HETIR ($\bar{x}$ =8760.01±1175.36 g m⁻², 4947.01±713.07 g m⁻² and 13526.26±943.37 g m⁻², respectively; Kruskal Wallis, $P<0.05$); however, in all TG sites, no seasonal differences were recorded among classes mean annual AGBP (Mann-Whitney, $P>0.05$) (Table 5.2 and Appendix Tables 5.2 and 5.14). Among TG sites, a significantly high mean annual AGBP of monocots was recorded in HETB, overall, in dry and wet seasons (Kruskal Wallis, $P<0.05$), and the minimum was recorded in HET, overall, in dry and wet seasons (Kruskal Wallis, $P<0.05$) (Appendix Tables 5.12). Among TG sites, a significant seasonal difference was recorded in the mean annual AGBP of monocots (Mann-Whitney, $P<0.05$). Compared to the dry season, a significantly high mean annual AGBP of monocots were recorded during the wet season in all TG sites (Mann-Whitney, $P<0.05$) (Appendix Tables 5.1). Among growth forms, grasses contributed significantly high to the mean annual AGBP overall, in the dry and wet seasons in HET ($\bar{x}$ =4236.66±654.20 g m⁻², 2103.46±327.03 g m⁻² and 6903.16±581.71 g m⁻², respectively; Kruskal Wallis, $P<0.05$), HIT ($\bar{x}$ =4515.15±1014.03 g m⁻², 2469.34±480.02 g m⁻² and 6560.96±1333.38 g m⁻², respectively; Kruskal Wallis, $P<0.05$), HETB ($\bar{x}$ =13086.80±1747.32 g m⁻², 7024.22±1143.72 g m⁻² and 19149.38±1129.31 g m⁻², respectively; Kruskal Wallis, $P<0.05$), HETIR ($\bar{x}$ =8473.28±1155.17 g m⁻², 4739.68±739.47 g m⁻² and 13140.29±901.12 g m⁻², respectively; Kruskal Wallis, $P<0.05$); however, no seasonal differences were recorded among growth forms mean annual AGBP of HET, HETB and HETIR (Mann-Whitney, $P>0.05$) except for HIT (Mann-Whitney, $P<0.05$) (Table 5.3 and Appendix Tables 5.2 and 5.13).

Among TG sites, a significantly high mean annual AGBP of grasses was recorded in HETB, overall, in dry and wet seasons (Kruskal Wallis, $P<0.05$), and the minimum was recorded in HET, overall, in dry and wet seasons (Kruskal Wallis, $P<0.05$) (Appendix Tables 5.12). Among TG sites, a significant seasonal difference was recorded in the mean annual AGBP of grasses (Mann-Whitney, $P<0.05$). Compared to the dry season, a significantly high mean annual AGBP of grasses were recorded during the wet season in all TG sites (Mann-Whitney, $P<0.05$) (Appendix Table 5.1). Among families, Poaceae contributed maximum to the mean annual AGBP overall, in dry and wet seasons in HET ($\bar{x}$ =4236.66±654.20 g m⁻², 2103.46±327.03 g m⁻² and 6903.16±581.71

g m⁻², respectively), HIT ($\bar{x}$ =4515.15±1014.03 g m⁻², 2469.34±480.02 g m⁻² and 6560.96±1333.38 g m⁻², respectively), HETB ($\bar{x}$ =13086.80±1747.32 g m⁻², 7024.22±1143.72 g m⁻² and 19149.38±1129.31 g m⁻², respectively), and HETIR ($\bar{x}$ =8473.28±1155.17 g m⁻², 4739.68±739.47 g m⁻² and 13140.29±901.12 g m⁻², respectively) (Appendix Tables 5.19-5.22). Among TG sites, a high mean annual AGBP of Poaceae was recorded in HETB overall, in dry and wet seasons and minimum in HET overall and in the dry season and in HIT during the wet season. In TG sites, a high mean annual AGBP of Poaceae was recorded during the wet season compared to the dry season.

Among species, *Saccharum* spp. contributed maximum to mean annual AGBP overall, in dry and wet seasons in HET ($\bar{x}$ =4120.05±642.42 g m⁻², 2036.39±315.31 g m⁻² and 6724.63±592.39 g m⁻², respectively), HIT ($\bar{x}$ =4391.12±1004.82 g m⁻², 2378.63±487.86 g m⁻² and 6403.61±1331.79 g m⁻², respectively), HETB ($\bar{x}$ =13024.23±1736.34 g m⁻², 7003.47±1140.07 g m⁻² and 19044.99±1124.37 g m⁻², respectively) and HETIR ($\bar{x}$ =8392.32±1149.80 g m⁻², 4663.13±723.74 g m⁻² and 13053.79±891.45 g m⁻², respectively) (Appendix Tables 5.23-5.26). Among TG sites, a high mean annual AGBP of *Saccharum* spp. was recorded in HETB overall, in dry and wet seasons and minimum in HET overall and during the dry season and in HIT during the wet season. In TG sites, a high mean annual AGBP of *Saccharum* spp. was recorded during the wet season compared to the dry season. Among life cycles, perennials contributed significantly high to the mean AGBP overall, in the dry and wet seasons in HET ($\bar{x}$ =5219.90±725.60 g m⁻², 2889.77±309.54 g m⁻² and 8132.56±735.80 g m⁻², respectively; Kruskal Wallis, $P<0.05$), HIT ($\bar{x}$ =6047.64±1237.57 g m⁻², 3467.47±507.07 g m⁻² and 8627.81±1565.91 g m⁻², respectively; Kruskal Wallis, $P<0.05$), HETB ($\bar{x}$ =14075.32±1852.37 g m⁻²; 7877.71±1243.06 g m⁻² and 20272.93±1478.49 g m⁻², Kruskal Wallis, $P<0.05$), and HETIR ($\bar{x}$ =9024.21±1191.17 g m⁻², 5141.16±681.53 g m⁻² and 13878.03±973.94 g m⁻², respectively; Kruskal Wallis, $P<0.05$); however, no seasonal differences were recorded among life cycles mean annual AGBP of HIT, HETB and HETIR (Mann-Whitney, $P>0.05$) except for HET (Mann-Whitney, $P<0.05$) (Table 5.4 and Appendix Tables 5.2 and 5.13). Among TG sites, a high mean annual AGBP of perennials were recorded in HETB overall, in dry and wet seasons (Kruskal Wallis, $P<0.05$), and a minimum was recorded in HET

overall, in dry and wet seasons (Kruskal Wallis, $P < 0.05$) (Appendix Table 5.12). Among TG sites, significant seasonal differences were recorded in the mean annual AGBP of perennials (Mann-Whitney, $P < 0.05$). Compared to the dry season, a high mean annual AGBP of perennials was recorded during the wet season for all TG sites (Mann-Whitney, $P < 0.05$) (Appendix Table 5.1).

The overall mean annual AGBP of *Mimosa* spp. and *Mikania micrantha* in HET, HIT, HETB and HETIR were $171.53 \pm 33.18 \text{ g m}^{-2}$, $130.57 \pm 32.08 \text{ g m}^{-2}$, $158.76 \pm 55.09 \text{ g m}^{-2}$ and $38.21 \pm 10.09 \text{ g m}^{-2}$ (Graph 5.1 and Appendix Table 5.10). Between dry and wet seasons, a high mean annual AGBP of *Mimosa* spp. and *Mikania micrantha* was recorded during the wet season for HET ($\bar{x} = 194.99 \pm 71.73 \text{ g m}^{-2}$, Mann-Whitney, $P > 0.05$) and HIT ($\bar{x} = 164.46 \pm 13.51 \text{ g m}^{-2}$, Mann-Whitney, $P > 0.05$) and during the dry season for HETB ($\bar{x} = 192.49 \pm 68.94 \text{ g m}^{-2}$, Mann-Whitney, $P < 0.05$) and HETIR ($\bar{x} = 54.01 \pm 16.44 \text{ g m}^{-2}$, Mann-Whitney, $P > 0.05$) (Appendix Table 5.11). Among TG sites, a significantly high mean annual AGBP of *Mimosa* spp. and *Mikania micrantha* was recorded in HET overall and in the wet season ($\bar{x} = 171.53 \pm 33.18 \text{ g m}^{-2}$ and $194.99 \pm 71.73 \text{ g m}^{-2}$, respectively; Kruskal Wallis, $P < 0.05$) and in HETB during the dry season, ($\bar{x} = 192.49 \pm 68.94 \text{ g m}^{-2}$, Kruskal Wallis, $P < 0.05$) and low was recorded in HETIR overall, in dry and wet seasons ($\bar{x} = 38.21 \pm 10.09 \text{ g m}^{-2}$, $54.01 \pm 16.44 \text{ g m}^{-2}$ and $19.77 \pm 4.95 \text{ g m}^{-2}$, respectively; Kruskal Wallis, $P < 0.05$). Among TG sites, no seasonal differences were recorded in the AGBP of *Mimosa* spp. and *Mikania micrantha* (Mann-Whitney, $P > 0.05$) (Appendix Table 5.27). Individually, the overall mean annual AGBP of *Mimosa* spp. in HET, HIT, HETB and HETIR was $94.08 \pm 20.41 \text{ g m}^{-2}$, $68.06 \pm 15.07 \text{ g m}^{-2}$, 25.26 ± 22.61 and 21.15 ± 4.09 , respectively (Appendix Table 5.10). Between dry and wet seasons, high mean AGBP of *Mimosa* spp. was recorded during the wet season in HET ($\bar{x} = 116.98 \pm 37.60 \text{ g m}^{-2}$, Mann-Whitney, $P > 0.05$) and HIT ($\bar{x} = 85.03 \pm 13.56 \text{ g m}^{-2}$, Mann-Whitney, $P < 0.05$) and during the dry season in HETB ($\bar{x} = 25.26 \pm 22.61 \text{ g m}^{-2}$, Mann-Whitney, $P > 0.05$) and HETIR ($\bar{x} = 29.43 \pm 6.25 \text{ g m}^{-2}$, Mann-Whitney, $P > 0.05$) (Appendix Table 5.11). Among TG sites, a significantly high mean annual AGBP of *Mimosa* spp. was recorded in HET overall, in dry and wet seasons ($\bar{x} = 94.08 \pm 20.41 \text{ g m}^{-2}$, $71.18 \pm 14.88 \text{ g m}^{-2}$ and $116.98 \pm 37.60 \text{ g m}^{-2}$, respectively; Kruskal Wallis, $P < 0.05$) and the minimum was recorded in HETIR overall ($\bar{x} = 21.15 \pm 4.09 \text{ g m}^{-2}$, Kruskal Wallis, $P < 0.05$) and in HETB during dry season ($\bar{x} = 25.26 \pm 22.61 \text{ g m}^{-2}$, Kruskal Wallis,

$P<0.05$) and wet season (absent) (Appendix Table 5.27). Among TG sites, no seasonal differences were recorded in the AGBP of *Mimosa* spp. (Mann-Whitney, $P>0.05$). Individually, the overall mean annual AGBP of *Mikania micrantha* in HET, HIT, HETB and HETIR was $87.90\pm19.07 \text{ g m}^{-2}$, $106.04\pm36.42 \text{ g m}^{-2}$, $152.44\pm55.16 \text{ g m}^{-2}$ and $25.93\pm6.80 \text{ g m}^{-2}$, respectively (Appendix Table 5.10). Compared to the wet season, high mean annual AGBP of *Mikania micrantha* was recorded during the dry season in HET ($\bar{x}=95.81\pm21.38 \text{ g m}^{-2}$, Mann-Whitney, $P>0.05$), HIT ($\bar{x}=159.25\pm121.30 \text{ g m}^{-2}$, Mann-Whitney, $P>0.05$), HETB ($\bar{x}=184.06\pm69.83 \text{ g m}^{-2}$, Mann-Whitney, $P<0.05$) and HETIR ($\bar{x}=38.49\pm9.65 \text{ g m}^{-2}$, Mann-Whitney, $P>0.05$) (Appendix Table 5.11). Among TG sites, a significantly high mean annual AGBP of *Mikania micrantha* was recorded in HETB overall and in the dry season ($\bar{x}=152.44\pm55.16 \text{ g m}^{-2}$ and $184.06\pm69.83 \text{ g m}^{-2}$, respectively; Kruskal Wallis, $P<0.05$) and in HIT during the wet season, ($\bar{x}=79.44\pm12.46 \text{ g m}^{-2}$, Kruskal Wallis, $P<0.05$) and minimum was recorded in HETIR overall, in dry and wet seasons ($\bar{x}=25.93\pm6.80 \text{ g m}^{-2}$, $38.49\pm9.65 \text{ g m}^{-2}$ and $10.86\pm3.23 \text{ g m}^{-2}$, respectively, Kruskal Wallis, $P<0.05$) seasons (Appendix Table 5.27). Among TG sites, no seasonal differences were recorded in the AGBP of *Mikania micrantha* (Mann-Whitney, $P>0.05$).

5.3.2.3 Comparison between SG and TG ES: HES, HIS, HET, HIT, HETIR and HETB

Among ES, a significantly high mean annual AGBP was recorded for HETB, overall, in dry and wet seasons ($\bar{x}=14215.79\pm1873.58 \text{ g m}^{-2}$, $7968.89\pm1265.70 \text{ g m}^{-2}$ and $20462.70\pm1514.09 \text{ g m}^{-2}$; Kruskal Wallis, $P<0.05$), and low was recorded for HIS overall, in dry and wet seasons ($\bar{x}=1317.03\pm225.47 \text{ g m}^{-2}$, $838.92\pm127.00 \text{ g m}^{-2}$, $1795.13\pm262.14 \text{ g m}^{-2}$, respectively; Kruskal Wallis, $P<0.05$) (Appendix Table 5.12). Among ES, there was a significant seasonal difference in mean annual AGBP (Mann-Whitney, $P<0.05$). Among classes, irrespective of seasons, monocots contributed significantly high to the mean annual AGBP in all ES (Kruskal Wallis, $P<0.05$) (Appendix Table 5.2). Among ES, a significantly high mean annual AGBP of monocots were recorded in HETB overall, in dry and wet seasons ($\bar{x}=13737.76\pm1838.76 \text{ g m}^{-2}$, $7536.5\pm1198.99 \text{ g m}^{-2}$ and $19939.02\pm1437.13 \text{ g m}^{-2}$, respectively; Kruskal Wallis, $P<0.05$) and low was recorded in HIS ($\bar{x}=1161.82\pm206.97 \text{ g m}^{-2}$, $740.73\pm124.38 \text{ g m}^{-2}$,

1582.91±257.35 g m⁻², respectively; Kruskal Wallis, $P<0.05$) (Table 5.2 and Appendix Tables 5.12-5.13). Among ES, a significant seasonal difference was recorded in the mean annual AGBP of monocots (Mann-Whitney, $P<0.05$). Among growth forms, irrespective of seasons, grasses contributed significantly high to the mean annual AGBP in all ES (Kruskal Wallis, $P<0.05$) (Appendix Table 5.2). Among ES, a significantly high mean AGBP of grasses was recorded in HETB overall in dry and wet seasons ($\bar{x}$ = 13086.8±1747.32 g m⁻², 7024.22±1143.72 g m⁻², 19149.38±1129.31 g m⁻², respectively; Kruskal Wallis, $P<0.05$) and low was recorded in HIS overall, in dry and wet seasons ($\bar{x}$ = 886.07±155.30 g m⁻², 589.82±85.69 g m⁻² and 1182.32±216.08 g m⁻², respectively; Kruskal Wallis, $P<0.05$) (Table 5.3 and Appendix Table 5.12-5.13). Among ES, a significant seasonal difference was recorded in the mean annual AGBP of grasses (Mann-Whitney, $P<0.05$). Among families, irrespective of seasons, Poaceae contributed maximum to mean annual AGBP in all ES (Appendix Tables 5.15-5.16 and 5.19-5.22). Among ES, a high mean annual AGBP of Poaceae was recorded in HETB overall, in dry and wet seasons ($\bar{x}$ =13086.80±1747.32 g m⁻², 7024.22±1143.72 g m⁻² and 19149.38±1129.31 g m⁻²) and low was recorded in HIS overall, in dry and wet seasons ($\bar{x}$ = 886.07±155.30 g m⁻², 943.71±360.06 g m⁻² and 1182.32±216.08 g m⁻²) (Appendix Tables 5.17-5.18 and 5.15-5.16). Among life cycles, irrespective of seasons, perennials contributed significantly high to the mean annual AGBP in all ES (Kruskal Wallis, $P<0.05$) (Appendix Table 5.2). Among ES, a significantly high mean annual AGBP of perennials were recorded in HETB overall, in dry and wet seasons (14075.32±1852.37 g m⁻², 7877.71±1243.06 g m⁻² and 20272.93±1478.49 g m⁻², respectively; Kruskal Wallis, $P<0.05$) and low was recorded in HIS (1184.84±202.91 g m⁻², 785.23±115.99 g m⁻² and 1584.45±268.75 g m⁻², Kruskal Wallis, $P<0.05$) (Table 5.4 and Appendix Table 5.12 and 5.13). Among ES, a significant seasonal difference was recorded in the mean annual AGBP of perennials (Mann-Whitney, $P<0.05$).

5.3.3 Belowground Biomass Productivity: HIS and HIT

The overall mean annual BGBP was 12203.34 ±916.95 g m⁻² (Table 5.5). Compared to the dry season, a high mean BGBP was recorded during the dry season ($\bar{x}$ =14224.47±926.52 g m⁻², t-test, $P>0.05$) (Appendix Table 5.28). Overall, the mean BGBP of HIS and HET were 2740.00 ±189.59 g m⁻² and 9463.34 ±737.82 g m⁻²,

respectively (Table 5.5). Compared to the dry season, a significantly high mean BGBP was recorded during the dry season in both HIS ($\bar{x}=3187.16\pm95.13 \text{ g m}^{-2}$, t-test, $P<0.05$) and HIT ($\bar{x}=11037.30\pm840.74 \text{ g m}^{-2}$, t-test, $P<0.05$) (Appendix Table 5.28). Compared to HIS, a significantly high mean BGBP was recorded in HIT overall, in dry and wet seasons ($\bar{x}=9463.34\pm737.82 \text{ g m}^{-2}$, $11037.3\pm840.74 \text{ g m}^{-2}$ and $7889.38\pm426.62 \text{ g m}^{-2}$; t-test, $P<0.05$). Between SG and TG, no significant seasonal differences were recorded in mean annual BGBP (t-test, $P>0.05$) (Appendix Table 5.29).

Table 5.5. Overall and seasonal belowground biomass productivity (g m^{-2}) recorded from experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Seasons	Total	Mean $\pm$ SE
HIS	Overall	21919.98	2740.00 $\pm$ 189.59
	Dry	12748.65	3187.16 $\pm$ 95.13
	Wet	9171.33	2292.83 $\pm$ 159.32
HIT	Overall	75706.73	9463.34 $\pm$ 737.82
	Dry	44149.21	11037.30 $\pm$ 840.74
	Wet	31557.52	7889.38 $\pm$ 426.62
Total (HIS & HIT)	Overall	97626.71	12203.34 $\pm$ 916.95
	Dry	56897.86	14224.47 $\pm$ 926.52
	Wet	40728.85	10182.21 $\pm$ 584.77

HIS- herbivore inclusion in short grassland, HIT- herbivore inclusion in tall grassland and SE- standard error.

5.3.4 Effect of Environmental Factors on Aboveground Biomass Productivity

In grasslands, AGBP was mostly influenced throughout the study period by K, N, P, C, RF and MINT; in the dry season, by K, C, N, and P and in the wet season by K, P, N, C, RF, MAXT and MINT (Table 5.6). The correlogram revealed that irrespective of season, AGBP was significantly positively correlated with the C, N, P and K content of the soil (Figure 5.1). In SG, AGBP was mostly influenced throughout the study period by P, N, C and K, in the dry season by N and C and in the wet season by P, C, N and K (Table 5.6). The correlogram revealed that irrespective of the seasons, the AGBP of SG was significantly positively correlated with the C, N, P and K content of the soil (Figure 5.2). In TG, AGBP was mostly influenced throughout the study period by K, N, C, P, RF, and MINT; in the dry season, by K, C, N and P and in the wet season by K, P, N, C, RF, MAXT and MINT (Table 5.6). The correlogram revealed that irrespective of the

seasons, the AGBP of TG was significantly positively correlated with the C, N, P and K content of the soil (Figure 5.3).

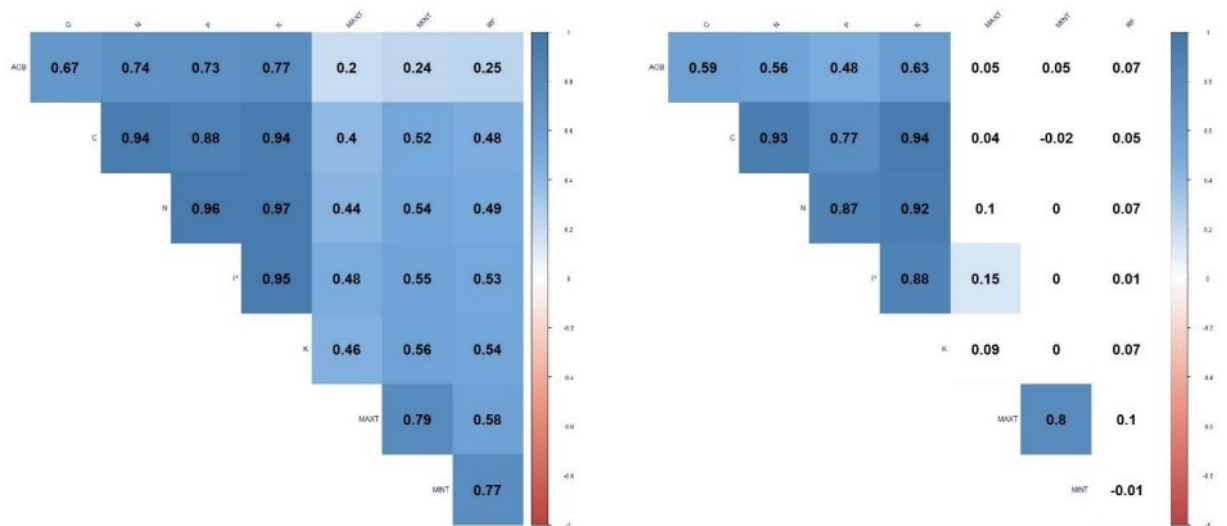
In HES, AGBP was mostly influenced throughout the study period by P, C, N and K, in the dry season by C, N, K and P and in the wet season by P, C, N and K (Table 5.6). The correlogram revealed that irrespective of the seasons, the AGBP of HES was significantly positively correlated with the C, N, P and K content of the soil (Figure 5.4). In HIS, AGBP was mostly influenced throughout the study period by N, P, C and K, in the dry season by K and P and in the wet season by P and C (Table 5.6). The correlogram revealed that irrespective of the seasons, the AGBP of HIS was significantly positively correlated with the C, N, P and K content of the soil (Figure 5.5). In HET, AGBP was mostly influenced throughout the study period by C, N, K, P and MINT, in the dry season by C and N and in the wet season by P, C, N, K and MINT (Table 5.6). The correlogram revealed that irrespective of the seasons, the AGBP of HET was significantly positively correlated with the C, N, P and K content of the soil (Figure 5.6). In HIT, AGBP was mostly influenced throughout the study period by C, K and N, in the dry season by P, N and C and in the wet season by C and K (Table 5.6). The correlogram revealed that throughout the study period and in the dry season, the AGBP of HIT was significantly positively correlated with C, N and P content of the soil, except for MAXT, MINT and RF, which was significantly negatively correlated in the dry season (Figure 5.7). The ABGP was significantly positively correlated with C and K content in the wet season. In HETB, AGBP was mostly influenced throughout the study period by MINT, MAXT, RF, C, N, K and P, in the dry season by MINT and P and in the wet season by P and N (Table 5.6). The correlogram revealed that only in the dry season, the AGBP of HETB was significantly positively correlated with MINT and significantly negatively correlated with the P content of the soil (Figure 5.8). In HETIR, AGBP was mostly influenced throughout the study period by MINT and N, in the dry season by K and N and in the wet season by MINT, N and C (Table 5.6). The correlogram revealed that in the dry season, the HETIR AGBP was significantly positively correlated with K content and in the wet season with MINT (Figure 5.9).

Table 5.6. GLM models with the environmental variables that best explain the variations in the aboveground biomass productivity (g m^{-2}) of experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Seasons	Model	Ak. wt	AICc	delta	df	Log L
HES	Overall	P+C+N+K	0.53	-183.97	0.00	6	98.40
		P+C+N+K+MINT	0.29	-182.75	1.21	7	98.94
	Dry	C+N+K+P	0.41	-82.03	0.00	6	47.81
		C+N+K	0.40	-82.00	0.03	5	46.56
	Wet	P+C+N+K	0.59	-57.78	0.00	6	35.91
		P+C+N+K+MINT	0.28	-56.30	1.48	7	36.55
HIS	Overall	N+P+C+K	0.37	-45.23	0.00	6	29.64
		N+P+C+K+MINT+RF+MAXT	0.20	-44.00	1.23	9	33.37
	Dry	K+P	0.64	-13.78	0.00	4	11.95
		K+P+N	0.28	-12.17	1.62	5	12.75
	Wet	P+C	0.79	-14.44	0.00	4	12.27
		P+C+N	0.17	-11.40	3.04	5	12.37
Total (SG)	Overall	P+N+C+K	0.52	-271.81	0.00	6	142.19
		P+N+C+K+MINT	0.32	-270.82	0.99	7	142.79
	Dry	N+C	0.67	-128.29	0.00	4	68.40
		N+C+K	0.22	-126.07	2.22	5	68.42
	Wet	P+C+N+K	0.42	-93.29	0.00	6	53.29
		P+C	0.20	-91.86	1.42	4	50.23
HET	Overall	C+N+K+P+MINT	0.70	-92.90	0.00	7	54.33
		C+N+K+P+MINT+RF	0.20	-90.42	2.48	8	54.36
	Dry	C+N	0.43	-54.48	0.00	4	31.81
		C+N+K	0.41	-54.38	0.10	5	33.07
	Wet	P+C+N+K+MINT	0.79	-23.75	0.00	7	21.21
		P+C+N+K+MINT+RF	0.14	-20.25	3.50	8	21.25
HIT	Overall	C+K+N	0.43	-106.83	0.00	5	58.87
		C+K	0.32	-106.21	0.62	4	57.40
	Dry	P+N+C	0.40	-49.32	0.00	5	30.66
		P+N	0.26	-48.43	0.89	4	28.86
	Wet	C+K	0.65	-35.52	0.00	4	22.41
		C+K+N	0.26	-33.64	1.88	5	22.82
HETB	Overall	MINT+MAXT+RF+C+N+K+P	0.69	-34.58	0.00	9	28.66
		MINT+MAXT+RF+C+N	0.21	-32.22	2.36	7	24.51
	Dry	MINT+P	0.48	-17.90	0.00	4	14.00
		MINT+P+N+MAXT+K	0.18	-15.89	2.01	7	18.45
	Wet	P+N	0.73	-14.43	0.00	4	12.27
		P+N+K	0.22	-12.03	2.40	5	12.68
HETIR	Overall	MINT+N	0.67	-26.83	0.00	4	18.06
		MINT+N+C	0.21	-24.46	2.37	5	18.23
	Dry	K+N	0.81	-5.39	0.00	4	8.03
		K+N+P	0.14	-1.85	3.54	5	8.07
	Wet	MINT+N+C	0.71	-4.20	0.00	5	10.10
		MINT+N	0.24	-2.04	2.16	4	6.84
Total (TG)	Overall	K+N+C+P+RF+MINT	0.69	-272.53	0.00	8	144.60
		K+N+C+P+RF+MINT+MAXT	0.27	-270.67	1.87	9	144.75
	Dry	K+C+N+P	0.61	-126.14	0.00	6	69.44
		K+C+N+P+RF	0.20	-123.94	2.21	7	69.47
	Wet	K+P+N+C+RF+MAXT+MINT	0.98	-137.89	0.00	9	78.86

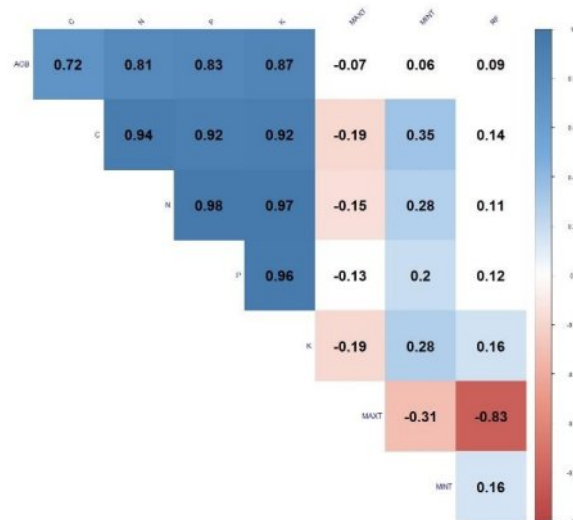
Experimental sites	Seasons	Model	Ak. wt	AICc	delta	df	Log L
Total (SG & TG)	Overall	K+P+N+C+RF+MAXT	0.01	-128.22	9.67	8	72.84
		K+N+P+C+RF+MINT	0.63	-593.33	0.00	8	304.85
		K+N+P+C+RF+MINT+MAXT	0.37	-592.26	1.07	9	305.37
	Dry	K+C+N+P	0.62	-300.80	0.00	6	156.61
		K+C+N+P+RF	0.21	-298.66	2.14	7	156.62
	Wet	K+P+N+C+RF+MAXT+MINT	0.97	-302.94	0.00	9	161.00
		K+P+N+C+RF	0.01	-294.04	8.90	7	154.34

SG- short grassland, TG- tall grassland, HES- herbivore exclusion in short grassland, HIS- herbivore inclusion in short grassland, HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal, C- organic carbon, N- nitrogen, P- phosphorus, K- potassium, RF- rainfall, MINT- minimum temperature and MAXT- maximum temperature.



(a)

(b)



(c)

Figure 5.2. Correlogram showing the relationship between environmental parameters explaining variation in aboveground biomass productivity (g m^{-2}) of riverine alluvial grasslands of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P>0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P<0.05$).

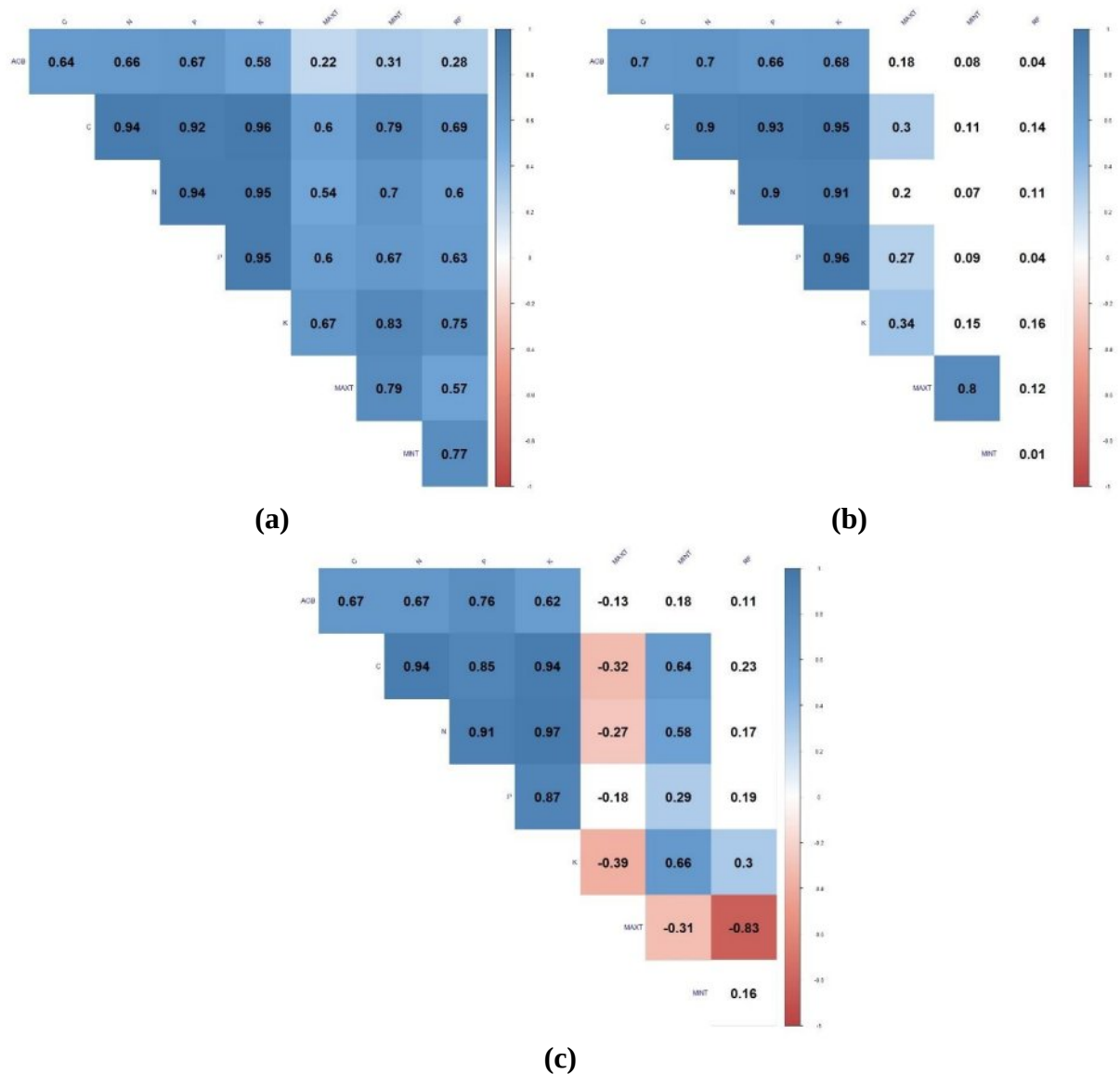


Figure 5.3. Correlogram showing the relationship between environmental parameters explaining variation in aboveground biomass productivity (g m^{-2}) of short grasslands (SG) of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The

values within the white boxes represent insignificant correlation ($P>0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P<0.05$).

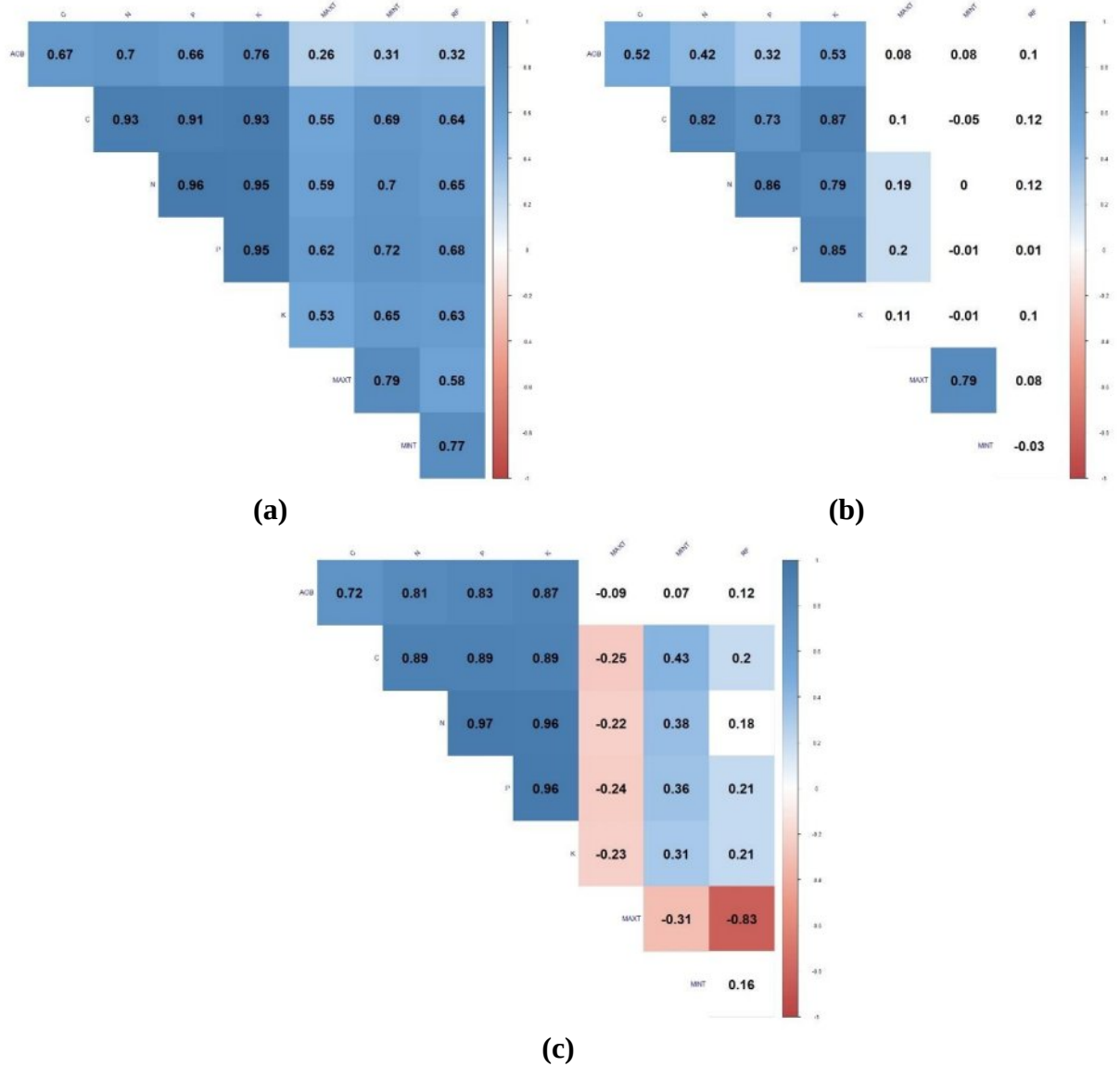


Figure 5.4. Correlogram showing the relationship between environmental parameters explaining variation in aboveground biomass productivity (g m^{-2}) of tall grassland (TG) of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P>0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P<0.05$).

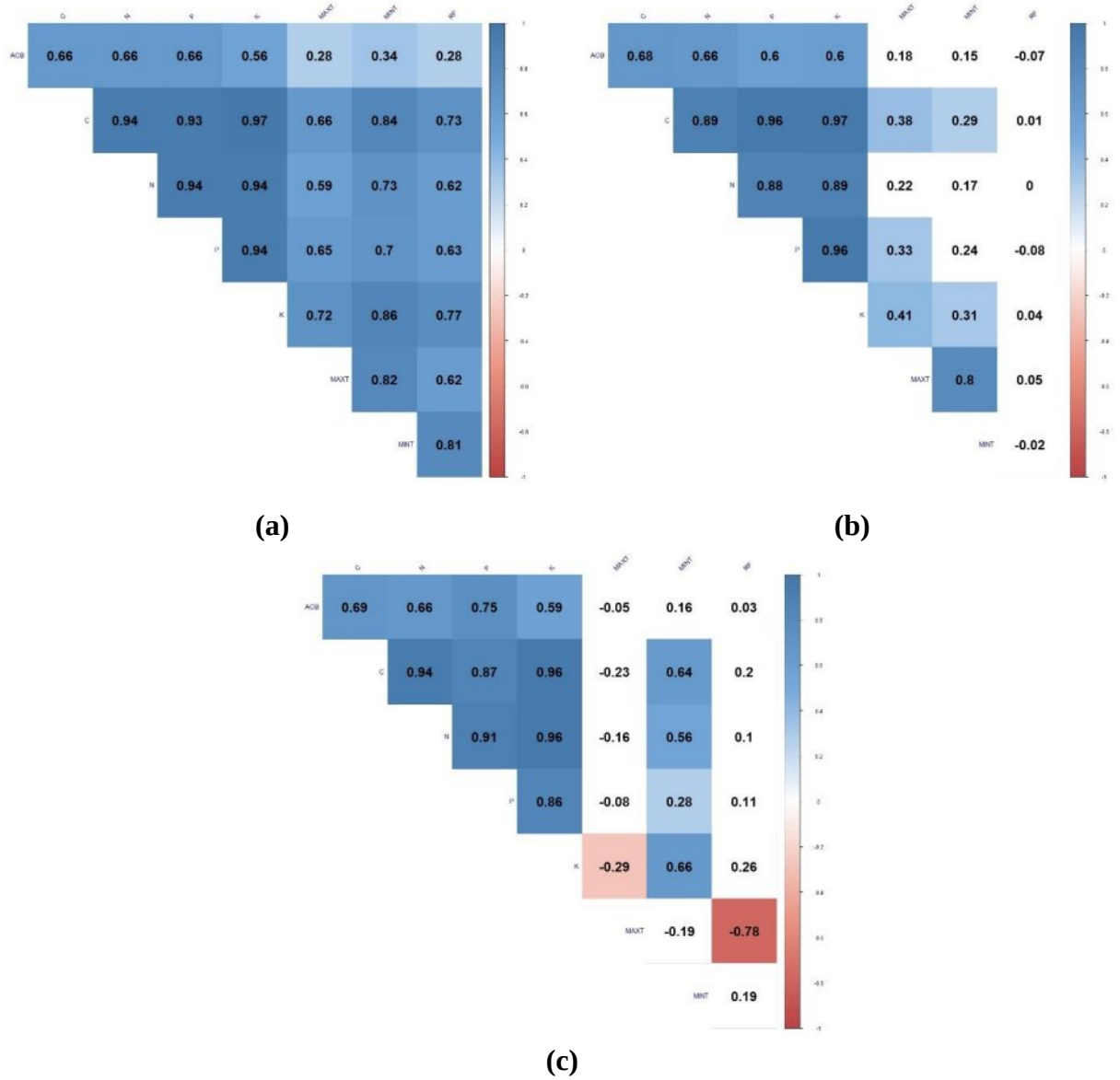


Figure 5.5. Correlogram showing the relationship between environmental parameters explaining variation in aboveground biomass productivity (g m^{-2}) of herbivore exclusion in short grassland (HES) of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P>0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P<0.05$).

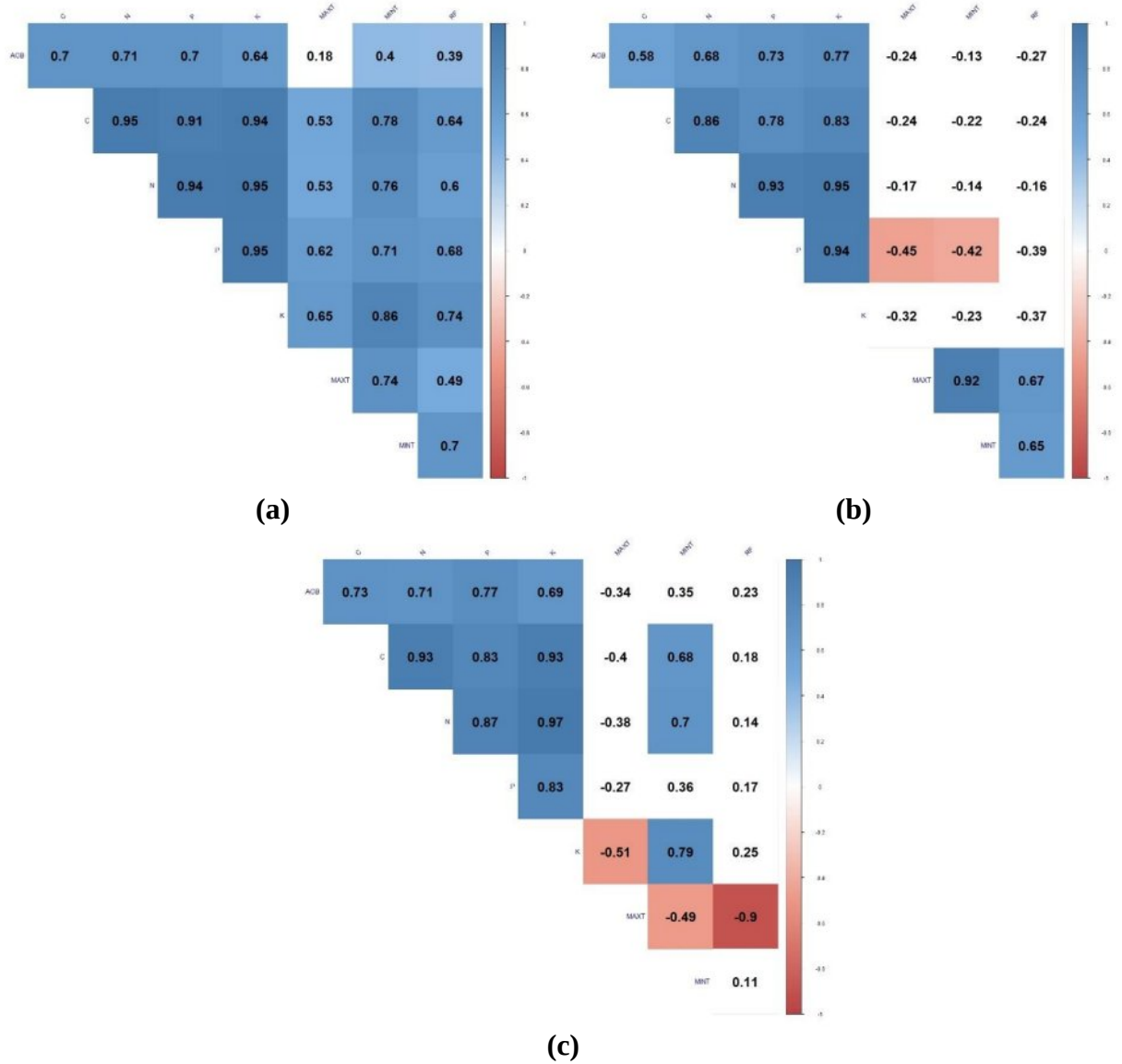


Figure 5.6. Correlogram showing the relationship between environmental parameters explaining variation in aboveground biomass productivity (g m^{-2}) of herbivore inclusion in short grassland (HIS) of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P > 0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P < 0.05$).

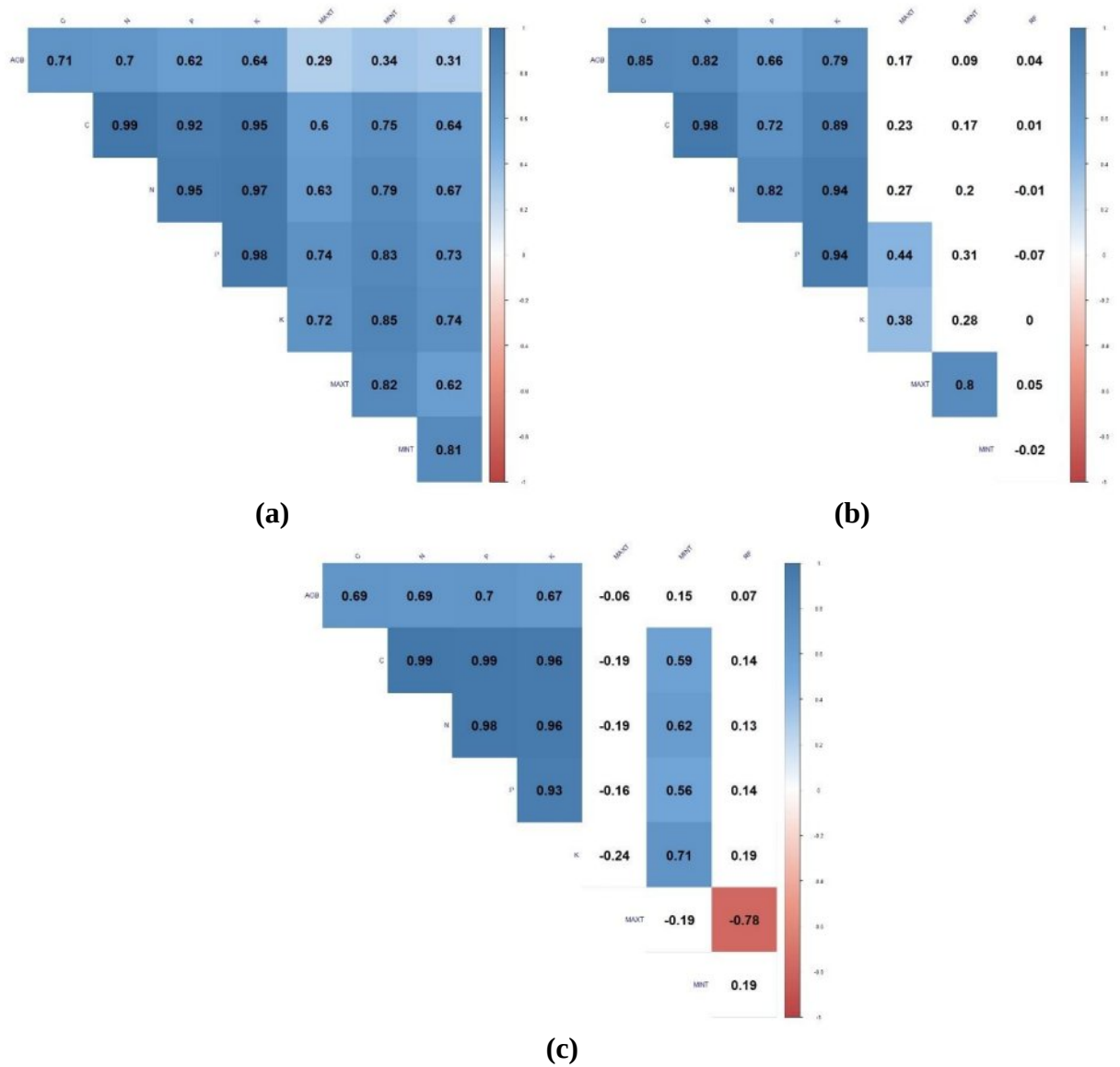


Figure 5.7. Correlogram showing the relationship between environmental parameters explaining variation in aboveground biomass productivity (g m^{-2}) of herbivore exclusion in tall grassland (HET) of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P>0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P<0.05$).

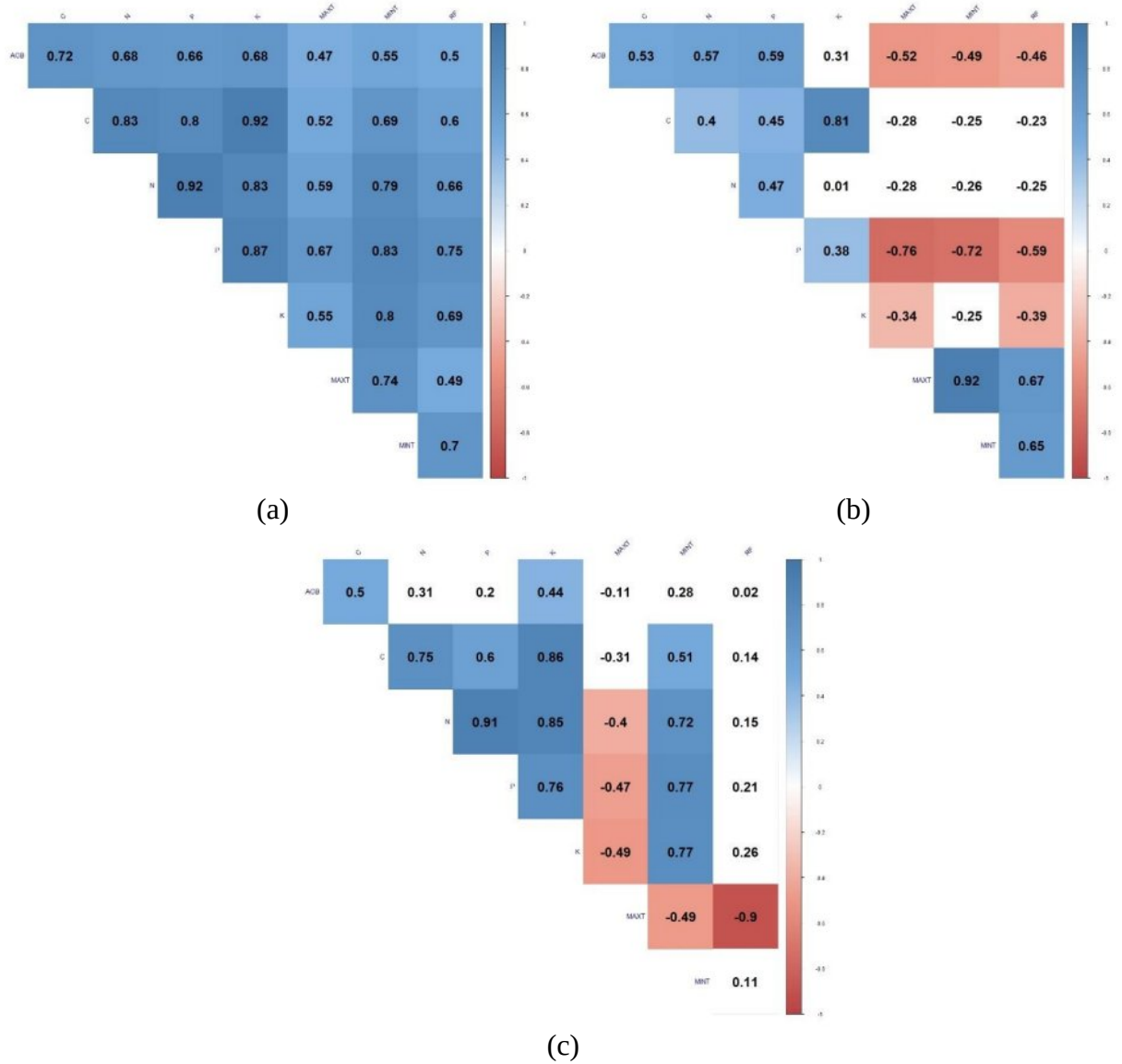


Figure 5.8. Correlogram showing the relationship between environmental parameters explaining variation in aboveground biomass productivity (g m^{-2}) of herbivore inclusion in tall grassland (HIT) of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P > 0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P < 0.05$).

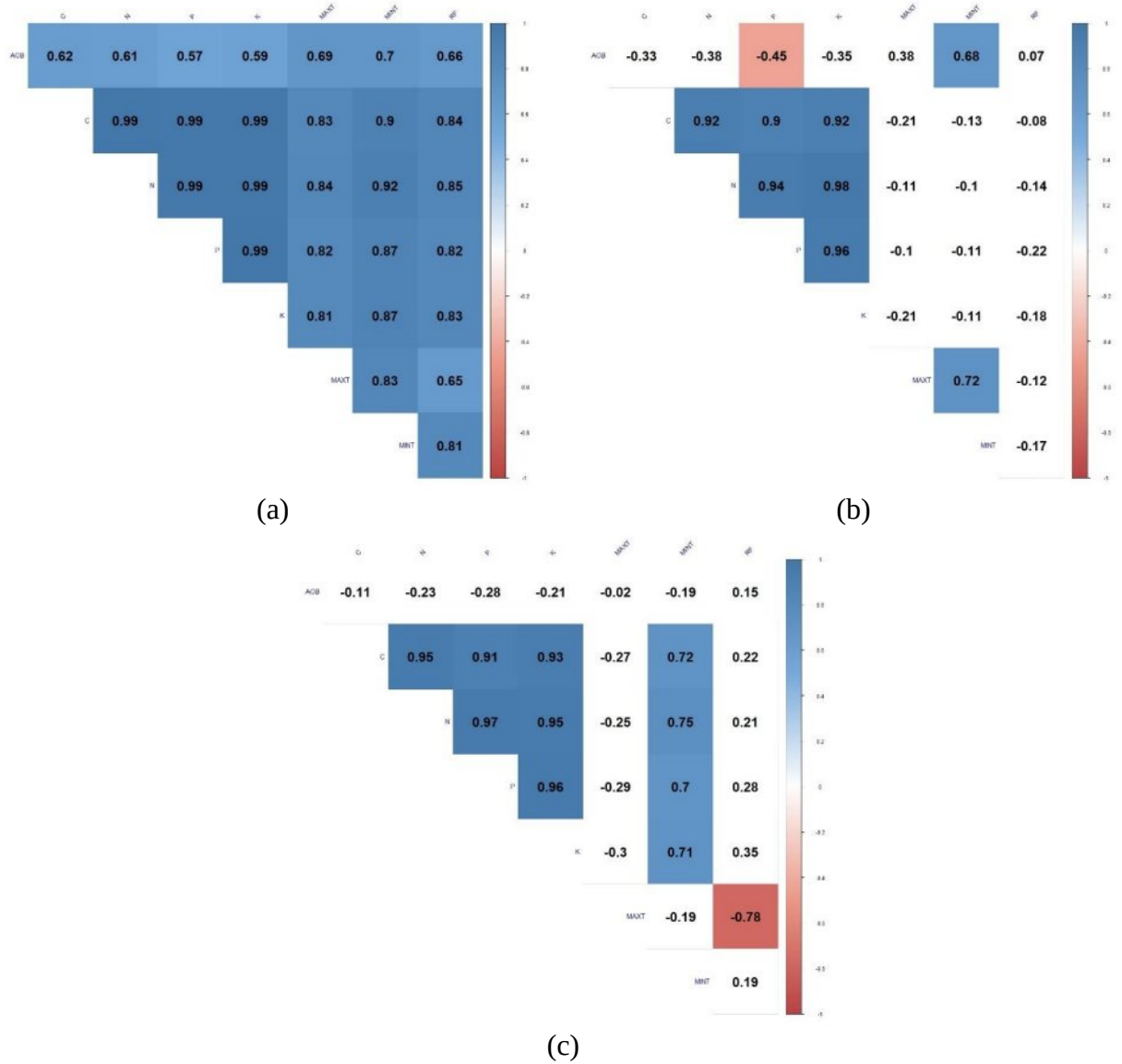


Figure 5.9. Correlogram showing the relationship between environmental parameters explaining variation in aboveground biomass productivity (g m^{-2}) of herbivore exclusion in tall grassland with burning (HETB) of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P > 0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P < 0.05$).

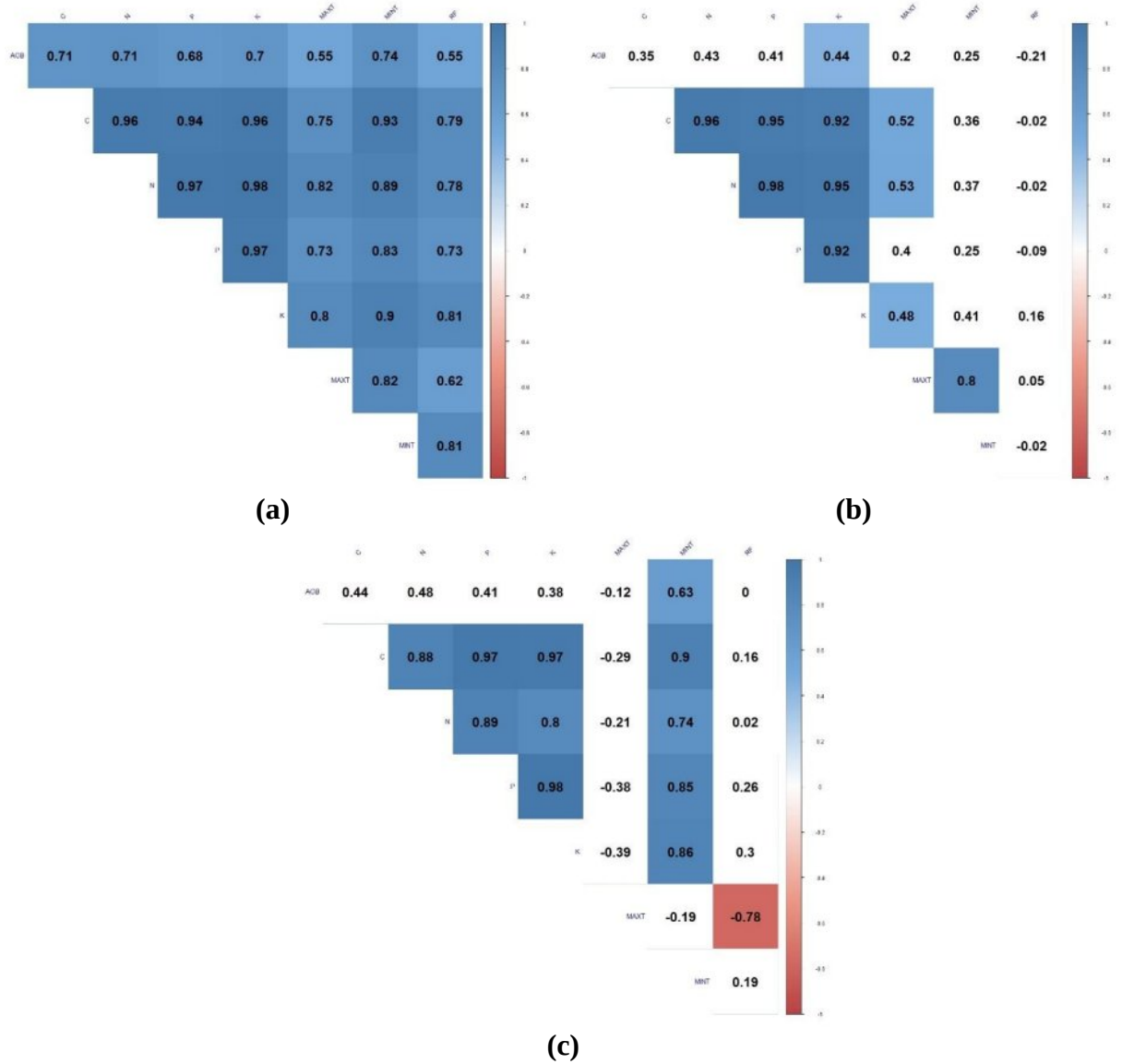


Figure 5.10. Correlogram showing the relationship between environmental parameters explaining variation in aboveground biomass productivity (g m^{-2}) of herbivore exclusion in tall grassland with invasive removal (HETIR) of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P > 0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P < 0.05$).

5.3.5 Effect of Environmental Factors on Belowground Biomass Productivity

In grasslands, the BGBP of grasslands was overall influenced by C, N, MAXT, K, RF, MINT and P, in the dry season by C and K and in the wet season by MAXT, C, N, RF, MINT and K (Table 5.7). The correlogram revealed that throughout the study period and in the wet season, BGBP was significantly positively correlated to C, N, and K and negatively correlated with MAXT, RF, and MINT (Figure 5.10). While in the dry season, BGBP was significantly positively correlated with the C, N, P, and K content of the soil. In HIS, the BGBP was mostly influenced throughout the study period by MAXT, RF, MINT, K, P, C and N, in the dry season by K and N and in the wet season by MAXT, RF, MINT, K, P and C (Table 5.7). The correlogram revealed that throughout the study period and in the wet season, the BGBP of HIS was significantly negatively correlated with MAXT, RF, MINT, K, and P (Figure 5.11). While in the dry season, BGBP was significantly positively correlated with the C, N, P, and K content of the soil. In HIT, BGBP was mostly influenced throughout the study period by P, MAXT, RF, K, N, C and MINT, in the dry season by N and P and in the wet season by MAXT, P, RF, MINT, K and N (Table 5.12). The correlogram revealed that throughout the study period and only in the wet season, the BGBP of HIT was significantly negatively correlated with MAXT, RF, MINT, C, N, K, and P (Figure 5.7).

Table 5.7. GLM models with the environmental variables that best explain the variations in the belowground biomass productivity (g m^{-2}) of experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Seasons	Model	Ak. wt	AICc	delta	df	Log L
HIS	Overall	MAXT+RF+MINT+K+P+C+N	1.00	-101.10	0.00	9	61.92
		MAXT+RF+MINT+K+P+C	0.00	-86.51	14.59	8	53.10
	Dry	K+N	0.92	-25.40	0.00	4	19.55
		K+N+C	0.07	-20.33	5.07	5	20.16
	Wet	MAXT+RF+MINT+K+P+C	0.42	-101.14	0.00	8	61.24
		MAXT+RF+MINT+K+P+C+N	0.31	-100.51	0.63	9	62.72
HIT	Overall	P+MAXT+RF+K+N+C+MINT	1.00	-142.80	0.00	9	81.85
		P+MAXT+RF+K+N	0.00	-118.93	23.87	7	67.34
	Dry	N+P	0.74	-31.42	0.00	4	21.25
		N+P+C	0.17	-28.47	2.96	5	21.73
	Wet	MAXT+P+RF+MINT+K+N	0.45	-121.79	0.00	8	70.50
		MAXT+P+RF	0.27	-120.81	0.98	5	66.03
Total (HIS & HIT)	Overall	C+N+MAXT+K+RF+MINT+P	0.96	-127.91	0.00	9	73.78
		C+N+MAXT+K+RF	0.03	-120.96	6.95	7	67.98
	Dry	C+K	0.34	-48.46	0.00	4	29.03

Experimental sites	Seasons	Model	Ak. wt	AICc	delta	df	Log L
	Wet	C+K+N	0.33	-48.36	0.09	5	30.43
		MAXT+C+N+RF+MINT+K	0.55	-148.56	0.00	8	83.17
		MAXT+C+N+RF+MINT+K+P	0.45	-148.16	0.39	9	84.21

HIS- herbivore inclusion in short grassland, HIT- herbivore inclusion in tall grassland, C- organic carbon, N- nitrogen, P- phosphorus, K- potassium, RF- rainfall, MINT- minimum temperature and MAXT- maximum temperature.

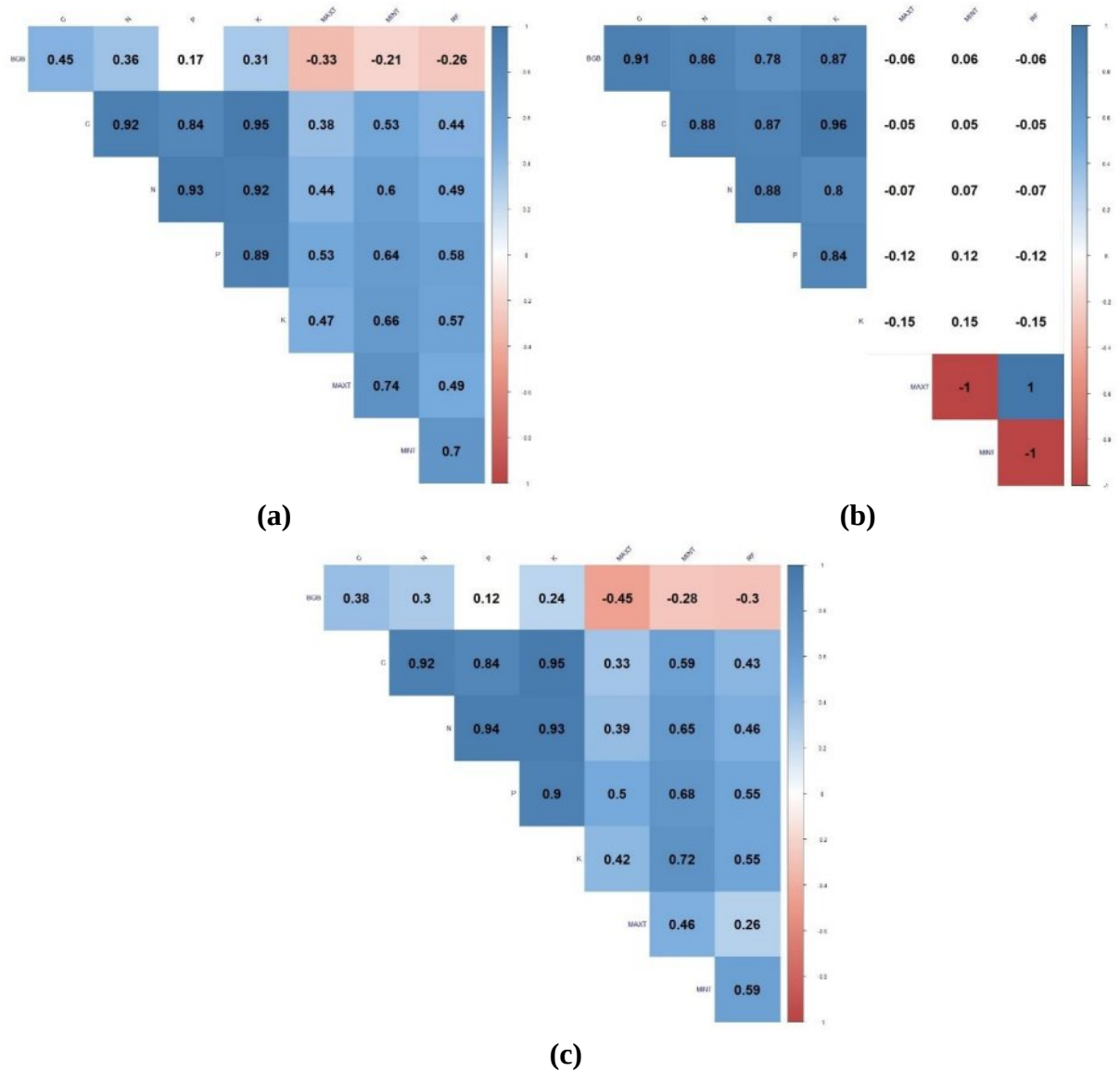


Figure 5.11. Correlogram showing the relationship between environmental parameters explaining variation in belowground biomass productivity (g m^{-2}) of riverine alluvial grasslands of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P>0.05$), whereas

the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P < 0.05$).

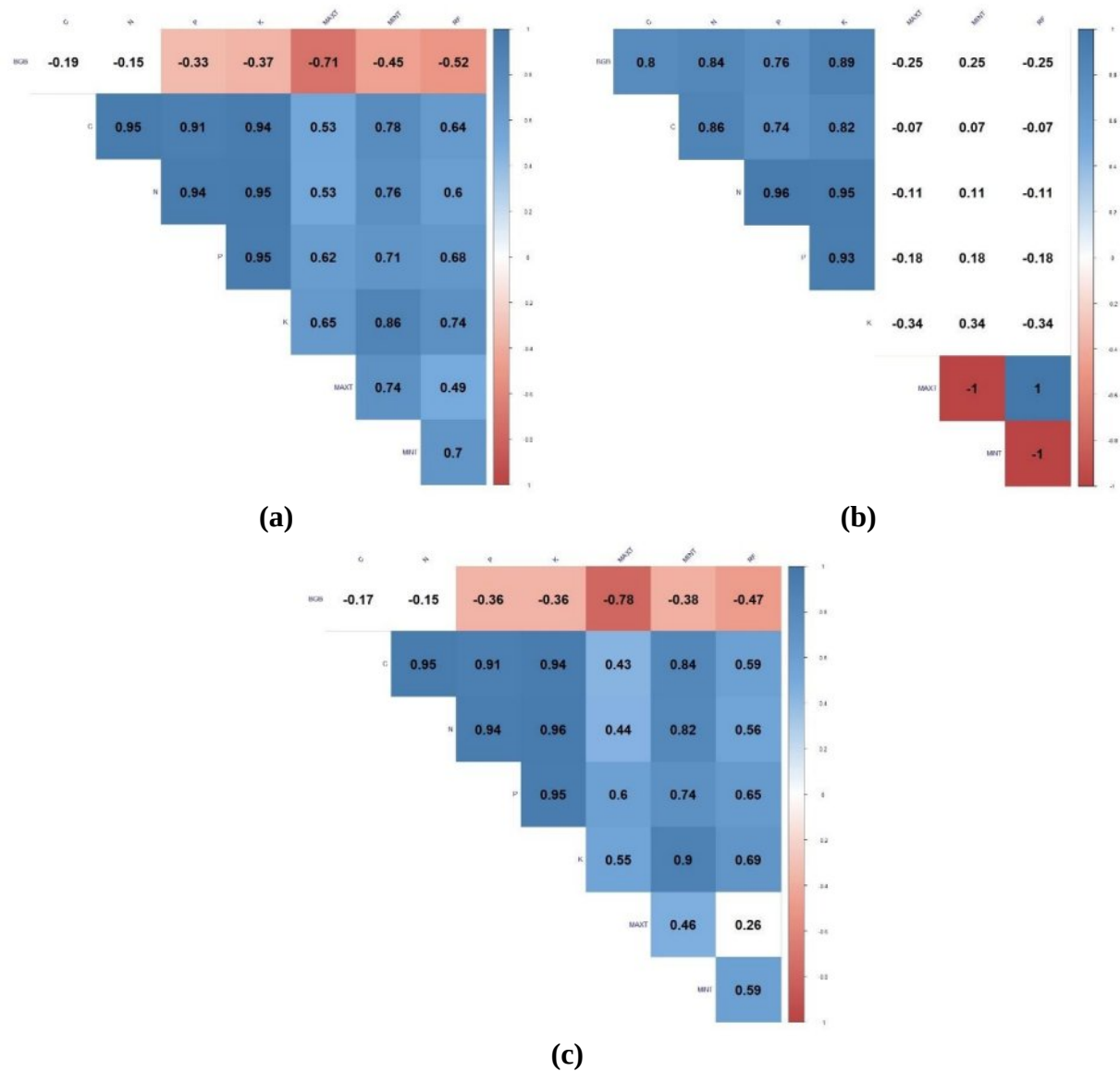


Figure 5.12. Correlogram showing the relationship between environmental parameters explaining variation in belowground biomass productivity (g m^{-2}) of herbivore inclusion in short grassland (HIS) of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P > 0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P < 0.05$).

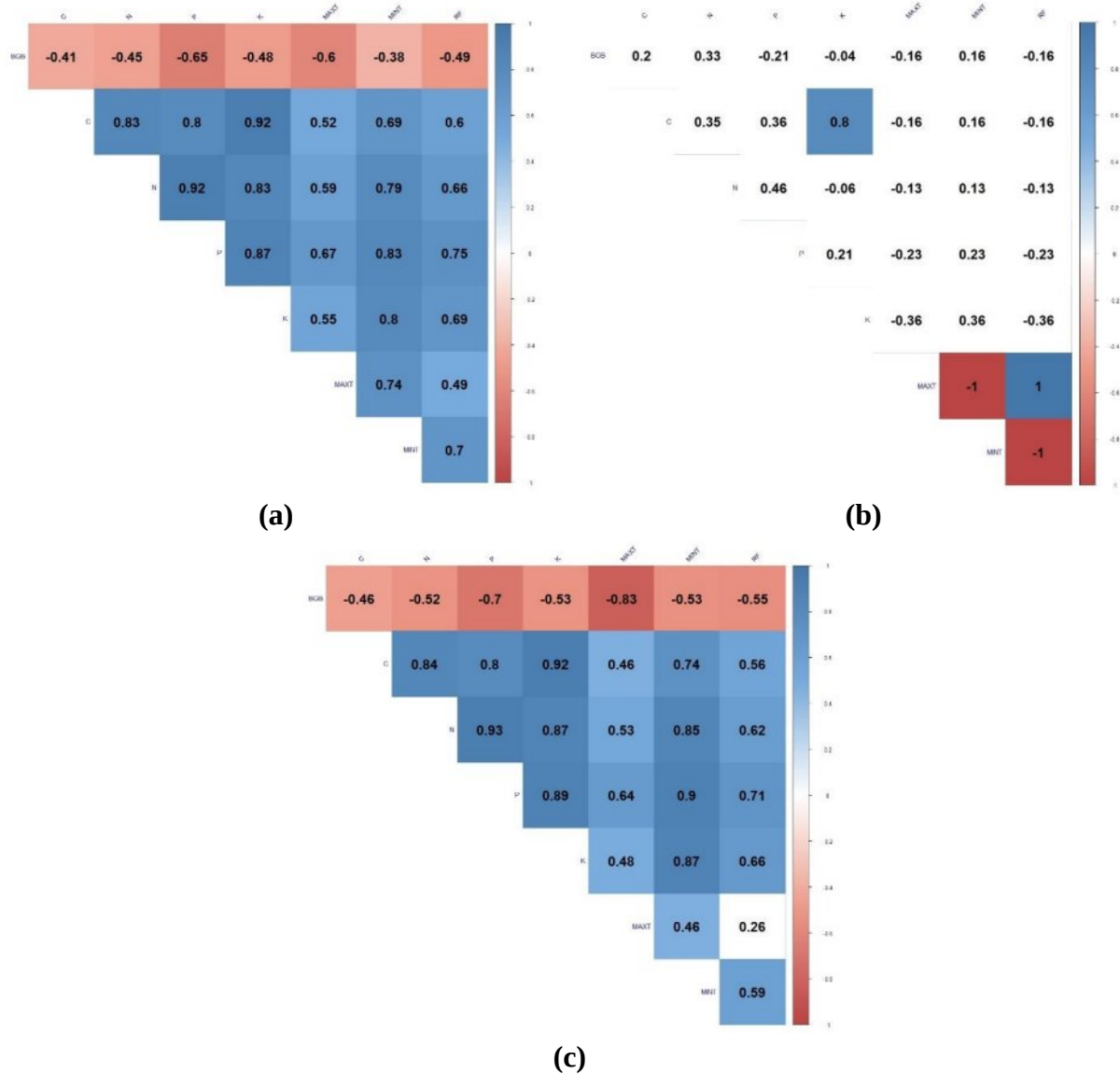


Figure 5.13. Correlogram showing the relationship between environmental parameters explaining variation in belowground biomass productivity (g m^{-2}) of herbivore inclusion in tall grassland (HET) of Kaziranga National Park (a) overall, (b) dry season, and (c) wet season. The values within the white boxes represent insignificant correlation ($P > 0.05$), whereas the values within the red (negative correlation) and blue (positive correlation) boxes represent significant correlation ($P < 0.05$).

5.4 Discussion

The biomass production of tropical grasslands may vary considerably due to changes in the intensity and frequency of climatic events, grazing by mega- and meso-herbivores and management practices such as burning and invasive removal (Lehmkuhl, 1989; Oosterheld et al., 1999; Buisson et al., 2018). This chapter aims to provide experimental evidence that grazing and management practices are crucial in defining the productivity potential of tropical riverine alluvial grasslands. Present study revealed that AGBP of SG varied from 1317 g m⁻² to 3580 g m⁻², and TG varied from 5264 g m⁻² to 14216 g m⁻², which was comparatively higher than other tropical grasslands (Ambasht et al., 1972; Singh & Yadava, 1974; Singh & Krishnamurthy, 1981; Lehmkuhl, 1989; Tuboi, 2013). The higher productivity potential of these grasslands could result from a large amount of rainfall (during monsoon and post-monsoon) and regular replenishment and deposition of fertile and nutrient-rich alluvial soil during annual floods received by these grasslands (Khatri & Barua, 2011). The results from the present chapter revealed that species belonging to class monocots, growth form grasses, family Poaceae and life cycle perennials significantly contributed to high mean annual AGBP in both SG and TG, as perennial grasses are the primary dominant vegetation documented from these grasslands (Khatri & Barua, 2011; Joyce et al., 2016). Similar to other tropical grasslands, the AGBP of SG and TG significantly increases during the wet season and declines during the dry season, as the commencement of monsoonal rains promotes resprouting and new species growth in wet season followed by the maturity of tillers in the dry season (Singh & Yadava, 1974; Khatri & Barua, 2011; Pathak et al., 2018).

Similarly, the BGBP recorded for SG was 2740 g m⁻², and TG was 9463 g m⁻², which is comparatively higher than other tropical grasslands (Singh & Yadava, 1974; Singh & Krishnamurthy, 1981). High aboveground biomass accumulation might have contributed to high BGBP in these grasslands (Khatri & Barua, 2011; Lehmkuhl, 1989). This study revealed that irrespective of season, the BGBP of HIS and HIT (except for the wet season in HIT) was higher compared to AGBP. According to Long et al. (1989), 50% of the biomass in tropical grasslands is composed of roots and rhizomes, a proportion that increases during the dry season to 70%. Also, plant growth theory predicts that plants in stressful conditions allocate much dry matter to belowground

organs and develop large reserve pools (Grime, 1979; Titlyanova et al., 1999). High BGBP compared to AGBP in the present study might result from difference in the intensity of stress factors, including flooding, low temperatures, increased grazing pressure and fire management (Singh & Yadava, 1974; Sims & Singh, 1978; Long et al., 1989; Titlyanova et al., 1999). Contrary to AGBP, the BGBP of HIS and HIT sites increased from the wet to dry season. The results of this study were consistent with studies conducted by Singh and Yadava (1974) and Sims and Singh (1978) on tropical grasslands, where low temperature (dry conditions) induces change in plant resource allocation strategies, including downward translocation of the assimilates with lower respiratory loss or changes in the botanical composition resulting into high BGBP during dry seasons compared to wet seasons. The results of the present chapter recorded significantly higher AGBP and BGBP in TG compared to SG, as tall grass species, namely *Saccharum* spp., dominates in TG, which attains a height of 6-8 m and accumulates high biomass (Khatri & Barua, 2011).

The results from the chapter also revealed that irrespective of seasons, grazing exclusion experiments in short grasslands (HES) enhances mean annual AGBP; however, in tall grasslands (HET) reduces AGBP. The effect of herbivory on AGBP can vary from positive to negative, as various mechanisms governs it, including herbivore consumption and selectivity pattern (defines species colonization and extinction), productivity and evolutionary history of plant communities and different environmental and edaphic conditions (e.g., Milchunas & Lauenroth, 1993; Olf & Ritchie, 1998; Proulx & Mazumder, 1998; Bakker & Olf, 2003). Probably, low grazing pressure, change in species composition, taller canopy (with a small proportion of green and a large amount of standing dead and litter biomass) and change in soil nutrients conditions might have supported high biomass productivity in ungrazed HES and *vice versa* for grazed HIS similar to the finding of Rusch and Oesterheld (1997). Contrarily, herbivory in HIT might have increased productivity by preventing vegetation senescence, reducing dead biomass, and thus increasing light penetration (photosynthetic efficiency) to stimulate new plant growth and productivity, similar to the effect of grazing reported on tropical grasslands of America and Africa by McNaughton (1976) and Altesor et al. (2005). The low productivity in ungrazed HET could result from a large quantity of standing dead biomass deposition in the absence

of grazing and burning, which limits the new species germination and reduces radiation absorption efficiency due to self-shading (taller canopy) (Altesor et al., 2005; Pathak et al., 2017).

In KNP, the high forage value and grazing pressures on short grasslands (HIS) might have reduced the AGBP; however, in tall grasslands (HIT), low grazing pressure and forage value might have supported a high AGBP in HIT (Khatri & Barua, 2011). A study conducted in the subtropical grasslands of Nepal (Bardia National Park) concluded that grazing lawns provide forage with a higher quantity and quality than tall grasslands (Thapa et al., 2021). This study's findings revealed that irrespective of season, the AGBP of both *Mimosa* spp. and *Mikania micrantha* was high in ungrazed HET compared to HIT, as herbivore exclusion from tropical grasslands, changes vegetation composition favoring the growth of non-gassy species, including invasives (Potter et al., 2021). Devi et al. (2022a) reported that large herbivores in KNP act as grazers and mixed feeders, consuming both woody and invasive species, possibly reducing the AGBP of invasive species in grazed HIT. Intriguingly, irrespective of the season, at the individual level, the AGBP of *Mimosa* spp. was recorded high in HET, while *Mikania micrantha* was recorded in HIT. The absence of burning in HET might have possibly enhanced the production of woody invasive *Mimosa* spp. (Lonsdale & Miller, 1993). Also, increased soil nutrient conditions due to burning in HIT might have enhanced the production of invasive *Mikania micrantha* (Swamy & Ramakrishnan, 1988). The absence of invasives from SG sites may be due to their location near water bodies, as longer inundation period controls biological invasion (Bezbarua, 2007).

The findings of this study revealed that irrespective of seasons, controlled burnt sites (HETB) showed the highest AGBP. The present chapter results were consistent with the effect of burning reported on the AGBP of tropical grasslands reported by Singh (1993) and Pathak et al. (2017). Experimental shreds of evidence showed high biomass accumulation in burned than unburned areas, as burning removes aboveground biomass (dead plant tissues) and enhances soil nutrient content through volatilization and ash deposition for better plant growth, which probably contributes to high biomass productivity (Singh, 1993; Pathak et al., 2017). In KNP, burning is a vital tool to enhance forage production and palatability for e.g., an experimental burning on *Phragmites karka* dominated grasslands showed the highest AGBP in burned sites

(3546 tons/km²/year) compared to unburned (698 tons/km²/year). In addition, burn sites also attract more grazers as soon as new shoot germinates (Khatri & Barua, 2011; Archibald et al., 2005). The present study showed that controlled burning promotes the AGBP of herbaceous invasive *Mikania micrantha* in the overall and dry season; possibly due to increasing soil nutrient content and the adaptation of *Mikania micrantha* to fire (Swamy & Ramakrishnan, 1988). Intriguingly, irrespective of seasons, controlled burning limits the AGBP of woody invasive *Mimosa* spp., possibly due to its intolerance to fire (Lonsdale & Miller, 1993).

The finding of this study revealed that irrespective of seasons, controlled invasive removal (HETIR) sites showed high AGBP than ungrazed HES and grazed HIS sites; however, it was low compared to burned HETB sites. Probably, the uprooting of *Mimosa* spp. and *Mikania micrantha* with their entire root system and debris might have promoted the density and cover of native species and their biomass (Dew et al., 2017; Guido & Piller, 2017; Nerlekar et al., 2022; Sinha et al., 2022). However, low AGBP, compared to HETB, might result from the absence of burning in HETIR, as burning by removing dry standing biomass enhances new species growth and production by promoting high soil nutrient conditions (Singh, 1993; Pathak et al., 2017). The finding of this study revealed that the AGBP of both invasives *Mimosa* spp. and *Mikania micrantha*, was effectively reduced by manual uprooting, as it might have reduced their cover and recovered native species diversity, density and cover (Dew et al., 2017; Guido & Piller, 2017; Nerlekar et al., 2022; Sinha et al., 2022). Experimental studies conducted in tropical grasslands of Asia and Africa reported that manual uprooting of some of the noxious invasives like *Chromolaena odorata*, *Mimosa* spp. and *Mikania micrantha* have effectively reduced their densities and cover by promoting native species recovery (te Beest et al., 2012; Dew et al., 2017; Choudhury et al., 2017; Sinha et al., 2022).

The results from GLM revealed that, irrespective of seasons, soil C, N, P and K content influenced and positively correlated with the AGBP of SG and TG. Similarly, irrespective of seasons, soil C, N, P and K content influenced and positively correlated with the AGBP of HIS, HES and HET sites. In HETIR, the AGBP was influenced and positively correlated with soil K content during dry and MinT during wet seasons. Experimental studies from tropical grasslands reported that soil C, N, P and K content

are positively related to AGBP, as enhanced soil nutrient conditions promote AGBP of grasslands (Sarmiento et al., 2006; Grace et al., 2006; Loeb et al., 2009; Fay et al., 2015; Pathak et al., 2018). Additionally, climatic factors like temperature and rainfall influence the AGBP of tropical grasslands (Singh & Yadava, 1974; Pandey & Singh, 1997; Tuboi, 2013; Choudhury, 2017; Pathak et al., 2018). Intriguingly, in HIT, the AGBP was influenced and showed a positive correlation with soil C, N and P content, a negative correlation with MaxT, MinT and RF during the dry season, and a positive correlation with soil C and K content during the dry wet season. In HETB, the AGBP was influenced and showed a positive correlation with MinT and a negative correlation with P only during the dry season. Other factors like grazing and enhanced soil nutrient conditions due to burning might influence the AGBP of HIT and HETB sites (McNaughton, 1976; Pathak et al., 2018).

For BGBP, the GLM results revealed that irrespective of seasons, grasslands productivity was positively correlated with C, N and K content. Intriguingly, grassland BGBP was negatively correlated with MaxT, MinT and RF. In HIS, BGBP was positively correlated with C, N, P and K during the dry season and negatively correlated with P, K, MaxT, MinT and RF during the wet season. In HIT, BGBP negatively correlated with soil C, N, P and K content and MaxT, MinT and RF. Experimental evidence from tropical grasslands showed that low temperatures and rainfall (drought conditions) promote BGBP (Singh & Yadava, 1974; Fidelis et al., 2012). Changes in climatic and edaphic conditions might probably be responsible for the negative and positive correlation of BGBP with soil nutrient content. For e.g., the onset of the dry season in tropical grasslands, when the soil nutrient content is low, produces more root than shoot biomass and *vice versa* in wet seasons (Singh & Yadava, 1974; Fidelis et al., 2012).

Additionally, the findings of the chapter revealed that grazing exclusion from SG promotes proliferation of invasives like *Ageratum conyzoides*, *Eichhornia crassipes*, *Merremia umbellata*, *Chromolaena odorata* and *Ipomoea carnea*. Whereas in TG, grazing, burning and invasive removal encourages proliferation of invasives like *Ageratum conyzoides* and *Merremia umbellata*. Woody species like *Lippia alba* and *Solanum viarum* in SG, and *Mimosa* spp., *Flemingia lineata*, *Flueggea virosa*, *Bombax ceiba*, *Litsea salicifolia* and *Glochidion multiloculare* in TG, may potentially accelerate

the grassland succession processes. A study conducted in the adjacent riverine alluvial grasslands of Manas National Park, found that a combination of prescribed burning and herbivory has resulted in the proliferation of woody invasives including non-native *Chromolaena odorata* and natives like *Bombax ceiba* and *Leea asiatica* (Bezbarua, 2007). Therefore, it is recommended that the individualist biology of other invasive and woody species with respect to grazing and ongoing management interventions must be investigated to understand the ever-changing ecology and dynamics of riverine alluvial grasslands.

5.5 Conclusion

The changing frequency and intensity of various degrees of natural and anthropogenic disturbances have necessitated evaluating the productivity potential of different ecological systems (Singh & Yadava, 1974; Sims & Singh, 1978). Grasslands, despite harboring rich biodiversity and providing vital ecosystem services, have been largely ignored in sustainable development agendas. It is only recently that the United Nations Decade on Ecosystem Restoration (2021-2030) added ‘grasslands, shrublands and savannas’ to their focal ecosystems (Bardgett et al., 2021). To provide direction to restoration efforts targeted at conserving this rapidly degrading ecosystem, there is a need to provide scientific evidence regarding the management interventions adopted. The results from the present study indicate that climatic conditions and management practices greatly influence the annual biomass production of riverine alluvial grasslands. To meet the nutritional requirements of large herbivore populations that largely feed on monocots to fulfil their dietary needs (Devi et al., 2022a), it is necessary to maintain the productivity of short and tall grasslands in the Kaziranga landscape. However, unorganized management practices may alter grassland vegetation composition in favor of other growth forms, such as herbs, shrubs and tree development, which might influence the productivity potential of these riverine alluvial grasslands. On examining the impact of herbivory, burning and invasive uprooting via on-site experimentation, it was noted that herbivore exclusion in SG increases AGBP while in TG decreases AGBP.

Furthermore, herbivore exclusion in TG was observed to promote biomass of invasive species like *Mimosa* spp. and *Mikania micarnta*. In TG, burning drastically increases AGBP and reduces AGBP of woody invasive *Mimosa* spp.; however, it promotes AGBP of *Mikania micarnta* by multiplying more in the dry season. On the other hand, invasive uprooting promoted AGBP and was found to reduce the AGBP of invasives *Mimosa* spp. and *Mikania micarnta*. Based on the experiments, slight modifications to adaptive management practices, i.e., controlled herbivory, burning, and invasive uprooting, are recommended by IPCC (2022) to conserve tropical grassland ecosystems. For rewilding SG and TG, rotational grazing must be incorporated into the management regime, which should not exceed more than two years, as it also decreases the AGBP of TG. To optimize both productivity and soil nutrient content of TG, it is advisable to implement controlled annual burning practices. Controlled burning must be carried out only in completely dry grassland patches, and in invaded patches post manual uprooting of fire-adapted invasives like *Mikania micrantha*. Additionally, manual uprooting of invasives must be carried out seasonally, during both dry and wet cycles. Compared to TG, less scientific and management focus has been given to SG, especially with respect to herbivory and invasive management. This study has provided evidence that if managed properly, the SG have the potential to provide more foraging ground and habitat not only to the mega- and meso-herbivores but also to other associated fauna. The successful implementation of the aforementioned recommendations is expensive, and adequate financial and human capital must be allotted.

CHAPTER 6

RESOURCE DEPENDENCE AND ATTITUDES OF LOCAL COMMUNITIES TOWARD CONSERVATION OF KAZIRANGA TIGER RESERVE

6.1 Introduction

The idea of preserving biodiversity in situ was conceived in the late 19th century as a primary defense mechanism against Earth's biodiversity loss. However, two polarized views often characterize the conservation of biological diversity in PAs; one from the 'Park' position demands excluding local communities from PAs and manages to practice their legal powers by enforcing the law, whereas the 'people' position demand access and management rights for local communities (Neumann, 1998; Terborgh & van Schaik, 2002; Mackenzie et al., 2012). Alternatively, the 'Parks' position is also known as 'fences and fines' or 'fortress conservation', which aims to prioritize the intrinsic value of biodiversity and support top-down management of conservation areas (Neumann, 1998; Adams et al., 2004; Mackenzie et al., 2012). The 'people' position is defined by social injustices that occurred due to the creation of PAs, resulting in forced eviction, denied access to basic resources for their livelihoods, human-wildlife conflict and losses incurred by local communities living around the PAs as well as resistance by local communities to the exclusionary 'Parks' position (Mackenzie et al., 2012).

Floodplain wetlands served as the cradle for early civilizations, and throughout history, people have learned to cultivate and harness their abundant resources. Most of the local communities residing along these fertile plains utilize the landscapes for grazing grounds and the extraction of thatch, fodder, fuelwood, and fishing materials (Ambastha et al., 2007a; Sarkar et al., 2022). The extraction of resources, whether for immediate consumption or commercial purposes, has been identified as a significant challenge confronting managers of protected areas globally (Shova & Hubacek, 2011). As many regions across the globe have experienced significant depletion or deterioration of floodplain wetlands, mainly due to expansion of human settlements, reduction in habitat size, intensified agricultural practices, urbanization,

overexploitation by local communities, and inadequately planned development activities (Ambastha et al., 2007a; Das, 2015).

Natural ecosystems, such as grasslands, forests, and wetlands, provide various ecosystem services with an estimated annual economic value of US\$33 trillion (Sarkar et al., 2022). A study conducted in floodplain wetlands reported a gradual loss and shrinkage of habitat due to increased human settlements and livestock numbers (Das, 2015). Another study revealed that local communities depend on floodplain wetlands for various types of subsistence and commercial goods, including thatch, fodder, fuelwood, and fish resources extracted from these areas (Ambastha et al., 2007a; Shrivastava & Heinen, 2007; Das, 2015). The resource use pattern in local communities is governed by various factors, including the proximity of settlements to natural ecosystems, socio-economic conditions (such as community composition, education, occupation, annual income, landholding, and availability of specific resources), livelihood preferences, and cultural practices. These factors determine the patterns of resource use (Ambastha et al., 2007a; Sarkar et al., 2022).

In addition to demographic and socio-economic factors, people's attitudes and awareness were recognized as influential factors in shaping resource utilization patterns and fostering successful conservation efforts (Ambastha et al., 2007b; Heinen & Shrivastava, 2009; Das, 2015). Research on the attitudes and perceptions of local communities has contributed significantly to our understanding of people's needs and aspirations. It has played a crucial role in identifying their ideas, opinions, and suggestions concerning conservation issues (Badola et al., 2012). The term 'attitude' is commonly employed to describe positive or negative responses to one or more stimuli, and it can also be associated with potential conduct and behaviour (Badola et al., 2012). Attitudes are partly shaped by communities or individuals' perceptions and experiences, influencing their values and thoughts and ultimately contributing to the enhancement of their overall welfare (Badola et al., 2012). For example, the 'Chipko Movement' is a noteworthy instance where the positive attitude of local people prevented the logging of forest trees by hugging them (Sharma et al., 1985). In addition, community-based conservation efforts have yielded positive outcomes, benefiting local communities with improved access to forest resources, enhanced infrastructure, and advancements in

health, sanitation, and social services (Bajracharya et al., 2006). Therefore, assessing anthropogenic pressure on natural ecosystems, such as floodplain wetlands, is crucial for formulating appropriate policy measures to ensure their conservation, sustainable utilization, and effective management.

This chapter aims to offer in-depth insights into the demographic and socio-economic conditions of the communities residing in the vicinity of the Kaziranga Tiger Reserve (KTR), and their attitude towards the Reserve. These landscapes have been affected by floods and habitat degradation due to the rapid increase in the peripheral village population, agricultural development, biological invasion, and overgrazing by wildlife and livestock (World Heritage Convention, 2011). Also, the Reserve-local people relationship is strained due to specific restrictions on residing around the Reserve (Das, 2015). However, only a limited number of studies have delved into the demographic, socio-economic, resource dependency, and attitudes of local communities regarding the conservation of the Reserve, posing challenges to conservation efforts in Kaziranga (Shrivastava & Heinen, 2007; Heinen & Shrivastava, 2009; Das, 2015).

The chapter aims to provide answers to the following research questions:

- 1) What is the current demographic structure and socio-economic status of the local communities residing around KTR?
- 2) In terms of resource use patterns, what is the degree of dependency of the local communities on KTR for (a) grazing and (b) extraction of thatch, fodder, fuelwood and fish material?
- 3) Which factors influence the resource extraction of thatch, fodder, fuelwood and fish material?
- 4) What are the prevailing attitudes of the local communities toward KTR?
- 5) To what extent are the local communities aware of the conservation efforts and ecological significance of KTR?

6.2 Methodology

Resource use patterns are primarily governed by distance and accessibility from the source. A buffer zone of 2 km around KTR was identified as a possible zone for

maximum resource utilization following Ambastha et al. (2007a). Based on the Survey of India (1:50,000 scale) toposheet, villages were identified, and a reconnaissance survey was conducted to understand the socio-economic conditions and extent of resource dependence (Appendix Table 6.1). Data from the 2011 census was used to collect secondary information on village profiles (total geographical area, forest area, household numbers, total population, education, working and non-working population and available facilities and infrastructure (Appendix Tables 6.2 and 6.3). A questionnaire survey was conducted in each village, involving a random sampling of 15% of households. Based on questionnaire surveys, one major entry point was identified in each village, which were monitored for data collection on resource extraction from Reserve throughout the year (Appendix Table 6.1). Therefore, both qualitative and quantitative data were gathered to assess the dependency of local people on Reserve resources.

6.2.1 Socio-economic questionnaire survey

A comprehensive socio-economic questionnaire survey was undertaken in villages in 2015 and 2016 using a semistructured questionnaire containing both open- and close-ended questions. A questionnaire survey of randomly selected households was conducted. Adults were chosen for the interviews according to their availability, though the head of the family (both male and female) was usually preferred as they had more knowledge of resource extraction related activities. Questions were verbally administered in the local Assamese language. The questions related to, proximity of settlements (from Reserve, water source and highway), respondent's profile (gender, age, qualification, religion, caste, occupation, income, landholding and family composition), household profile and socio-economic status (area, type of house, electricity, mobile, television, vehicles, sanitation, drinking water source, cooking source), natural resource dependence (grazing and extraction of resources like thatch, fodder, fuelwood and fishes) and attitudes and awareness of local people towards KTR conservation, were asked.

6.2.2 Entry point monitoring survey

To validate the information from questionnaire survey, entry-point monitoring was conducted in 2015 and 2016 (excluding flood periods). The question was based on the

proximity of settlements (from Reserve and water source), respondent's details (gender, age, qualification, religion, caste), time of extraction (including duration spent inside Reserve) and details of extracted resources (thatch, fodder, fuelwood and fishes). The quantity extracted per visit was recorded using spring balance. The recorded plant and fish species extracted were identified. A holistic understanding of resource extraction patterns was recorded by combining the socio-economic and entry-point surveys.

6.2.3 Data analysis

Principal Component Analysis (PCA) and Pearson correlations were performed using PAST3 software. Based on the socio-economic survey, for the thatch extraction, 19 parameters were considered for data analysis, 22 for fodder extraction, 24 for fuelwood extraction, and 17 for fish extraction. Similarly, for the entry point evaluation, ten parameters for each fishing activity, fuelwood extraction, fodder extraction, and thatching activity were considered for data analysis. Using Legendre and Legendre (1998), village-wise data collected from the socio-economic survey and entry point evaluation were standardized from 0 to 1. The standardized data was based on fishing activity, fuelwood extraction, fodder extraction, and thatching activity subjected to the multivariate Principal Component Analysis (PCA). PCA was used in data reduction by identifying a small number of parameters, which explain most of the variance observed in a much larger number of manifest variables. The interpretation was done based on the importance and loadings of principal components and biplot. The graphic interpretation of the biplot gives a clear frame to understand the influence of variables on the species, sites, and interrelationships among the exploratory variables. PCA was performed using Past3 software. Based on the results from PCA, the relationship between total annual extraction quantity and exploratory variables was estimated using Pearson's correlation (r) analysis for both the socio-economic survey and entry point evaluation. Mann-Whitney and Kruskal-Wallis tests were performed in SPSS (version 22) to derive significant differences.

6.3 Results

6.3.1 Village profile

A total of 31 villages encompassing an area of 6916.94 hectares and 4980 households were recorded within the 2 km area of the Reserve (Appendix Table 6.2). Among villages, Hatikhuli had the highest number of households (n=968), and Bamun Gaon had the largest geographical area (1040.09 hectares). Only eight villages were located amidst forested areas, and Deopani covers the highest forest area (369.63 hectares). A total population of 24592 was recorded with a higher number of males (n=12648) than females (n=11944). Among villages, the highest population was recorded from Hatikhuli (n=4619), with a high number of males (n=2374) and females (n=2245). Maximum number of villagers were literate (n=13338) than illiterate (n=11254). Among villagers, the highest population of illiterate (n=2405) and literate (n=2214) were recorded from Hatikhuli. The maximum number of villagers was non-working (n=10261) rather than working (n=14331). Among villages, the highest working (n=2102) and non-working (n=2517) population was recorded from Hatikhuli. In terms of education, the majority of villages have access to government primary schools (90.32%) but lack access to the middle (70.97%), secondary (93.55%), and senior secondary (100%) education facilities (Appendix Table 6.3). Health facilities were not available within villages; however, maximum villages have primary health centre (100%), family welfare centre (80.65%), maternity and child welfare centre (93.55%), mobile health clinic (87.10%), and veterinary hospital (100%) facilities available within <5 to >10 km away from the villages. In terms of facilities, maximum villages have accredited social health activists (58.06%), self-help groups (61.29%), Anganwadi centre (77.42%), and integrated child development services (54.84%) available within villages. Other facilities, including post office (93.55%), sub-post office (58.07%), agricultural credit society (96.77%), agricultural marketing society (87.10%), and public distribution system (64.52%), were available within <5 to >10 km away from the villages. Maximum villages lack hygiene and sanitation facilities, only a few villages have a drainage system (12.90%), and only one village was covered under a total sanitation campaign (3.23%).

A total of 663 households were surveyed, located at a mean distance of 0.51 ± 0.01 km from the Reserve and a mean distance of 1.06 ± 0.07 km from the National Highway. Among villages, Halidhibari households were closer to the Reserve at a mean distance

of 0.07 ± 0.01 km and Bagari households were closer to the National highway at a mean distance of 0.02 ± 0.00 km (Appendix Table 6.4). The mean distance from households to nearby River/beel was 0.53 ± 0.01 km. Among villages, Siljuri households were closer to water bodies, with a mean distance of 0.14 ± 0.01 km. The mean distance from households to Reserve, National Highways, and nearby River/beel significantly varies among villages (Kruskal-Wallis, $P < 0.05$) (Appendix Table 6.5).

6.3.2 Respondent details

In the socio-economic questionnaire survey, a total of 663 respondents were interviewed (Appendix Table 6.6). More males (58.82 %) participated in interviews than females (41.18%). The majority of respondents belong to the age group 31-60 years (54.75%) and are found to be literate (54.60%). The majority of respondents belong to the Hindu religion (84.01%). Among castes, the majority of respondents belong to Tea tribes (39.67%) and other backward classes (18.25%) (Appendix Table 6.7). The majority of respondents have a nuclear family (61.69%) (Appendix Table 6.8) and the mean family size was 5.25 ± 0.07 /hh (household). Among villages, there is no significant difference in mean family size (Kruskal-Wallis, $P > 0.05$) (Appendix Table 6.5). In terms of family composition among respondents, there was a slight predominance of males (50.06%) over females (49.94%). Most family members belong to the age group 1-15 (33.93%) and are found to be literate (57.71%) (Appendix Tables 6.8-6.10).

In the entry-point questionnaire survey, a total of 6520 respondents were interviewed (Appendix Table 6.11). Most of the respondents were involved in fishing (40.92%). The majority of respondents were males (79.39%) (Appendix Table 6.12). The majority of respondents belong to the 31-60 age group (54.29%). Most of the respondents were illiterate (68.22%). The majority of respondents belong to the Hindu religion (78.79%) (Appendix Table 6.13). Among castes, the majority of respondents belong to Tea tribes (25.84%) and other backward classes (24.62%). For resource extraction, most respondents spent ≥ 31 -60 minutes (36.10%) inside the Reserve (Appendix Table 6.14). The highest resource extraction activities were recorded between 9:01 and 12:00 (49.49%). The majority of respondents were aware of the species they were extracting (80.29%).

6.3.3 Household characteristics

The total mean household area of 1.80 ± 0.04 Katha/hh and build-up area of 1.17 ± 0.01 Katha/hh was recorded (Appendix Table 6.15). Among villages, the significantly highest mean household area was recorded for Kawaimari (3.83 ± 0.44 Katha/hh, Kruskal-Wallis, $P < 0.05$) and the built-up area was recorded for Bamun Gaon (1.62 ± 0.06 Katha/hh, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.15 and 6.5). The majority of respondents have Kaccha house type (70.44%). The majority of household's rooftops were made up of tin (95.93%). In terms of amenities, 84.31% of households have electricity, 64.71% have mobile phones, 33.33% have television, and 48.87% have vehicles (Appendix Table 6.16). Among vehicle types, the majority of respondents have cycles (89.20%). Only 38.46% of households have sanitation facilities, and 48.11% report receiving visits from Accredited Social Health Activists (ASHA) (Appendix Tables 6.16 and 6.17). The majority of households reported permanent and regular (83.07%) ASHA visits (Appendix Table 6.17). The majority of respondents (72.85%) utilize handpumps to access drinking water and conduct water-related activities. Fuelwood (95.02%) is the primary cooking source for most respondents (Appendix Table 6.18).

6.3.4 Occupation/Income source

The majority of respondents were involved in wage labour (75.87%) and agriculture (73.15%) (Appendix Tables 6.19 and 6.20). The maximum mean annual income was generated through tourism (242565.22 ± 6647.79 INR/hh/annum) and government jobs (174363.64 ± 29031.14 INR/hh/annum) (Appendix Tables 6.21 and 6.22). A total mean annual income of 148818.46 ± 5984.75 INR/hh/annum was generated from various types of occupation (Appendix Table 6.23). Among the villages, Kathani Basti significantly generated the highest mean annual income of 392294.29 ± 107908.60 INR/ annum from various occupations (Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.23 and 6.5).

6.3.4.1 Occupation details

The total mean agricultural land holding was 0.96 ± 0.04 hectares/hh (Appendix Table 6.24). Among villages, the significantly highest mean agriculture land was recorded for Baghmari (1.59 ± 0.54 hectare/hh, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.24 and 6.5). Some respondents were also involved in sharecropping (23.51%). The total mean

sharecropping land was 0.86 ± 0.10 hectares/hh. Among villages, the significantly highest mean sharecropping land was recorded for Baghmari (2.69 ± 1.17 hectare/hh, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.24 and 6.5). Most respondents were engaged in agriculture during the monsoon season (86.39%). Four crops cultivated, namely rice (*Oryza sativa*), mustard (*Brassica nigra*), jute (*Corchorus capsularis*), and tea (*Camellia sinensis*) (Appendix Tables 6.25-6.28). Maximum respondents cultivated rice (100%) and produced a total mean quantity of 24.93 ± 0.95 quintal/hh/annum. Maximum rice production quantity was used for selling (21.11 ± 0.94 quintal/hh/annum @1000/quintal) than self-consumption (4.30 ± 0.08 quintal/annual), which generates a total annual income of 21109.70 ± 940.01 INR/hh/annum (Appendix Table 6.25). The majority of respondents were engaged in tourism during the winter season (92.39%) (Appendix Table 6.29). Maximum respondents found tourism beneficial (76.09%). All respondents unanimously considered tourism a source of livelihood and income (76.09%). About 54.30% of respondents were involved in home gardening (Appendix Table 6.30). A total mean area of 1.16 ± 0.06 Katha/hh was recorded for home gardening. Among villages, the significantly highest mean home gardening area was recorded for Kawaimari (2.50 ± 0.50 hectare/hh, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.30 and 6.5). All respondents were self-consuming (100%) home garden harvest. The majority of respondents were engaged in home gardening during the monsoon season (85.28%). The highest percentage of respondents (81.39%) indicated that home gardens are primarily recognized for delivering provisioning ecosystem services (Appendix Table 6.31). A total of 138 species belonging to 109 genera and 53 families were recorded in home gardening (Appendix Table 6.32). About 87.18% of respondents were involved in livestock rearing (Appendix Table 6.33). Livestock consisting of cattle, goats, poultry, buffalo, and pigs were raised. Among the livestock, the highest number of poultry was recorded, with a total mean number of 8.21 ± 0.32 poultry/hh. The total mean number of livestock was 10.93 ± 0.37 animals/hh. About 25.26% of the respondents were engaged in activities related to milk production (Appendix Table 6.34). The total mean milk production was 271.35 ± 21.37 liters/hh/annum. Maximum milk was used for selling (279.66 ± 29.44 liters/hh/annum) rather than self-consumption (102.79 ± 3.19 liters/hh/annum). About 34.78% of the respondents were engaged in the sale of milk, contributing to an annual income of 11186.36 ± 1177.58 INR/hh/annum.

Additionally, about 81.42% of respondents were involved in selling meat/dairy products, contributing to an annual income of 7878.50±422.02 INR/hh/annum. The primary factor attributed to lower milk production among respondents was the unavailability of good fodder and nutritional supplements for livestock (76.71%) (Appendix Table 6.35).

6.3.5 Pattern of Resource dependency among villages

Fringe villages depend on the Reserve for grazing grounds and the collection of thatching, fodder, fuelwood, and fishing resources.

6.3.5.1 Grazing

About 81.90% of respondents were taking their livestock for grazing (Appendix Table 6.36). Most respondents (82.14%) reported conducting livestock grazing outside the Reserve. Among those grazing outside the Reserve, the highest percentage (69.28%) utilized land near their houses and agriculture fields. Most respondents conducted grazing activities during winter season (96.87%) (Appendix Table 6.37). The winter season recorded the highest average grazing hours, with a mean of 8.90±0.05 hours/hh.

6.3.5.2 Thatch extraction

Socio-economic questionnaire survey

About 14.03% of respondents were purchasing thatching material (Appendix Table 6.38). The total mean thatching material purchased quantity was 98.12±5.12 kg/hh/annum. Among villages, the highest total mean quantity of thatching material was purchased by Mohpara (175.00±15.00 kg/hh/annum, Kruskal-Wallis, $P>0.05$) (Appendix Tables 6.38 and 6.5). The total mean price for purchasing thatching material was 12.17±0.13 INR/kg. The total mean amount spent to purchase thatching material was 1209.41±67.93 INR/hh/annum. Among villages, Domjan No.2 had the highest expenditure on purchasing thatching material at 2400.00±0.00 INR/hh/annum (Kruskal-Wallis, $P>0.05$) (Appendix Tables 6.38 and 6.5). The majority of respondents are extracting thatching material (65.46%) rather than purchasing. Most respondents were using hand sickles (69.59%) for thatch extraction (Appendix Table 6.39). The majority of respondents extracted thatching material from outside the Reserve

(74.19%). The maximum thatching material outside the Reserve was collected from Reserve fringes (72.98%) (Appendix Table 6.40). Most respondents collected thatching material during the winter season (83.18%). In terms of daily extraction, the total mean thatching material quantity extraction from inside the Reserve was 11.39 ± 0.34 kg/hh/day (Appendix Table 6.41). The maximum extracted thatching material quantity was utilized for self-consumption (9.38 ± 0.33 kg/hh/day) rather than selling (5.93 ± 0.38 kg/hh/day). Among villages, the significantly highest mean thatching material quantity was extracted by Kathani Basti (20.00 ± 0.00 kg/hh/day, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.41 and 6.5). Among villages, the highest mean thatching material quantity self-consumed by Kathani Basti (20.00 ± 0.00 kg/hh/day, Kruskal-Wallis, $P < 0.05$) and sold by Pachi Gaon (10.00 ± 0.00 kg/hh/day, Kruskal-Wallis, $P > 0.05$). In terms of annual extraction, the total mean thatching material quantity extraction from inside the Reserve was 298.51 ± 14.27 kg/hh/annum (Appendix Table 6.41). The maximum extracted thatching material quantity was utilized for self-consumption (248.22 ± 13.32 kg/hh/annum) rather than selling (148.70 ± 12.36 kg/hh/annum). Among villages, the highest mean thatching material quantity was extracted by Tamuli Pathar (543.75 ± 144.16 kg/hh/annum, Kruskal-Wallis, $P > 0.05$) (Appendix Tables 6.41 and 6.5). Among villages, the highest mean thatching material quantity self-consumed by Deopani (472.50 ± 123.92 kg/hh/annum, Kruskal-Wallis, $P > 0.05$) and sold by Na-Jan (260.00 ± 0.00 kg/hh/annum, Kruskal-Wallis, $P > 0.05$). In terms of daily extraction, the total mean thatching material quantity extraction from outside the Reserve was 11.95 ± 0.36 kg/hh/day (Appendix Table 6.42). The maximum extracted thatching material quantity was utilized for self-consumption (9.57 ± 0.21 kg/hh/day) rather than selling (9.01 ± 0.53 kg/hh/day). Among villages, the significantly highest mean thatching material quantity was extracted by Kathani Basti (27.50 ± 1.44 kg/hh/day, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.42 and 6.5). Among villages, the significantly highest mean thatching material quantity self-consumed by Nahrubasti (17.86 ± 1.49 kg/hh/day, Kruskal-Wallis, $P < 0.05$) and sold by Bandar Dubi (14.17 ± 2.71 kg/hh/day, Kruskal-Wallis, $P < 0.05$). In terms of annual extraction, the total mean thatching material quantity extraction from outside the Reserve was 528.55 ± 22.06 kg/hh/annum (Appendix Table 6.42). The maximum extracted thatching material quantity was utilized for self-consumption (426.16 ± 16.05 kg/hh/annum) rather than

selling (387.88 ± 30.78 kg/hh/annum). Among villages, Bandar Dubi significantly extracted the highest mean thatching material quantity (1248.33 ± 190.41 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.42 and 6.5). Among villages, the highest mean thatching material quantity self-consumed by Nahrubasti (718.57 ± 108.90 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) and sold by Bandar Dubi (665.00 ± 120.82 kg/hh/annum, Kruskal-Wallis, $P > 0.05$). In terms of annual extraction, the total mean thatching material quantity extraction from both inside and outside Reserve was 485.69 ± 18.06 kg/hh/annum (Appendix Table 6.43). The maximum extracted thatching material quantity was utilized for self-consumption (393.96 ± 13.56 kg/hh/annum) rather than selling (308.60 ± 22.86 kg/hh/annum). Among villages, the significantly highest mean thatching material quantity extracted by Deopani (1013.24 ± 150.32 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.43 and 6.5). Among villages, the significantly highest mean thatching material quantity self-consumed by Deopani (695.71 ± 102.52 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) and sold by Bandar Dubi (587.14 ± 128.41 kg/hh/annum, Kruskal-Wallis, $P < 0.05$). The total mean selling rate of thatching material was 11.75 ± 0.15 INR/kg. The total mean annual income from selling thatching material was 3671.39 ± 280.93 INR/hh/annum (Appendix Table 6.43). Among villages, the significantly highest annual income generated by selling thatching material was recorded for Kathani Basti (7825.00 ± 2807.25 INR/hh/annum, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.43 and 6.5). A total of seven thatch species belonging to seven genera and one family were recorded. Among species, *Saccharum* spp. (83.49%) and *Bambusa* spp. (57.69%) were identified as the most extracted thatch species (Appendix Table 6.44)

Entry-point questionnaire survey

A total of 1374 (21.07%) respondents were involved in thatch extraction (Appendix Tables 6.45 and 6.11). Respondents travel a total mean distance of 8.47 ± 0.83 km from home to the Reserve for extraction (Appendix Table 6.45). Additionally, a total mean distance of 1.91 ± 0.24 km was travelled inside the Reserve. The mean distance from households to Reserve and inside the Reserve significantly varies among villages (Kruskal-Wallis, $P < 0.05$) (Appendix Table 6.46). The maximum respondents were males (77.00%) (Appendix Table 6.45). The majority of respondents belong to the 31-

60 age group (57.21%). Most of the respondents were illiterate (65.43%). The majority of respondents belong to the Hindu religion (79.40%) (Appendix Table 6.47). Among castes, the majority of respondents belong to Tea tribes (25.91%) and other backward classes (23.36%). For thatch extraction, most respondents spent ≥ 30 minutes (69.14%) inside the Reserve (Appendix Table 6.48). The highest resource extraction activities were recorded between 9:01 and 12:00 (57.50%). All respondents were aware of the species they were extracting (100%). Most respondents were using hand sickles (84.06%) for thatch extraction (Appendix Table 6.49). For delivery, the majority of respondents were using hand lifting of the extracted thatch material (70.09%). The extracted thatch was mostly utilized for self-consumption by respondents (90.32%). In terms of daily extraction, the total mean thatch quantity extraction from inside the Reserve was 461.43 ± 31.10 kg/day (Appendix Table 6.50). The maximum extracted thatch quantity was utilized for self-consumption (429.02 ± 27.43 kg/day) rather than selling (117.96 ± 20.20 kg/day). Among villages, the significantly highest mean thatch quantity was extracted by Beloguri (30.19 ± 2.28 kg/day, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.51 and 6.46). Among villages, the highest mean thatch quantity self-consumed (24.06 ± 2.06 kg/day, Kruskal-Wallis, $P < 0.05$) and sold by Beloguri (18.77 ± 2.44 kg/day, Kruskal-Wallis, $P > 0.05$). In terms of annual extraction, the total mean thatch quantity extraction from inside the Reserve was 6224.56 ± 571.59 kg/annum (Appendix Table 6.50). The maximum extracted thatch quantity was utilized for self-consumption (5564.43 ± 497.79 kg/annum) rather than selling (2388.25 ± 400.70 kg/annum). Among villages, the significantly highest mean thatch quantity was extracted by Beloguri (545.63 ± 35.32 kg/annum, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.52 and 6.46). Among villages, the highest mean thatch quantity self-consumed by Japari Pathar (423.54 ± 32.42 kg/annum, Kruskal-Wallis, $P < 0.05$) and sold by Beloguri (402.26 ± 51.14 kg/annum, Kruskal-Wallis, $P > 0.05$). The total mean selling rate of thatching material was 27.83 ± 7.56 INR/kg. The total mean annual income from selling thatch was 28198.30 ± 4951.22 INR/annum (Appendix Table 6.50). Among villages, the highest annual income generated by selling thatch was recorded for Beloguri (4491.45 ± 545.52 INR/annum, Kruskal-Wallis, $P > 0.05$) (Appendix Tables 6.52 and 6.46). A total of six thatch species belonging to six genera and six families

were recorded. Among species, *Saccharum* spp. (86.46%) and *Imperata cylindrica* (45.27%) were identified as the most extracted thatch species (Appendix Table 6.53).

Comparison among inside, outside and entry-point thatch extraction quantity

In terms of thatch material, compared to inside, a significantly high mean annual quantities for total extraction (528.55 ± 22.06 kg/annum, Mann-Whitney, $P < 0.05$), self-consumption (426.16 ± 16.05 kg/annum, Mann-Whitney, $P < 0.05$) and sale (387.88 ± 30.78 kg/annum, Mann-Whitney, $P < 0.05$) were recorded from outside the Reserve (Appendix Tables 6.41, 6.42 and 6.54). Compared to the socio-economic survey, the entry point survey showed significantly high mean annual quantities for total extraction (6224.56 ± 571.59 kg/annum, Mann-Whitney, $P < 0.05$), self-consumption (5564.43 ± 497.79 kg/annum, Mann-Whitney, $P < 0.05$) and sale (2388.25 ± 400.70 kg/annum, Mann-Whitney, $P < 0.05$) with high mean annual income (28198.3 ± 4951.22 INR/annum, Mann-Whitney, $P < 0.05$) (Appendix Tables 6.50, 6.43 and 6.55).

6.3.5.3 Fodder extraction

Socio-economic questionnaire survey

About 3.02% of respondents were purchasing fodder (Appendix Table 6.56). The total mean fodder purchased quantity was 597.50 ± 39.81 kg/hh/annum. Among villages, the highest total mean quantity of fodder was purchased by Domjan No.1 (1000.00 ± 0.00 kg/hh/annum, Kruskal-Wallis, $P > 0.05$) (Appendix Tables 6.56 and 6.5). The total mean price for purchasing fodder was 12.65 ± 0.51 INR/kg. The total amount spent to purchase fodder was 7565.00 ± 579.08 INR/hh/annum. Among villages, Goshanibar had the highest expenditure on purchasing fodder at 11550.00 ± 1950.00 INR/hh/annum (Kruskal-Wallis, $P > 0.05$). The majority of respondents are extracting fodder (26.85%) rather than purchasing. Most respondents were using hand sickles (70.22%) for fodder extraction (Appendix Table 6.57). Maximum respondents were extracting fodder from outside the Reserve (94.38%). The maximum fodder outside the Reserve was collected in and around their houses and agriculture fields (69.05%) (Appendix Table 6.58). Most respondents were collecting fodder during the winter season (75.84%). In terms of daily extraction, the total mean fodder quantity extraction from inside the Reserve was 9.65 ± 1.15 kg/hh/day (Appendix Table 6.59). The maximum extracted fodder quantity

was utilized for selling (7.36 ± 0.73 kg/hh/day) than self-consumption (4.88 ± 0.55 kg/hh/day). Among villages, the highest mean fodder quantity was extracted by Mohpara (13.75 ± 2.39 kg/hh/day, Kruskal-Wallis, $P > 0.05$) (Appendix Tables 6.59 and 6.5). Among villages, the highest mean fodder quantity self-consumed by Mohpara (7.50 ± 1.50 kg/hh/day, Kruskal-Wallis, $P > 0.05$) and sold by Tamuli Pathar (10.00 ± 0.00 kg/hh/day, Kruskal-Wallis, $P > 0.05$). In terms of annual extraction, the total mean fodder quantity extraction from inside the Reserve was 608.24 ± 180.81 kg/hh/annum (Appendix Table 6.59). The maximum extracted fodder quantity was utilized for selling (452.73 ± 163.26 kg/hh/annum) than self-consumption (315.29 ± 77.13 kg/hh/annum). Among villages, the highest mean fodder quantity was extracted by Pachi Gaon (1100.00 ± 800.00 kg/hh/annum, Kruskal-Wallis, $P > 0.05$) (Appendix Tables 6.59 and 6.5). Among villages, the highest mean fodder quantity self-consumed by No.2 Kohora (525.00 ± 75.00 kg/hh/annum, Kruskal-Wallis, $P > 0.05$) and sold by Pachi Gaon (730.00 ± 535.63 kg/hh/annum, Kruskal-Wallis, $P > 0.05$). In terms of daily extraction, the total mean fodder quantity extraction from outside the Reserve was 8.15 ± 0.38 kg/hh/day (Appendix Table 6.60). The maximum extracted fodder quantity was utilized selling (12.37 ± 0.80 kg/hh/day) than self-consumption (6.76 ± 0.19 kg/hh/day). Among villages, the significantly highest mean fodder quantity was extracted by Mohpara (21.25 ± 4.27 kg/hh/day, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.60 and 6.5). Among villages, the highest mean fodder quantity self-consumed (10.00 ± 0.00 kg/hh/day, Kruskal-Wallis, $P < 0.05$) and sold (15.00 ± 2.89 kg/hh/day, Kruskal-Wallis, $P > 0.05$) by Mohpara. In terms of annual extraction, the total mean fodder quantity extraction from outside the Reserve was 358.90 ± 34.03 kg/hh/annum (Appendix Table 6.60). The maximum extracted fodder quantity was utilized for selling (571.32 ± 144.89 kg/hh/annum) than self-consumption (294.29 ± 20.38 kg/hh/annum). Among villages, the significantly highest mean fodder quantity extracted by Mohpara (1912.50 ± 715.13 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.60 and 6.5). Among villages, the highest mean fodder quantity self-consumed (800.00 ± 176.78 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) and sold (1483.33 ± 552.52 kg/hh/annum, Kruskal-Wallis, $P > 0.05$) by Mohpara. In terms of annual extraction, the total mean fodder quantity extraction from both inside and outside the Reserve was 396.83 ± 38.54 kg/hh/annum (Appendix Table 6.61). The maximum extracted fodder quantity was

utilized for selling (546.03 ± 112.77 kg/hh/annum) than self-consumption (307.87 ± 21.65 kg/hh/annum). Among villages, the significantly highest mean fodder quantity extracted by Mohpara (1900.00 ± 519.13 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.61 and 6.5). Among villages, the highest mean fodder quantity self-consumed (853.33 ± 177.19 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) and sold (1046.67 ± 359.21 kg/hh/annum, Kruskal-Wallis, $P > 0.05$) by Mohpara. The total mean selling rate of fodder was 12.28 ± 0.45 INR/kg. The total mean annual income from selling fodder was 6689.66 ± 1491.95 INR/hh/annum (Appendix Table 6.61). Among villages, the highest annual income generated by selling fodder was recorded for Mohpara (13150.00 ± 5443.39 INR/hh/annum, Kruskal-Wallis, $P > 0.05$) (Appendix Tables 6.61 and 6.5). A total of 27 fodder species belonging to 26 genera and two families were recorded. Among species, *Hemarthria compressa* (78.09%) and *Hymenachne* spp. (75.28%) were identified as the most extracted fodder species (Appendix Table 6.62).

Entry-point questionnaire survey

A total of 881 (13.51%) respondents were involved in fodder extraction (Appendix Tables 6.63 and 6.11). Respondents travel a total mean distance of 8.35 ± 0.77 km from home to the Reserve for extraction (Appendix Table 6.63). Additionally, a total mean distance of 1.64 ± 0.23 km was travelled inside the Reserve. The mean distance from households to Reserve and inside the Reserve significantly varies among villages (Kruskal-Wallis, $P < 0.05$) (Appendix Table 6.46). The majority of respondents were males (77.64%) (Appendix Table 6.63). The majority of respondents belong to the 31-60 age group (55.51%). Most of the respondents were illiterate (70.37%). The majority of respondents belong to the Hindu religion (79.80%) (Appendix Table 6.64). Among castes, the majority of respondents belong to Tea tribes (28.38%) and other backward classes (22.70%). For fodder extraction, most respondents spent ≥ 30 minutes (66.52%) inside the Reserve (Appendix Table 6.65). The highest resource extraction activities were recorded between 9:01 and 12:00 (53.92%). The majority of respondents were aware of the species they were extracting (71.40%). Most respondents were using hand sickles (92.51%) for fodder extraction (Appendix Table 6.66). For delivery, the majority of respondents were using hand lifting of the extracted fodder (85.24%). The extracted fodder was mostly utilized for self-consumption by respondents (89.90%). In

terms of daily extraction, the total mean fodder quantity extraction from inside the Reserve was 341.49 ± 30.35 kg/day (Appendix Table 6.50). The maximum extracted fodder quantity was utilized for self-consumption (317.69 ± 25.96 kg/day) rather than selling (76.18 ± 18.12 kg/day). Among villages, the significantly highest mean fodder quantity was extracted by Goshanibar (18.16 ± 1.34 kg/day, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.67 and 6.46). Among villages, the highest mean fodder quantity self-consumed by Goshanibar (15.00 ± 0.92 kg/day, Kruskal-Wallis, $P < 0.05$) and sold by Baghmari (17.90 ± 0.00 kg/day, Kruskal-Wallis, $P > 0.05$). In terms of annual extraction, the total mean fodder quantity extraction from inside the Reserve was 3151.37 ± 412.50 kg/annum (Appendix Table 6.50). The maximum extracted fodder quantity was utilized for self-consumption (2874.15 ± 345.44 kg/annum) rather than selling (903.76 ± 249.19 kg/annum). Among villages, the significantly highest mean fodder quantity extracted by Goshanibar (182.97 ± 21.58 kg/annum, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.68 and 6.46). Among villages, the highest mean fodder quantity self-consumed by Goshanibar (146.84 ± 16.03 kg/annum, Kruskal-Wallis, $P < 0.05$) and sold by Baghmari (179.00 ± 0.00 kg/annum, Kruskal-Wallis, $P > 0.05$). The total mean selling rate of fodder was 26.54 ± 6.00 INR/kg. The total mean annual income from selling fodder was 10790.49 ± 2915.34 INR/annum (Appendix Table 6.50). Among villages, the highest annual income generated by selling fodder was recorded for Bagari (2209.50 ± 340.50 INR/annum, Kruskal-Wallis, $P > 0.05$) (Appendix Tables 6.68 and 6.46). A total of 56 fodder species belonging to 51 genera and 16 families were recorded. Among species, *Hemarthria compressa* (37.00%) and *Cynodon dactylon* (28.60%) were identified as the most extracted fodder species (Appendix Table 6.69).

Comparison among inside, outside and entry-point fodder extraction quantity

In terms of fodder material, high mean annual quantities for total extraction (608.24 ± 180.81 kg/annum, Mann-Whitney, $P < 0.05$) and self-consumption (315.29 ± 77.13 kg/annum, Mann-Whitney, $P < 0.05$) were recorded from inside the Reserve while sale (571.32 ± 144.89 kg/annum, Mann-Whitney, $P > 0.05$) was recorded from outside the Reserve (Appendix Tables 6.59, 6.60 and 6.54). Compared to the socio-economic survey, the entry point survey showed high mean annual quantities for total extraction (3151.37 ± 412.50 kg/annum, Mann-Whitney, $P < 0.05$), self-

consumption (2874.15 ± 345.44 kg/annum, Mann-Whitney, $P < 0.05$) and sale (903.76 ± 249.19 kg/annum, Mann-Whitney, $P > 0.05$) with high mean annual income (10790.49 ± 2915.34 INR/annum, Mann-Whitney, $P < 0.05$) (Appendix Tables 6.61, 6.50 and 6.55).

6.3.5.4 Fuelwood extraction

Socio-economic questionnaire survey

About 26.85% of respondents were purchasing fuelwood (Appendix Table 6.70). The total mean fuelwood purchased quantity was 127.47 ± 2.88 kg/hh/annum. Among villages, the significantly highest total mean quantity of fuelwood was purchased by Japari Pathar (154.29 ± 10.49 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.70 and 6.5). The total mean price for purchasing fuelwood was 21.69 ± 0.19 INR/kg. The total mean amount spent to purchase fuelwood was 2762.47 ± 66.50 INR/hh/annum. Among villages, Goshanibar had the highest expenditure on purchasing fuelwood at 3434.62 ± 254.03 INR/hh/annum (Kruskal-Wallis, $P < 0.05$). The majority of respondents are extracting fuelwood (82.96%) than purchasing. Most respondents were using hand axes (67.64%) for fuelwood extraction (Appendix Table 6.71). Most respondents were extracting fuelwood from outside the Reserve (85.64%). The maximum fuelwood outside the Reserve was collected from Karbi Anglong Hills (71.55%) (Appendix Table 6.72). The majority of respondents were collecting fuelwood during the winter season (94.55%). In terms of daily extraction, the total mean fuelwood quantity extraction from inside the Reserve was 24.92 ± 1.48 kg/hh/day (Appendix Table 6.73). The maximum extracted fuelwood quantity was utilized for selling (15.78 ± 1.09 kg/hh/day) rather than self-consumption (12.71 ± 0.63 kg/hh/day). Among villages, the significantly highest mean fuelwood quantity was extracted by Kanchanjuri (75.22 ± 9.52 kg/hh/day, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.73 and 6.5). Among villages, the significantly highest mean fuelwood quantity self-consumed (34.56 ± 4.39 kg/hh/day, Kruskal-Wallis, $P < 0.05$) and sold (40.67 ± 6.24 kg/hh/day, Kruskal-Wallis, $P < 0.05$) by Kanchanjuri. In terms of annual extraction, the total mean fuelwood quantity extraction from inside the Reserve was 1451.26 ± 102.35 kg/hh/annum (Appendix Table 6.73). The maximum extracted fuelwood quantity was utilized for selling (886.23 ± 71.60 kg/hh/annum) than self-consumption (766.00 ± 53.40 kg/hh/annum). Among villages,

the significantly highest mean fuelwood quantity extracted by Kanchanjuri (3527.11 ± 593.63 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.73 and 6.5). Among villages, the significantly highest mean fuelwood quantity self-consumed (1610.44 ± 303.17 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) and sold (1916.67 ± 319.80 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) by Kanchanjuri. In terms of daily extraction, the total mean fuelwood quantity extraction from outside the Reserve was 41.69 ± 1.96 kg/hh/day (Appendix Table 6.74). The maximum extracted fuelwood quantity was utilized selling (30.56 ± 2.03 kg/hh/day) than self-consumption (20.48 ± 0.55 kg/hh/day). Among villages, the significantly highest mean fuelwood quantity was extracted by Kanchanjuri (104.33 ± 32.33 kg/hh/day, Kruskal-Wallis, $P < 0.05$) (Appendix Table 6.74 and 6.5). Among villages, the significantly highest mean fuelwood quantity self-consumed (44.00 ± 13.01 kg/hh/day, Kruskal-Wallis, $P < 0.05$) and sold (60.33 ± 21.54 kg/hh/day, Kruskal-Wallis, $P < 0.05$) by Kanchanjuri. In terms of annual extraction, the total mean fuelwood quantity extraction from outside the Reserve was 2925.85 ± 69.07 kg/hh/annum (Appendix Table 6.74). The maximum extracted fuelwood quantity was utilized for selling (1804.14 ± 50.30 kg/hh/annum) rather than self-consumption (1673.30 ± 45.59 kg/hh/annum). Among villages, the significantly highest mean fuelwood quantity extracted by Kaziranga N.C (4266.67 ± 1185.09 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.74 and 6.5). Among villages, the significantly highest mean fuelwood quantity self-consumed (3226.67 ± 826.67 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) and sold (3120.00 ± 0.00 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) by Kaziranga N.C. In terms of annual extraction, the total mean fuelwood quantity extraction from both inside and outside Reserve was 3215.39 ± 67.49 kg/hh/annum (Appendix Table 6.75). The maximum extracted fuelwood quantity was utilized for selling (2011.14 ± 47.28 kg/hh/annum) than self-consumption (1807.59 ± 41.62 kg/hh/annum). Among villages, the significantly highest mean fuelwood quantity extracted by Bandar Dubi (4653.50 ± 386.35 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.75 and 6.5). Among villages, the significantly highest mean fuelwood quantity self-consumed by Bagari (2458.49 ± 186.85 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) and sold by Nahrubasti (2865.00 ± 553.94 kg/hh/annum, Kruskal-Wallis, $P < 0.05$). The total mean selling rate of fuelwood was 21.81 ± 0.16 INR/kg. The total mean annual income generated by selling fuelwood was

44142.60±1151.13 INR/hh/annum (Appendix Table 6.75). Among villages, the significantly highest annual income generated by selling fuelwood was recorded for Nahrubasti (69450.00±14214.75 INR/hh/annum, Kruskal-Wallis, $P<0.05$) (Appendix Tables 6.75 and 6.5). A total of 62 fuelwood species belonging to 55 genera and 26 families were recorded. Among species, *Albizia procera* (63.82%) and *Lagerstroemia speciosa* (46.00%) were identified as the most extracted fuelwood species (Appendix Table 6.76)

Entry-point questionnaire survey

A total of 1597 (24.49%) respondents were involved in fuelwood extraction (Appendix Tables 6.77 and 6.11). Respondents travel a total mean distance of 8.18±0.86 km from home to the Reserve for extraction (Appendix Table 6.77). Additionally, a total mean distance of 1.99±0.25 km was travelled inside the Reserve. The mean distance from households to Reserve and inside the Reserve significantly varies among villages (Kruskal-Wallis, $P<0.05$) (Appendix Table 6.46). The majority of respondents were males (76.64%) (Appendix Table 6.77). Most respondents belong to the 31-60 age group (53.04%). Most of the respondents were illiterate (67.00%). The majority of respondents belong to the Hindu religion (78.96%) (Appendix Table 6.78). Among castes, most respondents belong to Tea tribes (26.99%) and other backward classes (23.04%). For fuelwood extraction, most respondents spent ≤61 minutes (47.59%) inside the Reserve (Appendix Table 6.79). The highest resource extraction activities were recorded between 6:00 and 9:00 (55.17%). The majority of respondents were aware of the species they were extracting (78.27%). Most respondents were using an axe for fuelwood extraction (59.67%) (Appendix Table 6.80). For delivery, the majority of respondents were using cycles (55.04%). The extracted fuelwood was mostly utilized for self-consumption by the respondents (66.94%). In terms of daily extraction, the total mean fuelwood quantity extraction from inside the Reserve was 1834.19±170.82 kg/day (Appendix Table 6.50). The maximum extracted fuelwood quantity was utilized for self-consumption (1460.47±107.60 kg/day) rather than selling (715.37±122.57 kg/day). Among villages, the significantly highest mean fuelwood quantity was extracted by Bandar Dubi (106.82±7.82 kg/day, Kruskal-Wallis, $P<0.05$) (Appendix Tables 6.81 and 6.46). Among villages, the significantly highest mean fuelwood quantity self-consumed by Kathani Basti (65.08±4.29 kg/day, Kruskal-Wallis, $P<0.05$)

and sold by Kanchanjuri (67.32 ± 6.62 kg/day, Kruskal-Wallis, $P < 0.05$). In terms of annual extraction, the total mean fuelwood quantity extraction from inside Reserve was 14873.22 ± 2643.25 kg/annum (Appendix Table 6.50). The maximum extracted fuelwood quantity was utilized for self-consumption (9748.38 ± 1495.44 kg/annum) rather than selling (8753.63 ± 1828.31 kg/annum). Among villages, the significantly highest mean fuelwood quantity was extracted by Bandar Dubi (1592.00 ± 237.69 kg/annum, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.82 and 6.46). Among villages, the highest mean fuelwood quantity self-consumed by Bandar Dubi (784.40 ± 120.83 kg/annum, Kruskal-Wallis, $P < 0.05$) and sold by Kanchanjuri (1065.24 ± 178.84 kg/annum, Kruskal-Wallis, $P < 0.05$). The total mean selling rate of fuelwood was 95.92 ± 14.89 INR/kg. The total mean annual income from selling fuelwood was 201949.11 ± 42803.99 INR/annum (Appendix Table 6.50). Among villages, the significantly highest annual income generated by selling fuelwood was recorded for Kanchanjuri (24749.97 ± 4228.53 INR/annum, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.82 and 6.46). A total of 58 fuelwood species belonging to 51 genera and 24 families were recorded. Among species, *Lagerstroemia speciosa* (17.28%) and *Gmelina arborea* (15.65%) were identified as the most extracted fuelwood species (Appendix Table 6.83).

Comparison among inside, outside and entry-point fuelwood extraction quantity

In terms of fuelwood material, compared to inside, a significantly high mean annual quantities for total extraction (2925.85 ± 69.07 kg/annum, Mann-Whitney, $P < 0.05$), self-consumption (1673.30 ± 45.59 kg/annum, Mann-Whitney, $P < 0.05$) and sale (1804.14 ± 50.30 kg/annum, Mann-Whitney, $P < 0.05$) were recorded from outside the Reserve (Appendix Tables 6.73, 6.74 and 6.54). Compared to the socio-economic survey, the entry point survey showed significantly high mean annual quantities for total extraction (14873.22 ± 2643.25 kg/annum, Mann-Whitney, $P < 0.05$), self-consumption (9748.38 ± 1495.44 kg/annum, Mann-Whitney, $P < 0.05$) and sale (8753.63 ± 1828.31 kg/annum, Mann-Whitney, $P < 0.05$) with high mean annual income (201949.11 ± 42803.99 INR/annum, Mann-Whitney, $P < 0.05$) (Appendix Tables 6.75, 6.50 and 6.55).

6.3.5.5 Fish extraction

Socio-economic questionnaire survey

About 69.38% of respondents were purchasing fish (Appendix Table 6.84). The total mean fish purchased quantity was 671.54 ± 16.95 kg/hh/annum. Among villages, the highest total mean quantity of fish was purchased by Kaziranga N.C (1325.00 ± 975.00 kg/hh/annum, Kruskal-Wallis, $P > 0.05$) (Appendix Tables 6.84 and 6.5). The total mean price for purchasing fish was 48.93 ± 0.41 INR/kg. The total amount spent to purchase fish was 32779.13 ± 876.69 INR/hh/annum. Among villages, Kaziranga N.C had the significantly highest expenditure on purchasing fish at 65375.00 ± 49625.00 INR/hh/annum (Kruskal-Wallis, $P < 0.05$). The majority of respondents purchase fish rather than extract it (44.34%). Most respondents used nylon fishing nets (95.24%) for fish extraction (Appendix Table 6.85). Majority of respondents were extracting fish from outside the Reserve (100%). Most respondents were collecting fish during monsoon season (92.52%). In terms of daily extraction, the total mean fish quantity extraction from inside the Reserve was 14.17 ± 0.45 kg/hh/day (Appendix Table 6.86). The maximum extracted fish quantity was utilized for self-consumption (9.66 ± 0.50 kg/hh/day) than selling (9.38 ± 0.61 kg/hh/day). Among villages, the highest mean fish quantity was extracted by Nahrubasti (18.00 ± 0.00 kg/hh/day, Kruskal-Wallis, $P > 0.05$) (Appendix Tables 6.86 and 6.5). Among villages, the highest mean fish quantity self-consumed by Nahrubasti (18.00 ± 0.00 kg/hh/day, Kruskal-Wallis, $P > 0.05$) and sold by Domjan No.2 (14.00 ± 0.00 kg/hh/day, Kruskal-Wallis, $P > 0.05$). In terms of annual extraction, the total mean fish quantity extraction from inside the Reserve was 352.09 ± 19.12 kg/hh/annum (Appendix Table 6.86). The maximum extracted fish quantity was utilized for selling (243.62 ± 22.04 kg/hh/annum) than self-consumption (234.55 ± 16.12 kg/hh/annum). Among villages, the highest mean fish quantity was extracted by Siljuri (472.57 ± 81.80 kg/hh/annum, Kruskal-Wallis, $P > 0.05$) (Appendix Tables 6.86 and 6.5). Among villages, the highest mean fish quantity self-consumed by Nahrubasti (450.00 ± 0.00 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) and sold by Hatikhuli Tea Estate (432.00 ± 0.00 kg/hh/annum, Kruskal-Wallis, $P > 0.05$). In terms of daily extraction, the total mean fish quantity extraction from outside the Reserve was 8.97 ± 0.25 kg/hh/day (Appendix Table 6.87). The maximum extracted fish quantity was utilized for self-consumption (7.22 ± 0.25 kg/hh/day) than selling (5.71 ± 0.36 kg/hh/day). Among villages, the significantly highest mean fish quantity was extracted

by Domjan No.2 (15.00 ± 2.89 kg/hh/day, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.87 and 6.5). Among villages, the highest mean fish quantity self-consumed by Kaziranga N.C (13.60 ± 1.03 kg/hh/day, Kruskal-Wallis, $P < 0.05$) and sold by Domjan No.2 (14.00 ± 0.00 kg/hh/day, Kruskal-Wallis, $P > 0.05$). In terms of annual extraction, the total mean fish quantity extraction from outside the Reserve was 302.64 ± 21.14 kg/hh/annum (Appendix Table 6.87). The maximum extracted fish quantity was utilized for self-consumption (238.25 ± 17.20 kg/hh/annum) rather than selling (210.33 ± 24.02 kg/hh/annum). Among villages, the significantly highest mean fish quantity was extracted by Kathani Basti (977.17 ± 538.36 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.87 and 6.5). Among villages, the significantly highest mean fish quantity self-consumed (676.56 ± 241.67 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) and sold (735.00 ± 0.00 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) by Halidhibari. In terms of annual extraction, the total mean fish quantity extraction from both inside and outside Reserve was 434.37 ± 25.27 kg/hh/annum (Appendix Table 6.88). The maximum extracted fish quantity was utilized for self-consumption (324.41 ± 19.80 kg/hh/annum) rather than selling (307.90 ± 26.09 kg/hh/annum). Among villages, the significantly highest mean fish quantity extracted by Siljuri (1121.43 ± 116.32 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.88 and 6.5). Among villages, the significantly highest mean fish quantity self-consumed (946.11 ± 250.37 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) and sold (969.00 ± 0.00 kg/hh/annum, Kruskal-Wallis, $P < 0.05$) by Halidhibari. The total mean selling rate of fish was 49.30 ± 0.88 INR/kg. The total mean annual income from selling fish was 16647.84 ± 1838.56 INR/hh/annum (Appendix Table 6.88). Among villages, the significantly highest annual income generated by selling fish was recorded for Halidhibari. (67830.00 ± 0.00 INR/hh/annum, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.88 and 6.5). A total of 56 fish species belonging to 42 genera and 20 families were recorded. Among species, *Anabas testudineus* (62.59%) and *Channa punctata* (60.54%) were identified as the most extracted fish species (Appendix Table 6.89)

Entry-point questionnaire survey

A total of 2668 (40.92%) respondents were involved in fishing (Appendix Tables 6.90 and 6.11). Respondents travel a total mean distance of 8.39 ± 0.74 km from home to the Reserve for extraction (Appendix Table 6.90). Additionally, a total mean distance of

0.92±0.18 km was travelled inside the Reserve. The mean distance from households to Reserve and inside the Reserve significantly varies among villages (Kruskal-Wallis, $P<0.05$) (Appendix Table 6.46). The maximum respondents were males (82.83%) (Appendix Table 6.90). Most respondents belong to the 31-60 age group (53.15%). Most of the respondents were illiterate (69.68%). The majority of respondents belong to the Hindu religion (78.04%) (Appendix Table 6.91). Among castes, most respondents belong to other backward classes (26.84%) and tea tribes (24.29%). For fish extraction, most respondents spent ≤61 minutes (45.39%) inside the Reserve (Appendix Table 6.92). The highest resource extraction activities were recorded between 9:01 and 12:00 (56.15%). Most respondents were aware of the species they were extracting (74.29%). Most respondents used nylon fishing nets for fish extraction (93.22%) (Appendix Table 6.93). For delivery, most respondents hand-lift their extraction in bags and baskets (78.15%). The majority of respondents are involved in both the self-consumption and selling of extracted fish (49.96%). In terms of daily extraction, the total mean fish quantity extraction from inside Reserve was 551.99±24.05 kg/day (Appendix Table 6.50). The maximum extracted fish quantity was utilized for selling (362.70±24.23 kg/day) than self-consumption (324.19±2.82 kg/day). Among villages, the significantly highest mean fish quantity was extracted by Kathani Basti (35.76±1.69 kg/day, Kruskal-Wallis, $P<0.05$) (Appendix Tables 6.94 and 6.46). Among villages, the significantly highest mean fish quantity self-consumed by Japari Pathar (14.69±0.91 kg/day, Kruskal-Wallis, $P<0.05$) and sold by Kathani Basti (25.48±1.85 kg/day, Kruskal-Wallis, $P<0.05$). In terms of annual extraction, the total mean fish quantity extraction from inside the Reserve was 6310.97±428.09 kg/annum (Appendix Table 6.50). The maximum extracted fish quantity was utilized for selling (4390.65±393.70 kg/annum) than self-consumption (3479.15±83.99 kg/annum). Among villages, the significantly highest mean fish quantity was extracted by Kathani Basti (470.63±18.48 kg/annum, Kruskal-Wallis, $P<0.05$) (Appendix Tables 6.95 and 6.46). Among villages, the significantly highest mean fish quantity self-consumed by Goshanibar (164.01±13.36 kg/annum, Kruskal-Wallis, $P<0.05$) and sold by Kathani Basti (336.41±22.48 kg/annum, Kruskal-Wallis, $P<0.05$). The total mean selling rate of fish was 350.95±31.58 INR/kg. The total mean annual income from selling fish was 217712.77±22789.12 INR/annum (Appendix Table 6.50). Among villages, the

significantly highest annual income generated by selling fish was recorded for Domjan No.1 (17024.00 ± 0.00 INR/annum, Kruskal-Wallis, $P < 0.05$) (Appendix Tables 6.95 and 6.46). A total of 49 fish species belonging to 39 genera and 21 families were recorded. Among species, *Puntius sophore* (15.78%) and *Ompok pabo* (11.43%) were identified as the most extracted fish species (Appendix Table 6.96).

Comparison among inside, outside and entry point fish extraction quantity

In terms of fish material, high mean annual quantities for total extraction (352.09 ± 19.12 kg/annum, Mann-Whitney, $P > 0.05$) and sale (243.62 ± 22.04 , Mann-Whitney, $P > 0.05$) were recorded from inside the Reserve while self-consumption (238.25 ± 17.20 kg/annum, Mann-Whitney, $P > 0.05$) was recorded from outside the Reserve (Appendix Tables 6.86, 6.87 and 6.54). Compared to the socio-economic survey, the entry point survey showed high mean annual quantities for total extraction (6310.97 ± 428.09 kg/annum, Mann-Whitney, $P < 0.05$), self-consumption (3479.15 ± 83.99 kg/annum, Mann-Whitney, $P < 0.05$) and sale (4390.65 ± 393.70 kg/annum, Mann-Whitney, $P > 0.05$) with high mean annual income (217712.77 ± 22789.12 INR/annum, Mann-Whitney, $P > 0.05$) (Appendix Tables 6.88, 6.50 and 6.55).

6.3.6 Attitude and awareness towards conservation

The majority of respondents were aware of the status of KTR (91.10%) (Appendix Table 6.97). Maximum aware respondents found KTR important (73.01%), as it provides livelihood opportunities to local communities (90.93%) (Appendix Tables 6.97 and 6.98). However, about 19.87% of respondents found KTR to be of no importance; its close proximity enhances crop/livestock/human-wildlife conflict (77.50%) (Appendix Table 6.98). Most respondents want to conserve KTR (82.45%) by deploying fencing around the Reserve (83.73%). Most respondents found that the forest department is more cooperative (51.28%) than non-cooperative (41.63%) (Appendix Table 6.99). Most respondents feel that the relationship between the forest department and local communities can be improved if they provide secondary employment or alternate livelihood options to local communities (54.15%) (Appendix Table 6.100). In other options, timely solution and compensation for crop/livestock/human-wildlife conflict (54.29%) can also improve the relationship between the forest department and local communities (Appendix Table 6.101)

6.3.7 Correlation between resource extraction and socio-economic and entry-point parameters

6.3.7.1 Socio-economic questionnaire survey

For thatch extraction, the three component axis explained a total of 61.50% of the variance. Six parameters of significant contribution to variations were identified: house pucca, house kaccha, roof top thatched, annual sale quantity, annual income generated and annual purchase quantity (Appendix Table 6.102). With respect to villages, the annual thatch extraction quantity showed a significant strong positive correlation with the annual sale quantity ($r=0.80$, $P<0.05$), annual income generated ($r=0.79$, $P<0.05$) and annual purchase quantity ($r=0.49$, $P<0.05$), whereas showed the non-significant positive correlation with house kaccha ($r=0.30$, $P>0.05$), house pucca ($r=0.08$, $P>0.05$) and rooftop thatched ($r=0.02$, $P>0.05$) parameters.

For fodder extraction, the three component axis explained a total of 57.10% of the variance. Six parameters of significant contribution to variations were identified: house pucca, house kaccha, annual self-consumption quantity, annual sale quantity, annual income generated and involved in animal husbandry (Appendix Table 6.102). With respect to villages, the fodder annual extraction quantity showed a significant strong positive correlation with the annual self-consumption quantity ($r=0.88$, $P<0.05$), annual sale quantity ($r=0.78$, $P<0.05$), annual income generated ($r=0.75$, $P<0.05$), and involved in animal husbandry ($r=0.37$, $P<0.05$), whereas showed the non-significant positive correlation with house kaccha ($r=0.23$, $P>0.05$) and house pucca ($r=0.14$, $P>0.05$) parameters.

For fuelwood extraction, the three component axis explained a total of 54.09% of the variance. Six parameters of significant contribution to variations were identified: house kaccha, involved in fuelwood purchase, house pucca, annual purchase quantity, rooftop thatched and cooking source liquid petroleum gas (Appendix Table 6.102). With respect to villages, the fuelwood annual extraction quantity showed a non-significant positive correlation with the house kaccha ($r=0.24$, $P>0.05$), involved in fuelwood purchase ($r=0.22$, $P>0.05$), house pucca ($r=0.17$, $P>0.05$), annual purchase quantity

($r=0.10$, $P>0.05$), roof top thatched ($r=0.08$, $P>0.05$) and cooking source liquid petroleum gas ($r=0.05$, $P>0.05$).

For fishing activity, the three component axis explained a total of 63.04% of the variance. Five parameters of significant contribution to variations were identified: house pucca, house semi-pucca, annual self-consumption quantity, annual sale quantity and annual income generated (Appendix Table 6.102). With respect to villages, the fish total annual extraction quantity showed a significant strong positive correlation with the annual self-consumption quantity ($r=0.92$, $P<0.05$), annual sale quantity ($r=0.87$, $P<0.05$) and annual income generated ($r=0.86$, $P<0.05$), whereas showed non-significant positive correlation with house semi pucca ($r=0.11$, $P>0.05$) and house pucca ($r=0.06$, $P>0.05$) parameters.

6.3.7.2 Entry-point questionnaire survey

Results from PCA showed that the two component axis explained a total of 88.02% of the variance for thatch extraction, 78.20% of the variance for fodder extraction, 83.77% of the variance for fuelwood extraction and 77.46% of the variance for fish extraction. Five parameters of significant contribution to variations were identified for thatch, fodder, fuelwood and fish extraction, which include the distance from home to extraction location, distance travelled inside the Reserve for extraction, annual self-consumption quantity, annual sale quantity, and annual income generated (Appendix Table 6.103). With respect to villages, the annual extraction quantity showed a significant strong positive correlation with the annual sale quantity (thatch extraction:- $r=0.86$, $P<0.05$; fodder extraction:- $r=0.69$, $P<0.05$; fuelwood extraction:- $r=0.94$, $P<0.05$; fish extraction:- $r=0.93$, $P<0.05$), annual self-consumption quantity (thatch extraction:- $r=0.99$, $P<0.05$; fodder extraction:- $r=0.97$, $P<0.05$; fuelwood extraction:- $r=0.97$, $P<0.05$; fish extraction:- $r=0.92$, $P<0.05$), and annual income generated (thatch extraction:- $r=0.86$, $P<0.05$; fodder extraction:- $r=0.68$, $P<0.05$; fuelwood extraction:- $r=0.94$, $P<0.05$; fishing extraction:- $r=0.80$, $P<0.05$). Whereas the annual extraction quantity showed a non-significant positive correlation with the distance travelled inside the Reserve for extraction (thatch extraction:- $r=0.01$, $P>0.05$; fodder extraction:- $r=0.22$, $P>0.05$; fuelwood extraction:- $r=0.24$, $P>0.05$ and fish extraction:- $r=0.19$, $P>0.05$) and distance from home to extraction location (thatch extraction:- $r=0.20$,

$P > 0.05$; fodder extraction:- $r = 0.26$, $P > 0.05$; fuelwood extraction:- $r = 0.34$, $P > 0.05$ and fish extraction:- $r = 0.09$, $P > 0.05$).

6.3.8 Villages extracting maximum quantity of resources

Among villages, Bandar Dubi, Beloguri, Goshanibar, Kanchanjuri, Kathani Basti, Kaziranga N.C, Mohpara, Pachi Gaon, Siljuri, and Tamuli Pathar were identified as areas with maximum resource extraction (Table 1).

Table 6.1. Villages with maximum resource extraction in terms of thatch, fodder, fuelwood and fish material selected for a socio-economic and entry point survey around Kaziranga Tiger Reserve, Assam, India.

Extracted resources		Annual extraction qty (in kg) (Mean±SE)		
		Inside	Outside	Entry point
Thatch	Village (quantity)	Tamuli Pathar (543.75±144.16)	Bandar Dubi (1248.33±190.41)	Beloguri (545.63±35.32)
Fodder	Village (quantity)	Pachi Gaon (1100.00±800.00)	Mohpara (1912.50±715.13)	Goshanibar (182.97±21.58)
Fuelwood	Village (quantity)	Kanchanjuri (3527.11±593.63)	Kaziranga N.C (4266.67±1185.09)	Bandar Dubi (1592.00±237.69)
Fish	Village (quantity)	Siljuri (472.57±81.80)	Kathani Basti (977.17±538.36)	Kathani Basti (470.63±18.48)

6.4 Discussion

Floodplain wetlands are among the Earth's most distinctive landscape features. In their natural state, these areas exhibit significantly high biodiversity, productivity, and corresponding recreational and aesthetic values (Tockner & Stanford, 2002; Lockaby et al., 2008). Unfortunately, floodplain wetlands in various regions around the globe have experienced significant declines or deterioration due to widespread agricultural practices, urban expansion, and overexploitation by local communities (Tockner & Stanford, 2002; Ambastha et al., 2007a; Lockaby et al., 2008). The present study will improve our understanding of the local community's demographic and socio-economic status, resource use patterns, and attitudes and awareness towards the conservation of floodplain wetlands of the Brahmaputra River.

Our findings suggest that in the surveyed villages, a large portion of the population is literate but faces unemployment. Additionally, the area does not have essential facilities such as education, health services, sanitation, and general amenities (GOI, 2011). This

could be attributed to the illegal settlements around the region, as many immigrants tend to establish temporary houses in newly designated Reserve areas, where the development of infrastructure is prohibited (Vasu, 2003; Das, 2015). Our study findings indicate that most respondents were literate and belonged to the Hindu religion. The predominant caste groups identified were the tea tribes and other backward classes. A substantial number of respondents reported having nuclear families, with a mean family size of 5 members/hh. These results align with the socio-economic survey conducted in Kaziranga by Heinen and Shrivastava (2009), Das (2015) and Borah et al. (2018).

The present study revealed that most respondents have small landholdings and live in houses with kaccha walls and rooftops made of tin, and only have electricity while do not have access to television, mobile phones, vehicles, and sanitation facilities. Local people still rely on handpumps for water for drinking and other domestic uses and fuelwood for cooking. These findings indicate poverty and low living standards among the local people (Visaria, 1980). This study unveiled that most respondents were engaged in wage labour and agriculture. The population predominantly consisted of marginal and agricultural workers (n=4369 and 702, respectively, GOI, 2011). However, the maximum annual income was generated from tourism and government jobs. Maximum tourism activities were conducted during the winter season, and respondents perceived them as a beneficial source of livelihood and income. However, some respondents also expressed concerns that it is a seasonal activity with high maintenance costs and generates less revenue for them. These findings align with previous research (Hussain et al., 2012; Das, 2015; Saikia, 2020). Over the past couple of decades, tourism activities have flourished around Kaziranga. The total revenue from tourism in the Reserve has increased from INR 40,70,923 in 1997-98 to INR 2,07,90,690 in 2008-09 (Hussain et al., 2012). Furthermore, livelihoods such as livestock rearing, handicrafts, mekhela weaving, and home gardening contribute to income, albeit to a lesser extent. Livestock face challenges such as inadequate fodder and nutrition, lack of quality breeds, and insufficient veterinarian facilities. Additionally, there is a lack of livelihood skills among the local people, while home gardening is often confined to limited household areas. These problems were also

identified in previous surveys in Kaziranga fringe villages (Das, 2015; Borah et al., 2017).

The fringe villages depend on the Reserve for various essential resources, including grazing grounds and collection of thatching, fodder, fuelwood, and fishing resources, and present socio-economic data indicates that most livestock grazing occurs outside the Reserve during winter, allowing for approximately 8 hours of grazing time. However, Devi et al. (2022b) documented an overgrazing pressure around Kaziranga, where 58,000 livestock were observed grazing in 416 instances. Most respondents extract thatch, fodder, and fuelwood but purchase fish. The maximum resource extraction was reported from outside the Reserve, including thatch from the Kaziranga fringe, fodder from their house surroundings and agricultural fields, and fuelwood from the Karbi Anglong hills. The information was previously documented in a survey conducted in the region by Shrivastava and Heinen in 2007. Specifically, the Karbi Anglong hills were recognized as the primary source of timber. Therefore, any further increase in population is likely to impact these areas. The regions surrounding the Reserve and Karbi Anglong Hills play a vital role as wildlife corridors, enabling annual migration and providing a refuge for animals during flood periods (Areendran et al., 2020). The maximum plant material was collected during winter, while fishing was done in the monsoon. Thatch is collected during winter as most grasses dry up during this season, making them suitable for direct use in thatching. Fodder is more abundantly collected in winters, as new crops are sown in winters, and grazing grounds become unavailable during this period. Additionally, fuelwood is collected in winter to meet the increased demand for cooking, heating, and lighting during the colder months. Fishing activities are mainly conducted in the monsoon season, driven by the flooding and increased influx of fish from the Brahmaputra River.

The current study's entry point survey revealed that most respondents were involved in fish extraction. Furthermore, it was recorded that all resource extraction activities were confined to the buffer area (within <2 km) of the Reserve, with no extraction from the core area. This is likely due to the danger of animal attacks and the enforcement of strict regulations, including shoot-on-sight orders for individuals found within the Reserve boundaries (Das, 2015). In this study, a socio-economic survey revealed that the

maximum annual quantity of both thatch and fuelwood materials was extracted from outside the Reserve, while fodder and fish were extracted from inside the Reserve, for which the extracted quantities were higher than those reported in previous studies (Shrivastava & Heinen, 2007; Das, 2015). This indicates a notable increase in human pressure on this ecosystem. The extraction was higher from entry-points in comparison to the socio-economic survey. This might be one of the reasons that earlier socio-economic survey based studies in Kaziranga reported limited resource extraction (Shrivastava & Heinen, 2007; Das, 2015). All plant material collection, including thatch, fodder, and fuelwood, was done for both self-consumption and income generation. Among species, *Saccharum* spp., *Hemarthria compressa*, *Albizia procera*, and *Lagerstroemia speciosa* were prominent among the extracted species. However, species like *Saccharum* spp. and *Hemarthria compressa* are essential forage species for herbivores (Devi et al., 2022a). Therefore, a high level of extraction of these species might also impact the forage availability for herbivores.

The present study has revealed that fishing activities occur in the Brahmaputra River and its small tributaries, including the Mora Dhansiri River, Mora Diphlu River, and Diphlu River, which run along the Reserve boundaries. Additionally, fishing is observed in small wetlands, locally known as beels. These beels not only serve as fishing grounds but also provide other regulation, support, and cultural services for the local people residing around the Reserve (Geethanjali, 2017). Our results revealed that fishing was carried out for both self-consumption and income generation. Predominant extraction of fish species included *Anabas testudineus* and *Puntius sophore*. Although fishing is prohibited in KNP, it is challenging to enforce this prohibition (Shrivastava & Heinen, 2007).

PCA revealed that annual resource extraction quantity was positively correlated with annual sale quantity, annual self-consumption quantity and annual income generated; thatch quantity with annual purchase quantity; fodder with animal husbandry; fuelwood with household characteristics and annual purchase. Given that the majority of the population is unemployed and engaged in marginal work, they struggle to generate sufficient income to sustain their livelihoods. Consequently, they rely on freely available resources in their surroundings for survival. Additionally, a previous study by

Shrivastava and Heinen (2007) indicated that occupation, education, consumption, and household size also impact resource extraction in Kaziranga. This study revealed that respondents are aware of the conservation status of Kaziranga region and identify it as an important source of livelihood, consistent with the findings of Heinen and Shrivastava (2009), although Das (2015) reported that 88% of respondents had a negative attitude toward Reserve authority. The result of present study suggests that relationship between the Reserve and local communities should be improved for effective management by creating alternative livelihood options. Timely solutions and sufficient compensation for loss of crop and livestock can also minimize the conflict .

6.5 Conclusion

Floodplain wetlands exist on the outskirts of our conservation policies and face the highest threat of disappearance due to unregulated development and urgent resource demands (Ambastha et al., 2007a). The findings of this present study revealed intricate interactions between floodplain wetlands and the surrounding fringe communities. Conservation efforts have witnessed a notable acceleration, particularly in the case of Kaziranga. Initially declared a Reserve Forest, it underwent a series of redesignations, evolving into a Wildlife Sanctuary, National Park, United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site, and ultimately a Tiger Reserve in 2007. The upgrade of Kaziranga's status brought about stringent restrictions (Das, 2015). These encompassed the prohibition of grazing, resource extraction, and any developmental activities within the precincts of Kaziranga. To govern exploitation, management, and preservation, the 'Forest Act' and 'Assam Forest Regulation' were enforced, along with the application of 'shooting rules' from 1905 (Das, 2015). Despite intensified conservation efforts, this study indicates that Kaziranga and its fringe areas, including Karbi Anglong Hills are still being exploited for grazing and collecting thatch, fodder, fuelwood and fish resources. The challenges persist, likely stemming from insufficient essential facilities, low income, and limited livelihood options for the local communities. The local community exhibits a positive attitude towards the conservation of Kaziranga, recognizing its significance in wildlife conservation and as a source of livelihood. However, a segment of the population holds

a negative attitude due to increased conflicts with crops, livestock, and human-wildlife interactions and perceived restrictions on living in the vicinity.

In light of recent research findings, the following recommendations are proposed:

- Fodder with high nutritional value needs to be promoted and capacity of local communities should be developed to it. Panchayat and common lands can be used and managed to meet the fodder requirements.
- Alternative livelihood strategies need to be developed on basis of availability of natural and agricultural resource, demands, markets and local skill sets. Local communities should be consulted regularly and market surveys should be conducted during formation of alternative livelihood frameworks.
- Guarding of the crops and supervised grazing should be promoted through incentives.
- Strategies such as corrals and insurance of livestock (suggested by Namgail et al. 2007 for western Himalayan states) can be adopted and implemented after modification in consideration with the socio-ecological conditions of Kaziranga, to address the livestock losses.
- Regular sensitization and awareness among local communities and other stakeholders need to be conducted regarding conservation and its benefits.
- Platforms need to be created to conduct regular dialogues among all the stakeholders, wherein concerns and issues of affected communities can be discussed. These platforms will not only help in understanding the socio-ecological complexities of the region but will also inculcate ownership among the stakeholders towards Kaziranga and its conservation.
- Local institutions such as Panchayats and SHGs, should be strengthened and their role, rights and responsibilities should be defined in conservation planning and implementation.
- Strategies and frameworks should be in place to ensure equal opportunities and benefit sharing.

CHAPTER 7

SYNTHESIS AND MANAGEMENT RECOMMENDATIONS

7.1 Introduction

Tropical grasslands are characterized by species-rich herbaceous plant communities (Joyce et al., 2016; Buisson et al., 2018). These plant communities are maintained by changing intensities and frequencies of diverse factors, including climate change, herbivory and management interventions (Joyce et al., 2016; Buisson et al., 2018; Sharma et al., 2023). The present study was conducted in the riverine alluvial grasslands of Kaziranga National Park (KNP) in the Brahmaputra floodplains to aid the management authorities in formulating and upgrading current management practices. These grasslands support an assemblage of eight mega- and meso-herbivores, namely greater one-horned rhino (*Rhinoceros unicornis*), Asian elephant (*Elephas maximus*), Asiatic wild buffalo (*Bubalus arnee*), Indian bison (*Bos gaurus*), swamp deer (*Rucervus duvaucelii*), hog deer (*Axis porcinus*), sambar (*Rusa unicolor*) and Indian red muntjac (*Muntiacus muntjak*) (Devi et al., 2022a). The grasslands of KNP are subjected to combinations of herbivory, and management practices such as prescribed burning and manual uprooting of globally noxious invasive, *Mikania micrantha* and *Mimosa* spp. (Vasu, 2003; Vasu & Singh, 2015; Nath et al., 2019). Given the lack of scientific evidence regarding the effectiveness of manual uprooting and burning in controlling biological invasion in this Natural World Heritage Site, the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Convention (WHC) strongly recommended that the efficacy of these management interventions be assessed (WHC, 2011). This study aims to provide experimental evidence of factors influencing the grassland soil seed bank and how the managed herbivory, prescribed burning and manual invasive uprooting influence the vegetation characteristics and edaphic conditions of these grasslands.

7.2 Key Research Findings

7.2.1 Seed bank characteristics and composition of riverine alluvial grasslands

- Compared to TG (tall grasslands), the SG (short grasslands) showed high mean seed abundances and densities.
- With respect to the soil layers of both SG & TG, the upper soil layer showed the highest mean seed abundances and densities.
- In the hand sorting experiment, TG showed higher mean seed abundances and densities than SG. Irrespective of soil layers in both SG & TG, high mean seed abundances and densities were recorded for seeds with whole conditions, smooth surfaces, and without appendages.
- In the germination experiment, irrespective of experiments, the SG showed higher mean seed abundances and densities than TG. Compared to flooding conditions in both SG & TG, the high mean seed abundances and densities were recorded in natural conditions.
- In both SG & TG, with respect to experiments and soil layers, family Poaceae & growth form herbs dominated.
- In SG, irrespective of treatments and soil layers, *Cynodon dactylon* contributed most to the mean seed abundances and densities. In TG, overall and in flooding treatment *Apluda mutica* contributed most to the mean seed abundances and densities and *Phyllanthus niruri* in natural treatment. In the upper soil layer of TG, *Apluda mutica* and *Phyllanthus niruri* contributed most to the mean seed abundances and densities. Similarly, *Imperata cylindrica*, *Phyllanthus niruri*, *Pouzolzia zeylanica* and *Apluda mutica* contributed most in the middle soil layer and *Apluda mutica*, *Phyllanthus niruri* and *Imperata cylindrica* contributed most in the lower soil layer.
- In both SG & TG, compared to natural treatment, the highest pairwise overlap in species composition was recorded in flooding treatment, between the upper & middle layers, upper & lower layers and middle & lower layers.

7.2.2 Plant species composition and structure of riverine alluvial grasslands

- In both SG & TG, family Poaceae & growth form herbs dominated. SG plant communities were dominated by *Cynodon dactylon*, *Hemarthria compressa* and *Carex vesicaria*, while TG were dominated by *Saccharum* spp.
- SG showed high plant species richness and diversity, while TG showed high woody individuals and soil nutrient content.
- No invasion of *Mimosa* spp. and *Mikania micrantha* was recorded in SG. Compared to invasive *Mimosa* spp., the TG showed a high occurrence of *Mikania micrantha*.
- Herbivore exclusion promoted woody individuals, richness, diversity and soil nutrient content in SG & TG and *vice-versa* for herbivore inclusion.
- Burning and invasive removal in TG reduced woody and enhanced soil nutrient content. Burning in TG decreased species richness and diversity, while invasive removal increased richness and diversity.
- In terms of invasives, herbivore exclusion enhances the occurrence of *Mimosa* spp. while grazing, burning, and invasive removal reduces *Mimosa* spp. Herbivore exclusion and inclusion enhances the occurrence of *Mikania micrantha*, while invasive removal reduces *Mikania micrantha*. Burning reduces the occurrence of *Mikania micrantha* in the wet season while enhances *Mikania micrantha* in the dry season.
- High similarities in species composition were recorded overall between HETIR & HIT, in the dry season between HETB & HIT, and in the wet season between HET & HIT; the lowest was recorded between HES & HETB.
- Grassland species distribution was defined by soil carbon, nitrogen, & phosphorus content.

7.2.3 Biomass productivity of riverine alluvial grasslands

- Compared to SG, a high annual aboveground biomass productivity (AGBP) was recorded in TG.
- In both SG & TG, class monocots, growth form grasses, family Poaceae and life cycle perennials contributed maximum to mean annual AGBP. In SG

Hemarthria compressa and in TG *Saccharum* spp. contributed maximum to mean annual AGBP.

- Compared to SG, the high mean annual AGBP of class monocots, growth form grasses, family Poaceae and life cycle perennials were recorded in TG.
- Irrespective of seasons, herbivore exclusion enhances the mean annual AGBP in SG while decrease the mean annual AGBP in TG. In TG, irrespective of seasons, burning and invasive removal enhances mean annual AGBP.
- Herbivore exclusion enhances the mean annual AGBP of *Mimosa* spp. and reduces the mean annual AGBP of *Mikania micrantha*. Contrarily, herbivore inclusion reduces the mean annual AGBP of *Mimosa* spp. and increases the mean annual AGBP of *Mikania micrantha*. Burning reduces the mean annual AGBP of *Mimosa* spp. throughout the study period and *Mikania micrantha* in the wet season and increases *Mikania micrantha* in the dry season. Invasive removal experiment resulted in a reduction in the mean annual AGBP of invasives, *Mimosa* spp. and *Mikania micrantha*.
- Compared to SG, a high mean annual belowground biomass productivity (BGBP) was recorded for TG. The mean annual AGBP of grasslands was influenced by soil carbon, nitrogen, phosphorus & potassium content and rainfall & minimum temperature, while the mean annual BGBP was influenced by soil carbon, nitrogen, phosphorus & potassium content and rainfall, minimum temperature and maximum temperature.

7.2.4 Resource dependence and attitudes of local communities toward conservation of Kaziranga Tiger Reserve

- In the socio-economic survey, the majority of respondents belong to the Hindu religion and tea tribe caste and have nuclear families.
- In terms of amenities, 84.31% of households have electricity, 64.71% mobile phones, 33.33% television & 48.87% have vehicles. Most respondents utilize handpumps for conducting water-related activities and fuelwood as a cooking source. Maximum respondents were involved in wage labour and agriculture.

- About 81.90% of respondents were involved in livestock grazing. Most respondents were conducting livestock grazing outside the Reserve and during the winter season.
- The majority of respondents were extracting thatch, fodder, fuelwood and fish resources from outside the Reserve. Maximum thatch, fodder and fuelwood resources were collected during the winter season, while fishing was conducted in the monsoon season.
- In terms of thatch, compared to inside, the high mean annual quantity was extracted from outside the Reserve. Compared to the socio-economic survey, the entry point monitoring showed a high mean annual quantity of thatch extraction. *Saccharum* spp. was the most extracted thatch species.
- In terms of fodder, compared to outside, the high mean annual quantity was extracted from inside the Reserve. Compared to the socio-economic survey, the entry point monitoring showed a high mean annual quantity of fodder extraction. *Hemarthria compressa* was the most extracted fodder species.
- In terms of fuelwood, compared to inside, the high mean annual quantity was extracted from outside the Reserve. Compared to the socio-economic survey, the entry point monitoring showed a high mean annual quantity of fuelwood extraction. *Albizia procera* and *Lagerstroemia speciosa* were the most extracted fuelwood species.
- In terms of fish, compared to outside, the high mean annual quantity was extracted from inside the Reserve. Compared to the socio-economic survey, the entry point monitoring showed a high mean annual quantity of fish extraction. *Anabas testudineus* and *Puntius sophore* were the most extracted fish species.
- The majority of respondents found KTR important, as it provides livelihood opportunities to local communities. However, about 19.87% of respondents found KTR to be of no importance; its close proximity enhances crop/livestock/human-wildlife conflict.
- Most respondents found that the forest department is more cooperative. However, the relationship between the forest department and local communities

can be further improved if the department provides secondary employment or alternate livelihood options to local communities.

7.3 Conservation Implication and Management Recommendation

- ***Preserve and establish soil seed bank:*** It is recommended to maintain and preserve the existing vegetation seedlings using soil seed banks of both SG and TG. For seed bank establishment, topsoil translocation is recommended to preserve native species in seed banks, as upper layers showed a high mean number of seed abundance densities. It is recommended to prioritize resprouting and vegetative propagation of important tall grass species using roots and rhizomes.
- ***Rotational grazing:*** To enhance heterogeneity and soil quality of SG & TG, managed herbivory through enclosures is recommended. Nevertheless, enclosed areas lead to increased growth of woody vegetation in both SG & TG, along with the spread of invasive species in TG. Herbivore exclusion enhances productivity in SG while decreasing productivity in TG. Therefore, it is recommended to adopt rotational grazing to control the succession, invasion and productivity potential of these ecosystems.
- ***Controlled annual burning:*** To enhance vegetation characteristics and soil conditions of these ecosystems, it is recommended to carry out controlled annual burning only in completely dry grassland patches, and in invaded patches post manual uprooting of fire-adapted invasives like *Mikania micrantha*.
- ***Invasive uprooting:*** To enhance vegetation characteristics and soil conditions of these ecosystems, it is recommended to carry out manual uprooting of both *Mimosa* spp. and *Mikania micrantha* in dry and wet seasons.
- ***Conduct long-term experimental studies:*** It is recommended to conduct a thorough examination of the dynamics of woody and invasive species in grasslands subjected to various management practices. Exploring grassland management techniques is essential in mitigating the impacts of succession and invasion in grasslands, ultimately aiding in their restoration and effective management.

- a) ***Mitigate resource extraction:*** Despite intensified conservation efforts, this study indicates that Kaziranga and its fringe areas, including Karbi Anglong Hills are still being exploited for grazing and collecting thatch, fodder, fuelwood and fish resources. The challenges persist, likely stemming from insufficient essential facilities, low income, and limited livelihood options for the local communities. The local community exhibits a positive attitude towards the conservation of Kaziranga, recognizing its significance in wildlife conservation and as a source of livelihood. However, a segment of the population holds a negative attitude due to increased conflicts with crops, livestock, and human-wildlife interactions and perceived restrictions on living in the vicinity. In light of recent research findings, the following recommendations are proposed: (a) fodder with high nutritional value needs to be promoted, and the capacity of local communities should be developed for it, (b) alternative livelihood strategies need to be developed based on the availability of natural and agricultural resources, demands, markets and local skill sets, (c) local communities should be consulted regularly, and market surveys should be conducted during the formation of alternative livelihood frameworks, (d) guarding of the crops and supervised grazing should be promoted through incentives, (e) strategies such as corrals and livestock insurance can be adopted and implemented after modification in consideration of the socio-ecological conditions of Kaziranga to address livestock losses, (f) regular sensitization and awareness among local communities and other stakeholders need to be conducted regarding conservation and its benefits, (g) platforms need to be created to conduct regular dialogues among all the stakeholders, wherein concerns and issues of affected communities can be discussed, (h) local institutions like Panchayats and SHGs should be strengthened, and their role, rights and responsibilities need to be defined in conservation planning and implementation, and (i) strategies and frameworks should be in place to ensure equal opportunities and benefit sharing.

LITERATURE CITED

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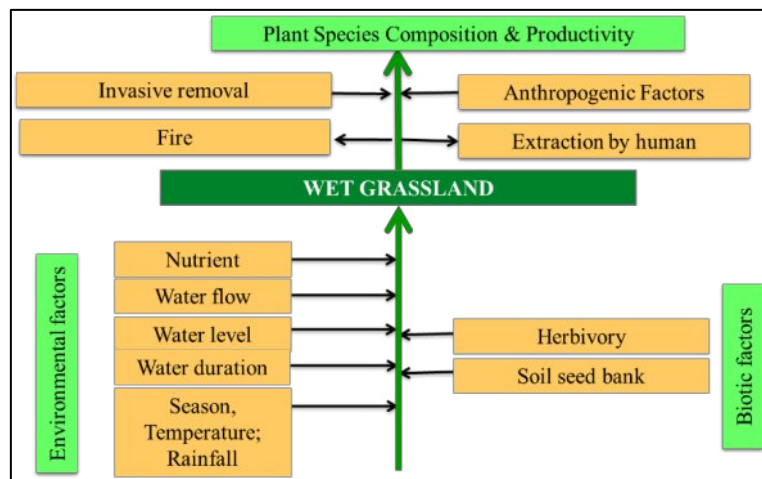
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APPENDICES

APPENDIX 1: Factors affecting plant species composition and biomass productivity of wet grasslands

Appendix Table 1.1. Flow chart of the factors affecting the wet grassland ecosystem.



APPENDIX 2: Threats to ungulates in the Kaziranga Tiger Reserve, Assam, India

Appendix Table 2.1. Various threats to the wild animals excluded from the experimental sites in the Kaziranga Tiger Reserve, Assam, India.

Threat	Description	Reason	Taxa affected	Literature
Habitat fragmentation	NH 37 highway	Increased anthropogenic pressure and developmental activities	Rhino, Asian Elephant, Asiatic Wild buffalo, Swamp deer, Hog deer, Wild boar and Barking deer	b, f, g
	Increased settlement nearby NH 37			
	Agriculture expansion			
	Tea garden			
Poaching	Horn	Traditional medicine purpose	Rhino, Asiatic Wild buffalo and Swamp deer	d
Flood	High flood during 1988, 1998, 2004 and 2012	Making animals more prone to drowning	Rhino, Asian Elephant, Asiatic Wild buffalo, Swamp deer, Hog deer and Wild boar	b, f
Accident	Road Kill	During high flood level wild animal migrate to karbi areas which makes them more prone to poaching, accident and drowning	Rhino, Hog deer, Barking deer, Wild boar, Reptiles	e
Disease	Transmission of disease like rinderpest and anthrax	Due to cattle grazing	Asian Elephant, Asiatic Wild buffalo, Swamp deer and Hog deer	a, b
Dog kill	Street dogs attacks the animal	Meat	Hog deer	Present study
Burning	Late burning may affect the fawn and calves	Sometimes burning till April	Rhino, Swamp deer and herpetofauna (python, turtle and frog)	b, c
Overgrazing	Grazing by domestic cattle on the fringes of the park	Cows, goats and buffaloes grazing might decrease the forage availability for other wild animals and also increase the chances of spread of disease	Rhino, Asian Elephant, Asiatic Wild buffalo, Swamp deer, Hog deer and Sambar	Present study

^aChoudhury (1994), ^bBonal (1998), ^cAhmed et al. (2005), ^dPatar (2005), ^eDas et al. (2007), ^fYadava (2014) and ^gSharma & Sarma (2014)

APPENDIX 3: Soil seed bank characteristics and composition of riverine alluvial grasslands

Appendix Table 3.1. GPS coordinates of the experimental sites in riverine alluvial grasslands of Kaziranga National Park, Assam, India.

Experimental sites	Habitat	Forest Range	GPS	
			Latitude	Longitude
SGN & SGF	Short grassland	Agoratoli	26.686306	93.542917
	Short grassland	Agoratoli	26.670194	93.554944
	Short grassland	Kohora	26.623278	93.375444
	Short grassland	Kohora	26.612528	93.323417
	Short grassland	Bagori	26.589972	93.268972
	Short grassland	Bagori	26.606665	93.301546
TGN & TGF	Tall grassland	Agoratoli	26.693722	93.571333
	Tall grassland	Agoratoli	26.674694	93.540444
	Tall grassland	Kohora	26.64175	93.365806
	Tall grassland	Kohora	26.626917	93.361417
	Tall grassland	Bagori	26.586556	93.284478
	Tall grassland	Bagori	26.604472	93.296778

SGN- short grassland given natural treatment, SGF-short grassland given flooding treatment, TGN- tall grassland given natural treatment and TGF- tall grassland given flooding treatment.

Appendix Table 3.2. Number of composite soil samples collected from short and tall riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Treatment	Soil layer	Number of soil samples		
			Overall	Dry season	Wet season
Short grassland	Natural	UL	144	72	72
		ML	144	72	72
		LL	144	72	72
		Total	432	216	216
	Flooded	UL	144	72	72
		ML	144	72	72
		LL	144	72	72
		Total	432	216	216
	Total	UL	288	144	144
		ML	288	144	144
		LL	288	144	144
		Total	864	432	432
Tall grassland	Natural	UL	144	72	72
		ML	144	72	72
		LL	144	72	72

Experimental sites	Treatment	Soil layer	Number of soil samples		
			Overall	Dry season	Wet season
	Flooded	Total	432	216	216
		UL	144	72	72
		ML	144	72	72
		LL	144	72	72
		Total	432	216	216
	Total	UL	288	144	144
		ML	288	144	144
		LL	288	144	144
		Total	864	432	432
Total	Natural	UL	288	144	144
		ML	288	144	144
		LL	288	144	144
		Total	864	432	432
	Flooded	UL	288	144	144
		ML	288	144	144
		LL	288	144	144
		Total	864	432	432
	Total	UL	576	288	288
		ML	576	288	288
		LL	576	288	288
		Total	1728	864	864

Overall indicates sampling from January 2014 to December 2015 (excluding August to October), dry season indicates sampling from November to March, wet season indicates sampling from April to July, UL- upper layer (0-5), ML- middle layer (5-10) and LL- lower layer (10-15).

Appendix Table 3.3. Total mean seed abundances and densities (m⁻²) recorded from short and tall riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Treatment	Soil layers	Season	Experiment 1				Experiment 2				Total			
				A	Total	Mean±SE	D	A	Total	Mean±SE	D	A	Total	Mean±SE	D
Grassland	Natural	UL	Overall	5847	1949.00	243.63±31.41	1149.45	114988	38329.33	4791.17±620.38	22605.17	120835	40278.33	5034.79±649.34	23754.62
			Dry	3845	1281.67	320.42±21.18	1511.76	75098	25032.67	6258.17±492.19	29526.62	78943	26314.33	6578.58±503.01	31038.37
			Wet	2002	667.33	166.83±15.01	787.14	39890	13296.67	3324.17±345.09	15683.73	41892	13964.00	3491.00±354.67	16470.87
		ML	Overall	2026	675.33	84.42±13.04	398.29	39663	13221.00	1652.63±259.00	7797.24	41689	13896.33	1737.04±270.23	8195.53
			Dry	1374	458.00	114.50±13.12	540.22	26779	8926.33	2231.58±271.62	10528.82	28153	9384.33	2346.08±278.30	11069.04
			Wet	652	217.33	54.33±4.21	256.35	12884	4294.67	1073.67±125.72	5065.66	13536	4512.00	1128.00±126.67	5322.01
		LL	Overall	972	324.00	40.50±5.17	191.08	18982	6327.33	790.92±104.66	3731.62	19954	6651.33	831.42±108.62	3922.70
			Dry	632	210.67	52.67±4.67	248.49	12290	4096.67	1024.17±106.35	4832.11	12922	4307.33	1076.83±107.08	5080.60
			Wet	340	113.33	28.33±2.11	133.68	6692	2230.67	557.67±59.47	2631.12	7032	2344.00	586.00±58.65	2764.80
		Total	Overall	8845	2948.33	368.54±49.38	579.60	173633	57877.67	7234.71±981.61	11378.01	182478	60826.00	7603.25±1025.76	11957.62
			Dry	5851	1950.33	487.58±38.77	766.82	114167	38055.67	9513.92±869.66	14962.52	120018	40006.00	10001.50±887.87	15729.34
			Wet	2994	998.00	249.50±20.71	392.39	59466	19822.00	4955.50±526.44	7793.50	62460	20820.00	5205.00±536.13	8185.89

Experimental sites	Treatment	Soil layers	Season	Experiment 1				Experiment 2				Total			
				A	Total	Mean±SE	D	A	Total	Mean±SE	D	A	Total	Mean±SE	D
	Flooded	UL	Overall	5359	1786.33	223.29±27.49	1053.51	44538	14846.00	1855.75±173.38	8755.60	49897	16632.33	2079.04±198.72	9809.11
Dry			3500	1166.67	291.67±16.88	1376.11	27123	9041.00	2260.25±117.00	10664.07	30623	10207.67	2551.92±126.37	12040.18	
Wet			1859	619.67	154.92±11.17	730.91	17415	5805.00	1451.25±132.31	6847.13	19274	6424.67	1606.17±138.69	7578.05	
ML		Overall	1860	620.00	77.50±10.56	365.65	16299	5433.00	679.13±64.75	3204.18	18159	6053.00	756.63±73.60	3569.83	
		Dry	1244	414.67	103.67±7.50	489.11	9835	3278.33	819.58±69.96	3866.87	11079	3693.00	923.25±71.76	4355.98	
		Wet	616	205.33	51.33±2.75	242.20	6464	2154.67	538.67±38.93	2541.48	7080	2360.00	590.00±40.23	2783.68	
LL		Overall	858	286.00	35.75±3.77	168.67	10791	3597.00	449.63±36.52	2121.37	11649	3883.00	485.38±39.37	2290.04	
		Dry	543	181.00	45.25±2.14	213.49	6283	2094.33	523.58±41.63	2470.32	6826	2275.33	568.83±42.04	2683.81	
		Wet	315	105.00	26.25±1.27	123.85	4508	1502.67	375.67±29.04	1772.43	4823	1607.67	401.92±28.65	1896.28	
Total		Overall	8077	2692.33	336.54±41.68	529.28	71628	23876.00	2984.50±272.43	4693.72	79705	26568.33	3321.04±309.55	5223.00	
		Dry	5287	1762.33	440.58±26.07	692.90	43241	14413.67	3603.42±226.30	5667.09	48528	16176.00	4044.00±236.88	6359.99	
		Wet	2790	930.00	232.50±14.47	365.65	28387	9462.33	2365.58±199.45	3720.35	31177	10392.33	2598.08±206.45	4086.00	
Total	UL	Overall	11206	3735.33	466.92±58.79	1101.48	159526	53175.33	6646.92±792.19	15680.39	170732	56910.67	7113.83±846.74	16781.87	
		Dry	7345	2448.33	612.08±37.38	1443.93	102221	34073.67	8518.42±604.96	20095.34	109566	36522.00	9130.50±625.58	21539.28	
		Wet	3861	1287.00	321.75±26.16	759.02	57305	19101.67	4775.42±477.09	11265.43	61166	20388.67	5097.17±493.14	12024.46	
	ML	Overall	3886	1295.33	161.92±23.51	381.97	55962	18654.00	2331.75±322.69	5500.71	59848	19949.33	2493.67±343.10	5882.68	
		Dry	2618	872.67	218.17±20.61	514.67	36614	12204.67	3051.17±337.34	7197.85	39232	13077.33	3269.33±346.96	7712.51	
		Wet	1268	422.67	105.67±6.70	249.27	19348	6449.33	1612.33±164.62	3803.57	20616	6872.00	1718.00±166.91	4052.84	
	LL	Overall	1830	610.00	76.25±8.87	179.88	29773	9924.33	1240.54±140.45	2926.50	31603	10534.33	1316.79±147.38	3106.37	
		Dry	1175	391.67	97.92±6.65	230.99	18573	6191.00	1547.75±145.99	3651.21	19748	6582.67	1645.67±147.18	3882.20	
		Wet	655	218.33	54.58±3.18	128.76	11200	3733.33	933.33±88.44	2201.78	11855	3951.67	987.92±87.17	2330.54	
	Total	Overall	16922	5640.67	705.08±90.87	554.44	245261	81753.67	10219.21±1251.36	8035.86	262183	87394.33	10924.29±1333.32	8590.31	
		Dry	11138	3712.67	928.17±64.26	729.86	157408	52469.33	13117.33±1087.01	10314.80	168546	56182.00	14045.50±1118.22	11044.66	
		Wet	5784	1928.00	482.00±35.02	379.02	87853	29284.33	7321.08±725.66	5756.93	93637	31212.33	7803.08±742.36	6135.95	
Short grassland	Natural	UL	Overall	2009	669.67	83.71±11.54	789.89	74468	24822.67	3102.83±366.82	29278.92	76477	25492.33	3186.54±377.30	30068.81
			Dry	1340	446.67	111.67±9.08	1053.71	47308	15769.33	3942.33±337.22	37200.60	48648	16216.00	4054.00±342.36	38254.31
			Wet	669	223.00	55.75±4.20	526.07	27160	9053.33	2263.33±210.67	21357.24	27829	9276.33	2319.08±213.20	21883.31
		ML	Overall	534	178.00	22.25±2.92	209.96	27024	9008.00	1126.00±155.51	10625.15	27558	9186.00	1148.25±158.05	10835.10
			Dry	345	115.00	28.75±3.26	271.29	17586	5862.00	1465.50±171.92	13828.73	17931	5977.00	1494.25±174.05	14100.02
			Wet	189	63.00	15.75±1.07	148.62	9438	3146.00	786.50±80.33	7421.56	9627	3209.00	802.25±80.46	7570.18
		LL	Overall	317	105.67	13.21±1.43	124.64	12833	4277.67	534.71±63.49	5045.61	13150	4383.33	547.92±64.44	5170.24
			Dry	191	63.67	15.92±2.01	150.19	8133	2711.00	677.75±65.03	6395.38	8324	2774.67	693.67±65.66	6545.57
			Wet	126	42.00	10.50±0.80	99.08	4700	1566.67	391.67±30.67	3695.84	4826	1608.67	402.17±30.08	3794.92
		Total	Overall	2860	953.33	119.17±15.69	374.83	114325	38108.33	4763.54±584.47	14983.22	117185	39061.67	4882.71±598.45	15358.05
			Dry	1876	625.33	156.33±14.21	491.73	73027	24342.33	6085.58±571.41	19141.57	74903	24967.67	6241.92±579.53	19633.30
			Wet	984	328.00	82.00±5.15	257.92	41298	13766.00	3441.50±320.11	10824.88	42282	14094.00	3523.50±322.25	11082.80
	Flooded	UL	Overall	1799	599.67	74.96±10.69	707.32	27867	9289.00	1161.13±80.45	10956.59	29666	9888.67	1236.08±89.84	11663.91
			Dry	1209	403.00	100.75±8.79	950.70	16049	5349.67	1337.42±81.46	12620.11	17258	5752.67	1438.17±86.57	13570.81
			Wet	590	196.67	49.17±3.60	463.95	11818	3939.33	984.83±53.36	9293.07	12408	4136.00	1034.00±54.26	9757.02
		ML	Overall	504	168.00	21.00±1.87	198.16	10977	3659.00	457.38±34.60	4315.88	11481	3827.00	478.38±35.84	4514.04
			Dry	300	100.00	25.00±2.32	235.90	6339	2113.00	528.25±39.65	4984.67	6639	2213.00	553.25±39.79	5220.57
			Wet	204	68.00	17.00±0.58	160.42	4638	1546.00	386.50±25.83	3647.09	4842	1614.00	403.50±25.98	3807.50
		LL	Overall	295	98.33	12.29±0.88	115.99	7586	2528.67	316.08±21.08	2982.62	7881	2627.00	328.38±21.49	3098.61
			Dry	166	55.33	13.83±0.95	130.53	4264	1421.33	355.33±26.31	3352.99	4430	1476.67	369.17±26.71	3483.53
			Wet	129	43.00	10.75±1.05	101.44	3322	1107.33	276.83±18.84	2612.25	3451	1150.33	287.58±18.21	2713.69
		Total	Overall	2598	866.00	108.25±13.10	340.49	46430	15476.67	1934.58±135.02	6085.03	49028	16342.67	2042.83±145.74	6425.52

Experimental sites	Treatment	Soil layers	Season	Experiment 1				Experiment 2				Total			
				A	Total	Mean±SE	D	A	Total	Mean±SE	D	A	Total	Mean±SE	D
			Dry	1675	558.33	139.58±11.33	439.04	26652	8884.00	2221.00±144.66	6985.92	28327	9442.33	2360.58±149.39	7424.97
	Total	UL	Wet	923	307.67	76.92±4.26	241.93	19778	6592.67	1648.17±97.23	5184.14	20701	6900.33	1725.08±97.40	5426.07
			Overall	3808	1269.33	158.67±22.19	748.60	102335	34111.67	4263.96±445.54	20117.76	106143	35381.00	4422.63±465.54	20866.36
			Dry	2549	849.67	212.42±17.71	1002.20	63357	21119.00	5279.75±411.04	24910.36	65906	21968.67	5492.17±421.16	25912.56
			Wet	1259	419.67	104.92±7.63	495.01	38978	12992.67	3248.17±263.70	15325.16	40237	13412.33	3353.08±267.20	15820.16
		ML	Overall	1038	346.00	43.25±4.77	204.06	38001	12667.00	1583.38±188.46	7470.51	39039	13013.00	1626.63±192.46	7674.57
			Dry	645	215.00	53.75±5.49	253.60	23925	7975.00	1993.75±206.18	9406.70	24570	8190.00	2047.50±209.16	9660.30
			Wet	393	131.00	32.75±1.59	154.52	14076	4692.00	1173.00±104.69	5534.32	14469	4823.00	1205.75±104.99	5688.84
			Overall	612	204.00	25.50±2.25	120.31	20419	6806.33	850.79±83.59	4014.11	21031	7010.33	876.29±85.00	4134.43
		LL	Dry	357	119.00	29.75±2.86	140.36	12397	4132.33	1033.08±89.94	4874.18	12754	4251.33	1062.83±90.98	5014.55
			Wet	255	85.00	21.25±1.83	100.26	8022	2674.00	668.50±48.61	3154.05	8277	2759.00	689.75±47.34	3254.31
			Overall	5458	1819.33	227.42±28.77	357.66	160755	53585.00	6698.13±716.31	10534.13	166213	55404.33	6925.54±741.66	10891.79
			Dry	3551	1183.67	295.92±25.45	465.39	99679	33226.33	8306.58±704.89	13063.75	103230	34410.00	8602.50±719.09	13529.13
Tall grassland	Natural	Total	Wet	1907	635.67	158.92±9.33	249.93	61076	20358.67	5089.67±415.78	8004.51	62983	20994.33	5248.58±418.43	8254.44
			Overall	3838	1279.33	159.92±20.02	1509.00	40520	13506.67	1688.33±256.88	15931.43	44358	14786.00	1848.25±275.70	17440.43
			Dry	2505	835.00	208.75±12.79	1969.80	27790	9263.33	2315.83±162.09	21852.64	30295	10098.33	2524.58±168.22	23822.44
			Wet	1333	444.33	111.08±10.83	1048.20	12730	4243.33	1060.83±138.40	10010.22	14063	4687.67	1171.92±146.52	11058.43
		ML	Overall	1492	497.33	62.17±10.14	586.62	12639	4213.00	526.63±104.96	4969.33	14131	4710.33	588.79±113.40	5555.95
			Dry	1029	343.00	85.75±9.91	809.15	9193	3064.33	766.08±102.93	7228.91	10222	3407.33	851.83±106.32	8038.06
			Wet	463	154.33	38.58±3.30	364.08	3446	1148.67	287.17±50.90	2709.76	3909	1303.00	325.75±50.79	3073.84
			Overall	655	218.33	27.29±3.88	257.53	6149	2049.67	256.21±41.64	2417.63	6804	2268.00	283.50±44.57	2675.16
		LL	Dry	441	147.00	36.75±2.73	346.78	4157	1385.67	346.42±41.55	3268.85	4598	1532.67	383.17±41.74	3615.63
			Wet	214	71.33	17.83±1.75	168.28	1992	664.00	166.00±30.64	1566.41	2206	735.33	183.83±30.06	1734.69
			Overall	5985	1995.00	249.38±33.85	784.38	59308	19769.33	2471.17±399.77	7772.80	65293	21764.33	2720.54±430.34	8557.18
			Dry	3975	1325.00	331.25±25.17	1041.91	41140	13713.33	3428.33±304.04	10783.47	45115	15038.33	3759.58±314.10	11825.38
		Total	Wet	2010	670.00	167.50±15.69	526.85	18168	6056.00	1514.00±206.41	4762.13	20178	6726.00	1681.50±214.05	5288.98
			Overall	3560	1212.67	151.58±17.92	1399.70	16671	5639.33	704.92±99.46	6554.61	20231	6852.00	856.50±116.59	7954.31
			Dry	2291	789.67	197.42±6.02	1801.53	11074	3773.67	943.42±43.37	8708.03	13365	4563.33	1140.83±47.91	10509.55
			Wet	1269	423.00	105.75±7.84	997.88	5597	1865.67	466.42±79.73	4401.20	6866	2288.67	572.17±85.13	5399.07
		ML	Overall	1356	468.33	58.54±9.37	533.14	5322	1837.67	229.71±34.33	2092.47	6678	2306.00	288.25±42.92	2625.62
			Dry	944	331.00	82.75±3.78	742.31	3496	1229.00	307.25±36.05	2749.08	4440	1560.00	390.00±38.22	3491.39
			Wet	412	137.33	34.33±2.19	323.98	1826	608.67	152.17±13.79	1435.87	2238	746.00	186.50±15.23	1759.85
			Overall	563	189.67	23.71±3.16	221.36	3205	1094.67	136.83±17.34	1260.12	3768	1284.33	160.54±20.04	1481.48
		LL	Dry	377	127.67	31.92±1.07	296.45	2019	699.33	174.83±17.92	1587.64	2396	827.00	206.75±17.98	1884.09
			Wet	186	62.00	15.50±0.62	146.26	1186	395.33	98.83±10.90	932.61	1372	457.33	114.33±11.27	1078.87
			Overall	5479	1870.67	233.83±30.39	718.07	25198	8571.67	1071.46±149.15	3302.40	30677	10442.33	1305.29±177.91	4020.47
			Dry	3612	1248.33	312.08±10.76	946.76	16589	5702.00	1425.50±96.71	4348.25	20201	6950.33	1737.58±103.36	5295.01
		Total	Wet	1867	622.33	155.58±10.55	489.37	8609	2869.67	717.42±104.38	2256.56	10476	3492.00	873.00±111.52	2745.93
			Overall	7398	2466.00	308.25±36.88	1454.35	57191	19063.67	2382.96±351.06	11243.02	64589	21529.67	2691.21±386.18	12697.37
			Dry	4796	1598.67	399.67±20.76	1885.66	38864	12954.67	3238.67±199.29	15280.33	43660	14553.33	3638.33±211.18	17166.00
			Wet	2602	867.33	216.83±18.58	1023.04	18327	6109.00	1527.25±217.36	7205.71	20929	6976.33	1744.08±230.93	8228.75
		ML	Overall	2848	949.33	118.67±18.82	559.88	17961	5987.00	748.38±135.32	3530.90	20809	6936.33	867.04±151.71	4090.78
			Dry	1973	657.67	164.42±15.14	775.73	12689	4229.67	1057.42±133.57	4988.99	14662	4887.33	1221.83±139.33	5764.72
			Wet	875	291.67	72.92±5.27	344.03	5272	1757.33	439.33±62.77	2072.82	6147	2049.00	512.25±63.86	2416.84
			Overall	1218	406.00	50.75±6.91	239.44	9354	3118.00	389.75±57.06	1838.88	10572	3524.00	440.50±62.65	2078.32
		LL	Dry	818	272.67	68.17±3.92	321.62	6176	2058.67	514.67±56.30	2428.25	6994	2331.33	582.83±56.59	2749.86

Experimental sites	Treatment	Soil layers	Season	Experiment 1				Experiment 2				Total			
				A	Total	Mean±SE	D	A	Total	Mean±SE	D	A	Total	Mean±SE	D
			Wet	400	133.33	33.33±2.29	157.27	3178	1059.33	264.83±40.29	1249.51	3578	1192.67	298.17±40.10	1406.78
			Overall	11464	3821.33	477.67±62.40	751.23	84506	28168.67	3521.08±538.67	5537.60	95970	31990.00	3998.75±596.33	6288.83
Total			Dry	7587	2529.00	632.25±39.62	994.34	57729	19243.00	4810.75±385.85	7565.86	65316	21772.00	5443.00±403.97	8560.20
			Wet	3877	1292.33	323.08±25.93	508.11	26777	8925.67	2231.42±310.45	3509.34	30654	10218.00	2554.50±325.17	4017.46

Experiment 1- hand sorting, experiment 2- seed germination, A- abundance, D- density (m⁻²), UL- upper layer (0-5), ML- middle layer (5-10) and LL- lower layer (10-15).

Appendix Table 3.4. Mann-Whitney significance test between dry and wet season's mean seed abundances and densities, recorded from short and tall riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Treatment	Mann-Whitney	Experiment 1		Experiment 1		Total	
			A	D	A	D	A	D
Grassland	Natural	<i>U</i>	6346.50	1600.50	6096.50	1525.00	5977.50	1494.00
		<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Flooding	<i>U</i>	6770.00	1710.50	6985.50	1731.50	6687.50	1667.50
		<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Total	<i>U</i>	26170.50	6581.00	27290.00	6812.00	26513.00	6624.00
		<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
Short grassland	Natural	<i>U</i>	1502.00	378.00	1567.00	391.00	1566.50	391.00
		<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Flooding	<i>U</i>	1768.50	441.50	1677.50	413.50	1669.00	412.50
		<i>P</i>	0.00*	0.02*	0.00*	0.01*	0.00*	0.01*
	Total	<i>U</i>	6536.50	1629.00	7140.00	1783.00	7118.00	1780.50
		<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
Tall grassland	Natural	<i>U</i>	1368.00	343.00	1221.50	305.00	1231.00	306.50
		<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Flooding	<i>U</i>	1473.00	378.00	1280.00	311.00	1299.00	326.50
		<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Total	<i>U</i>	5671.50	1437.00	5624.00	1399.00	5538.50	1378.00
		<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*

Experiment 1- hand sorting, experiment 2- seed germination, A- mean seed abundance, D- Density (m⁻²), *U*- Mann-Whitney test value and *indicates significant result at *P*<0.05.

Appendix Table 3.5. Kruskal-Wallis significance test among soil layers (upper, middle, and lower layers) and Mann-Whitney significance test between dry and wet season's mean seed abundances and densities, recorded from short and tall riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Treatment	Season	Test	Experiment 1		Experiment 2		Total	
				A	D	A	D	A	D
Grassland	Natural	Overall	Kruskal-Wallis	χ^2	184.34	93.04	186.16	192.64	96.56
				<i>df</i>	2	2	2	2	2

Experimental sites	Treatment	Season	Test	Experiment 1		Experiment 2		Total				
				A	D	A	D	A	D			
		Dry	Mann-Whitney	P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*		
				χ2	99.94	50.09	115.01	57.49	118.27	59.14		
				df	2	2	2	2	2	2		
		Wet		P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*		
				χ2	105.58	53.13	96.91	48.22	101.21	50.82		
				df	2	2	2	2	2	2		
		Dry & Wet		P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*		
				U	6346.50	1600.50	6096.50	1525.00	5977.50	1494.00		
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*		
		Flooding	Overall	Kruskal-Wallis	χ2	192.47	97.74	172.88	85.70	191.35	96.10	
					df	2	2	2	2	2	2	
					P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	
	Dry		χ2		99.96	49.90	105.60	52.62	112.24	56.14		
			df		2	2	2	2	2	2		
			P		0.00*	0.00*	0.00*	0.00*	0.00*	0.00*		
	Wet		χ2		112.13	56.75	83.60	41.07	94.75	47.26		
			df		2	2	2	2	2	2		
			P		0.00*	0.00*	0.00*	0.00*	0.00*	0.00*		
	Total	Dry & Wet	Mann-Whitney	U	6770.00	1710.50	6985.50	1731.50	6687.50	1667.50		
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*		
				χ2	376.05	190.48	302.01	151.07	328.16	165.19		
		Natural		Overall	Kruskal-Wallis	df	2	2	2	2	2	2
						P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
						χ2	200.33	100.79	173.61	87.06	187.03	93.63
				Dry		df	2	2	2	2	2	2
						P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
						χ2	217.40	110.12	157.54	78.59	173.96	87.60
	Wet		df	2		2	2	2	2	2		
			P	0.00*		0.00*	0.00*	0.00*	0.00*	0.00*		
			Dry & Wet	U		26170.50	6581.00	27290.00	6812.00	26513.00	6624.00	
	P	0.00*		0.00*	0.00*	0.00*	0.00*	0.00*				
χ2	111.28	55.73		114.79	57.46	115.11	57.55					
Short grassland	Natural	Overall	Kruskal-Wallis	df	2	2	2	2	2	2		
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*		
				χ2	61.70	30.54	62.26	30.71	62.31	30.92		
		Dry		df	2	2	2	2	2	2		
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*		
				χ2	60.61	29.97	62.37	31.14	62.48	31.14		
		Wet		df	2	2	2	2	2	2		
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*		

Experimental sites	Treatment	Season	Test	Experiment 1		Experiment 2		Total					
				A	D	A	D	A	D				
		Dry & Wet	Mann-Whitney	U	1502.00	378.00	1567.00	391.00	1566.50	391.00			
Flooding	Overall	Kruskal-Wallis	P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*				
			χ^2	116.81	59.26	112.62	56.35	113.28	56.76				
			df	2	2	2	2	2	2				
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*				
			Dry	Kruskal-Wallis	χ^2	61.37	30.74	59.62	30.10	60.11	30.10		
					df	2	2	2	2	2	2		
					P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*		
					Wet	Kruskal-Wallis	χ^2	60.08	30.27	58.45	29.04	58.68	29.51
							df	2	2	2	2	2	2
							P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Dry & Wet	Mann-Whitney	U	1768.50	441.50	1677.50	413.50	1669.00	412.50		
					P	0.00*	0.02*	0.00*	0.01*	0.00*	0.01*		
	Total	Overall	Kruskal-Wallis	χ^2	228.18	115.14	180.65	90.76	184.18	92.42			
				df	2	2	2	2	2	2			
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*			
				Dry	Kruskal-Wallis	χ^2	122.61	61.38	83.98	41.77	86.47	42.97	
						df	2	2	2	2	2	2	
						P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	
		Wet	Kruskal-Wallis	χ^2	121.31	60.90	103.97	52.44	105.88	53.24			
				df	2	2	2	2	2	2			
P				0.00*	0.00*	0.00*	0.00*	0.00*	0.00*				
Dry & Wet		Mann-Whitney	U	6536.50	1629.00	7140.00	1783.00	7118.00	1780.50				
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*				
Tall grassland		Natural	Overall	Kruskal-Wallis	χ^2	108.36	53.91	98.60	49.19	100.28	49.81		
	df				2	2	2	2	2	2			
	P				0.00*	0.00*	0.00*	0.00*	0.00*	0.00*			
	Dry				Kruskal-Wallis	χ^2	63.19	31.15	62.47	31.14	62.91	31.14	
						df	2	2	2	2	2	2	
						P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	
	Wet		Kruskal-Wallis	χ^2	63.18	31.18	55.90	27.98	58.26	28.76			
				df	2	2	2	2	2	2			
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*			
	Dry & Wet		Mann-Whitney	U	1368.00	343.00	1221.50	305.00	1231.00	306.50			
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*			
	Flooding		Overall	Kruskal-Wallis	χ^2	113.95	57.58	102.95	50.40	105.83	52.86		
		df			2	2	2	2	2	2			
		P			0.00*	0.00*	0.00*	0.00*	0.00*	0.00*			
		χ^2			63.22	31.16	61.69	30.71	63.13	31.14			
		Dry	Kruskal-Wallis	df	2	2	2	2	2	2			
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*			
				χ^2	63.22	31.16	61.69	30.71	63.13	31.14			
				df	2	2	2	2	2	2			

Experimental sites	Treatment	Season	Test	Experiment 1		Experiment 2		Total		
				A	D	A	D	A	D	
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		Wet	Mann-Whitney	χ^2	63.30	31.26	60.11	29.61	62.70	31.14
				df	2	2	2	2	2	2
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		Dry & Wet		U	1473.00	378.00	1280.00	311.00	1299.00	326.50
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Total	Overall	Kruskal-Wallis	χ^2	222.58	111.98	171.19	85.40	182.54	91.47
				df	2	2	2	2	2	2
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		Dry		χ^2	127.23	63.15	99.86	50.18	108.03	53.54
				df	2	2	2	2	2	2
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		Wet		χ^2	127.11	63.27	101.84	51.11	108.61	54.55
				df	2	2	2	2	2	2
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		Dry & Wet	Mann-Whitney	U	5671.50	1437.00	5624.00	1399.00	5538.50	1378.00
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*

Experiment 1- hand sorting, experiment 2- seed germination, A- mean seed abundance, D- Density (m^{-2}), χ^2 -chi square value, df- degree of freedom, U- Mann-Whitney test value and *indicates significant result at $P < 0.05$.

Appendix Table 3.6. Mann-Whitney significance test between soil layers mean seed abundances and densities, recorded from short and tall riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Treatment	Soil layers	Season	Mann-Whitney	Experiment 1		Experiment 2		Total	
					A	D	A	D	A	D
Grassland	Natural	UL-ML	Overall	U	815.50	195.00	749.00	187.00	665.50	163.00
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Dry	U	95.50	20.00	11.00	3.00	2.00	0.00
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Wet	U	51.50	8.00	114.50	28.00	82.50	17.00
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Dry & Wet	U	2414.50	609.00	2280.50	569.00	2205.00	552.00
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		UL-LL	Overall	U	33.50	3.00	64.50	14.00	38.00	8.00
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Dry	U	0.00	0.00	0.00	0.00	0.00	0.00
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Wet	U	0.00	0.00	0.00	0.00	0.00	0.00
				P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*

Experimental sites	Treatment	Soil layers	Season	Mann-Whitney	Experiment 1		Experiment 2		Total	
					A	D	A	D	A	D
			Dry & Wet	<i>U</i>	2996.00	758.00	2924.00	733.00	2821.50	706.50
		ML-LL	Overall	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	2034.00	501.50	1946.00	480.00	1793.00	442.00
			Dry	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	484.00	121.00	230.50	53.00	171.00	39.00
			Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	410.50	100.00	537.50	134.00	468.50	115.50
			Dry & Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	2149.00	543.50	1912.50	477.00	1783.00	443.00
	Flooding	UL-ML	Overall	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	776.00	183.00	638.50	165.00	441.00	108.50
			Dry	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	97.00	21.00	0.00	0.00	0.00	0.00
			Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	49.00	9.00	185.00	49.50	99.50	26.50
			Dry & Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	2574.00	651.50	2794.00	694.00	2570.50	640.50
		UL-LL	Overall	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	21.00	1.00	210.50	55.00	73.00	16.00
			Dry	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
			Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	61.50	16.00	7.50	1.00
			Dry & Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	3126.50	786.00	3204.50	794.50	3067.50	762.00
	Total	UL-ML	Overall	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	3212.50	763.00	4998.50	1251.50	4349.00	1074.00
			Dry	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	400.00	81.50	1048.50	261.00	884.00	221.50
			Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	222.00	37.50	1024.00	256.50	800.50	196.50

Experimental sites	Treatment	Soil layers	Season	Mann-Whitney	Experiment 1		Experiment 2		Total	
					A	D	A	D	A	D
			Dry & Wet	<i>U</i>	9931.00	2490.00	11168.50	2789.00	10649.00	2655.50
		UL-LL	Overall	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	134.50	16.00	1189.00	294.00	743.50	172.50
			Dry	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	50.50	10.00	3.00	0.00
			Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	262.00	66.00	116.00	24.00
			Dry & Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	12178.00	3061.00	13057.50	3266.50	12823.00	3208.50
		ML-LL	Overall	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	7483.00	1819.50	10477.50	2603.50	9490.50	2345.50
			Dry	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	1917.50	483.50	2211.50	545.50	1849.00	452.00
			Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	1335.00	311.00	2690.00	666.50	2449.50	604.00
			Dry & Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	9222.50	2325.00	10067.50	2514.00	9288.00	2316.00
Short grassland	Natural	UL-ML	Overall	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	7.50	0.00	35.00	8.00	31.00	8.00
			Dry	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
			Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
			Dry & Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	569.50	144.00	575.50	142.00	577.00	142.00
		UL-LL	Overall	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
			Dry	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
			Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
			Dry & Wet	<i>P</i>	0.00*	0.01*	0.00*	0.01*	0.00*	0.01*
				<i>U</i>	645.50	159.50	613.00	152.00	610.00	152.00
		ML-LL	Overall	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	336.50	79.00	204.00	47.00	202.00	46.00
			Dry	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	15.00	3.00	8.00	2.00	7.50	1.00
			Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	32.50	6.50	7.00	0.00	6.00	0.00
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*

Experimental sites	Treatment	Soil layers	Season	Mann-Whitney	Experiment 1		Experiment 2		Total	
					A	D	A	D	A	D
			Dry & Wet	<i>U</i>	357.50	90.00	441.50	109.00	437.50	109.00
	Flooding	UL-ML	Overall	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	9.50	0.00	0.00	0.00	0.00	0.00
			Dry	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
			Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
			Dry & Wet	<i>P</i>	0.00*	0.01*	0.00*	0.01*	0.00*	0.01*
				<i>U</i>	637.00	157.00	665.00	162.00	649.00	160.00
		UL-LL	Overall	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
			Dry	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
			Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
			Dry & Wet	<i>P</i>	0.00*	0.02*	0.00*	0.01*	0.00*	0.01*
				<i>U</i>	706.50	172.50	680.00	165.50	669.50	164.00
		ML-LL	Overall	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	207.50	38.50	302.50	70.50	286.50	65.50
			Dry	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	19.00	2.00	34.00	5.00	29.00	5.00
			Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	36.00	4.50	46.50	10.50	44.00	8.00
			Dry & Wet	<i>P</i>	0.00*	0.01*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	625.50	153.50	500.00	121.50	501.00	121.50
	Total	UL-ML	Overall	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	41.00	2.00	1021.50	252.50	956.00	238.00
			Dry	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	369.00	92.50	333.00	84.00
			Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	109.50	24.00	91.00	20.00
			Dry & Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	2401.50	594.00	2985.50	746.00	2966.00	741.50
		UL-LL	Overall	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	37.50	8.00	24.50	4.50
			Dry	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
			Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
			Dry & Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00

Experimental sites	Treatment	Soil layers	Season	Mann-Whitney	Experiment 1		Experiment 2		Total	
					A	D	A	D	A	D
			Dry & Wet							
Tall grassland	Natural	ML-LL	Overall	<i>U</i>	2704.50	662.00	3337.50	834.00	3323.00	834.50
				<i>P</i>	0.00*	0.00*	0.00*	0.02*	0.00*	0.02*
			Dry	<i>U</i>	1098.50	243.50	1900.00	463.00	1841.00	449.00
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Wet	<i>U</i>	92.00	17.00	500.50	124.00	483.50	119.50
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Dry & Wet	<i>U</i>	140.50	23.50	352.50	83.00	332.50	79.00
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		UL-ML	Overall	<i>U</i>	1960.00	479.00	2504.50	625.00	2474.50	620.00
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Dry	<i>U</i>	117.50	28.50	115.50	28.00	112.50	27.00
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Wet	<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Dry & Wet	<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Overall	<i>U</i>	458.50	115.50	461.50	116.00	463.50	117.00
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Dry	<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Wet	<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Dry & Wet	<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		UL-LL	Overall	<i>U</i>	576.50	144.00	587.00	148.00	584.00	146.00
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Dry	<i>U</i>	243.50	60.50	485.00	119.50	443.00	112.50
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Wet	<i>U</i>	0.00	0.00	6.00	0.00	2.00	0.00
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Dry & Wet	<i>U</i>	0.50	0.00	76.00	16.50	48.50	12.00
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		ML-LL	Overall	<i>U</i>	333.50	83.50	185.00	45.00	191.50	45.50
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Dry	<i>U</i>	53.00	9.00	80.00	24.50	68.50	16.00
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Wet	<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Flooding	UL-ML	Overall	<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Dry	<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			Wet	<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
				<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*

Experimental sites	Treatment	Soil layers	Season	Mann-Whitney	Experiment 1		Experiment 2		Total	
					A	D	A	D	A	D
			Dry & Wet	<i>U</i>	523.00	135.00	499.00	120.50	507.50	128.00
		UL-LL	Overall	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
			Dry	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
			Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
			Dry & Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	576.00	144.00	588.00	145.50	578.50	144.00
		ML-LL	Overall	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	202.00	45.00	424.50	108.50	367.00	89.50
			Dry	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	13.50	2.00	0.00	0.00
			Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	29.00	7.50	4.00	0.00
			Dry & Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	374.00	99.00	207.00	47.50	215.50	54.50
	Total	UL-ML	Overall	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	342.50	74.50	925.50	234.00	798.50	195.50
			Dry	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	128.50	28.50	72.50	18.50
			Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	87.00	22.00	50.50	10.00
			Dry & Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	1962.00	501.50	2232.00	556.50	2140.50	533.00
		UL-LL	Overall	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	146.00	35.00	87.50	19.00
			Dry	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00
			Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	5.00	0.00	0.00	0.00
			Dry & Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	2308.00	576.00	2832.50	710.50	2778.50	693.00
		ML-LL	Overall	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	906.50	216.50	2306.50	573.00	2009.00	502.00
			Dry	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	428.50	105.00	307.00	77.50
			Wet	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	4.50	0.00	429.50	103.00	325.00	77.50
			Overall	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
				<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00

Experimental sites	Treatment	Soil layers	Season	Mann-Whitney	Experiment 1		Experiment 2		Total	
					A	D	A	D	A	D
			Dry & Wet		U	P	U	P	U	P
					1405.50	0.00*	1494.00	0.00*	1372.00	0.00*
					359.50	0.00*	370.50	0.00*	333.00	0.00*

Experiment 1- hand sorting, experiment 2- seed germination, A- mean seed abundance, D- Density (m⁻²), UL- upper layer (0-5), ML- middle layer (5-10) and LL- lower layer (10-15), U- Mann-Whitney test value and *indicates significant result at $P < 0.05$.

Appendix Table 3.7. Mann-Whitney significance test between dry and wet season's mean seed abundances and densities recorded from upper, middle and lower soil layers of tall and short riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Treatment	Soil layer	Mann-Whitney	Experiment 1		Experiment 2		Total	
				A	D	A	D	A	D
Grassland	Natural	UL	U	291.50	75.00	264.00	66.00	205.50	53.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		ML	U	487.50	125.00	336.00	83.00	276.50	69.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		LL	U	434.00	110.00	420.50	105.00	350.00	85.50
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Flooding	UL	U	339.00	86.00	387.00	94.50	187.00	43.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		ML	U	561.00	142.50	556.50	139.00	421.00	103.50
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		LL	U	504.50	125.00	662.50	163.00	642.00	158.00
			P	0.00*	0.00*	0.00*	0.01*	0.00*	0.01*
	Total	UL	U	1241.00	308.00	2290.00	573.00	1998.00	494.50
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		ML	U	2064.50	522.00	2285.50	577.00	2015.50	503.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		LL	U	1855.50	465.00	2428.00	607.50	2233.50	558.50
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
Short grassland	Natural	UL	U	0.00	0.00	8.50	2.00	8.00	2.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		ML	U	1.00	0.00	26.00	4.00	24.00	4.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		LL	U	69.50	15.50	28.50	6.00	26.00	6.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Flooding	UL	U	0.50	0.00	25.50	4.00	16.00	3.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		ML	U	70.00	13.00	63.50	14.00	57.00	13.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		LL	U	130.00	28.50	78.50	17.50	77.50	17.00

Experimental sites	Treatment	Soil layer	Mann-Whitney	Experiment 1		Experiment 2		Total	
				A	D	A	D	A	D
				P					
Tall grassland	Total	UL	U	9.50	0.00	607.00	150.00	592.00	147.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		ML	U	129.00	20.00	616.50	156.00	602.00	152.50
			P	0.00*	0.00*	0.00*	0.01*	0.00*	0.01*
		LL	U	391.00	86.00	464.00	116.00	451.50	116.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Natural	UL	U	0.00	0.00	0.00	0.00	0.00	0.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		ML	U	0.00	0.00	1.00	0.00	0.00	0.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		LL	U	0.50	0.00	11.00	4.00	8.00	2.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
Tall grassland	Flooding	UL	U	0.00	0.00	1.00	0.00	0.00	0.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		ML	U	0.00	0.00	2.00	1.00	0.00	0.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		LL	U	0.00	0.00	11.00	1.50	2.50	0.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Total	UL	U	0.50	0.00	373.00	95.00	321.50	79.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		ML	U	0.00	0.00	265.00	69.00	190.50	45.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		LL	U	3.50	0.00	296.50	74.50	240.50	57.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*

Experiment 1- hand sorting, experiment 2- seed germination, A- mean seed abundance, D- Density (m⁻²), UL- upper layer (0-5), ML- middle layer (5-10) and LL- lower layer (10-15), U- Mann-Whitney test value and *indicates significant result at $P < 0.05$.

Appendix Table 3.8. Kruskal-Wallis significance test among different experimental sites and treatments and Mann-Whitney significance test between dry and wet season's mean seed abundances and densities, recorded from short and tall riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Season	Test		Experiment 1		Experiment 2		Total	
				A	D	A	D	A	D
Among four sites (SGN, SGF, TGN & TGF)	Overall	Kruskal-Wallis	χ^2	100.28	50.10	170.43	85.61	141.92	70.60
			df	3	3	3	3	3	3
			P	0.00*	0.00*	0.00*	0.00*	0.01*	0.00*
	Dry		χ^2	66.40	32.84	92.90	46.38	80.67	40.42
			df	3	3	3	3	3	3

Experimental sites	Season	Test	Experiment 1		Experiment 2		Total		
			A	D	A	D	A	D	
	Wet		P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
Grassland (Natural-Flooding)	Wet	Mann-Whitney	χ^2	45.54	22.32	100.81	50.78	87.51	43.56
			df	3	3	3	3	3	3
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Dry & Wet		U	26170.50	6581.00	27290.00	6812.00	26513.00	6624.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			U	39078.50	9750.00	23390.00	5835.50	24159.50	6058.00
SG-TG	Overall	Mann-Whitney	P	0.23	0.38	0.00*	0.00*	0.00*	0.00*
			U	9440.00	2342.00	4764.00	1190.50	4982.50	1241.50
			P	0.19	0.32	0.00*	0.00*	0.00*	0.00*
	Dry		U	9965.50	2477.00	6526.00	1634.50	6651.00	1668.00
			P	0.57	0.65	0.00*	0.00*	0.00*	0.00*
			U	26170.50	6581.00	27290.00	6812.00	26513.00	6624.00
SGN-SGF	Wet	Mann-Whitney	P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			U	21638.50	5408.00	22695.00	5656.50	25165.00	6287.50
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Dry & Wet		U	4687.00	1180.00	6496.50	1622.00	7019.00	1753.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			U	5643.00	1422.00	4407.50	1088.50	4902.50	1223.00
SGN-TGN	Overall	Mann-Whitney	P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			U	26170.50	6581.00	27290.00	6812.00	26513.00	6624.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Dry		U	9911.00	2480.50	4853.50	1204.00	4988.00	1234.50
			P	0.52	0.66	0.00*	0.00*	0.00*	0.00*
			U	2277.50	566.50	911.50	224.50	959.00	236.50
SGN-TGF	Wet	Mann-Whitney	P	0.21	0.36	0.00*	0.00*	0.00*	0.00*
			U	2578.50	645.50	1396.50	350.00	1430.50	356.00
			P	0.96	0.98	0.00*	0.00*	0.00*	0.00*
	Dry & Wet		U	6536.50	1629.00	7140.00	1783.00	7118.00	1780.50
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			U	5345.00	1336.50	5830.50	1453.50	6243.50	1561.00
SGN-TGN	Overall	Mann-Whitney	P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			U	1163.50	294.00	1545.50	387.00	1628.00	407.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.01*
	Dry		U	1324.00	333.00	1166.00	287.50	1239.50	312.50
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			U	6346.50	1600.50	6096.50	1525.00	5977.50	1494.00
SGN-TGF	Overall	Mann-Whitney	P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
			U	5940.00	1486.00	2194.50	545.00	2768.00	697.00

Experimental sites	Season	Test	Experiment 1		Experiment 2		Total				
			A	D	A	D	A	D			
	Dry		U	1321.50	337.50	571.50	143.00	691.50	174.00		
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*		
	Wet		U	1476.00	374.00	428.50	105.00	566.50	142.00		
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*		
	Dry & Wet		U	6252.50	1571.50	7019.50	1745.00	6877.50	1716.50		
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*		
	SGF-TGN		Overall	Mann-Whitney	U	4887.00	1223.00	10064.00	2512.00	10225.00	2569.50
					P	0.00*	0.00*	0.67	0.75	0.84	0.93
Dry		U	1033.50		257.50	2090.00	522.50	1981.50	495.00		
		P	0.00*		0.00*	0.04*	0.16	0.01*	0.09		
Wet		U	1329.50		334.50	1907.50	473.50	2042.50	506.00		
		P	0.00*		0.00*	0.01*	0.05*	0.03*	0.11		
Dry & Wet		U	6816.50		1713.50	5916.50	1469.50	5845.00	1460.50		
		P	0.00*		0.00*	0.00*	0.00*	0.00*	0.00*		
SGF-TGF	Overall	Mann-Whitney	U	5466.50	1362.50	4606.00	1146.00	5642.50	1415.00		
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*		
	Dry		U	1168.50	291.00	1285.50	318.50	1497.00	371.00		
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*		
	Wet		U	1513.50	380.50	905.50	222.50	1054.00	262.50		
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*		
	Dry & Wet		U	6770.00	1710.50	6985.50	1731.50	6687.50	1667.50		
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*		
TGN-TGF	Overall	Mann-Whitney	U	9484.50	2348.50	5670.00	1414.50	6178.50	1557.00		
			P	0.21	0.33	0.00*	0.00*	0.00*	0.00*		
	Dry		U	2266.50	559.50	1191.00	300.50	1350.50	336.00		
			P	0.19	0.32	0.00*	0.00*	0.00*	0.00*		
	Wet		U	2349.50	575.00	1424.50	357.00	1512.50	380.00		
			P	0.33	0.41	0.00*	0.00*	0.00*	0.00*		
	Dry & Wet		U	5671.50	1437.00	5624.00	1399.00	5538.50	1378.00		
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*		

Experiment 1- hand sorting, experiment 2- seed germination, SG- short grassland, TG- tall grassland, SGN- short grassland natural treatment, SGF-short grassland flooding treatment, TGN- tall grassland natural treatment and TGF- tall grassland flooding treatment, A- mean seed abundance, D- Density (m⁻²), χ^2 -chi square value, *df*- degree of freedom, *U*- Mann-Whitney test value and *indicates significant result at *P*<0.05.

Appendix Table 3.9. Soil seed bank physical characteristics (seed condition, surface and presence and absence of appendages) in terms of mean seed abundances recorded from short and tall riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental site	Treatment	Soil layer	Season	Abundance	Seed condition (Abundance)						Seed coat surface (Abundance)						Seed appendages (Abundance)					
					Whole		Cracked		Split		Smooth		Rough		Absent		Present					
					Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE				
Grassland	Natural	UL	Overall	5847	1326.67	165.83±22.79	399.00	49.88±6.12	223.33	27.92±3.17	1080.67	135.08±18.25	868.33	108.54±13.67	1480.00	185.00±24.81	469.00	58.63±6.66				
			Dry	3845	882.67	220.67±16.95	257.00	64.25±5.46	142.00	35.50±2.11	715.33	178.83±14.58	566.33	141.58±9.70	980.67	245.17±17.55	301.00	75.25±3.64				
			Wet	2002	444.00	111.00±11.50	142.00	35.50±2.65	81.33	20.33±2.01	365.33	91.33±8.15	302.00	75.50±7.09	499.33	124.83±12.32	168.00	42.00±3.05				
		ML	Overall	2026	448.67	56.08±9.23	151.67	18.96±2.28	75.00	9.38±1.70	440.00	55.00±6.87	235.33	29.42±6.58	557.33	69.67±10.89	118.00	14.75±2.42				
			Dry	1374	308.00	77.00±9.67	97.33	24.33±1.87	52.67	13.17±1.88	284.67	71.17±5.78	173.33	43.33±8.51	374.33	93.58±12.60	83.67	20.92±0.83				
			Wet	652	140.67	35.17±3.53	54.33	13.58±1.22	22.33	5.58±0.67	155.33	38.83±3.56	62.00	15.50±0.84	183.00	45.75±3.61	34.33	8.58±1.12				
		LL	Overall	972	224.00	28.00±3.07	61.00	7.63±1.34	39.00	4.88±0.98	242.00	30.25±3.70	82.00	10.25±1.99	275.33	34.42±4.91	48.67	6.08±0.39				
			Dry	632	141.67	35.42±2.36	42.67	10.67±1.41	26.33	6.58±1.26	152.00	38.00±4.68	58.67	14.67±2.18	184.67	46.17±4.01	26.00	6.50±0.70				
			Wet	340	82.33	20.58±1.32	18.33	4.58±0.48	12.67	3.17±0.97	90.00	22.50±1.43	23.33	5.83±0.88	90.67	22.67±2.09	22.67	5.67±0.30				
		Total	Overall	8845	1999.33	249.92±34.91	611.67	76.46±9.59	337.33	42.17±5.29	1762.67	220.33±28.57	1185.67	148.21±21.66	2312.67	289.08±40.32	635.67	79.46±9.19				
			Dry	5851	1332.33	333.08±28.76	397.00	99.25±8.32	221.00	55.25±3.24	1152.00	288.00±24.45	798.33	199.58±18.92	1539.67	384.92±33.98	410.67	102.67±4.89				
			Wet	2994	667.00	166.75±15.79	214.67	53.67±3.66	116.33	29.08±2.40	610.67	152.67±12.64	387.33	96.83±8.52	773.00	193.25±17.55	225.00	56.25±3.29				
	Flooded	UL	Overall	5359	1213.67	151.71±18.44	367.67	45.96±5.84	205.00	25.63±3.76	977.00	122.13±14.81	809.33	101.17±13.31	1376.33	172.04±22.18	410.00	51.25±6.01				
			Dry	3500	792.33	198.08±10.39	238.33	59.58±4.67	136.00	34.00±3.58	633.00	158.25±9.40	533.67	133.42±11.12	899.33	224.83±18.46	267.33	66.83±1.83				
			Wet	1859	421.33	105.33±6.70	129.33	32.33±3.72	69.00	17.25±2.50	344.00	86.00±8.07	275.67	68.92±3.12	477.00	119.25±9.82	142.67	35.67±1.83				
		ML	Overall	1860	412.33	51.54±6.94	135.67	16.96±2.35	72.00	9.00±1.36	423.67	52.96±6.44	196.33	24.54±4.84	499.33	62.42±7.81	120.67	15.08±2.77				
			Dry	1244	274.33	68.58±5.12	90.67	22.67±1.82	49.67	12.42±0.76	275.00	68.75±4.91	139.67	34.92±5.65	326.67	81.67±5.76	88.00	22.00±1.87				
			Wet	616	138.00	34.50±2.17	45.00	11.25±0.80	22.33	5.58±0.55	148.67	37.17±1.80	56.67	14.17±2.41	172.67	43.17±2.17	32.67	8.17±0.62				
		LL	Overall	858	205.67	25.71±1.93	54.33	6.79±1.25	26.00	3.25±0.82	222.33	27.79±3.24	63.67	7.96±0.94	243.33	30.42±3.61	42.67	5.33±0.22				
			Dry	543	121.00	30.25±1.67	39.00	9.75±1.03	21.00	5.25±0.60	141.67	35.42±2.35	39.33	9.83±0.95	158.00	39.50±2.12	23.00	5.75±0.25				
			Wet	315	84.67	21.17±0.91	15.33	3.83±0.65	5.00	1.25±0.32	80.67	20.17±2.20	24.33	6.08±0.96	85.33	21.33±1.11	19.67	4.92±0.21				
		Total	Overall	8077	1831.67	228.96±27.01	557.67	69.71±9.26	303.00	37.88±5.75	1623.00	202.88±24.02	1069.33	133.67±18.06	2119.00	264.88±33.39	573.33	71.67±8.76				
			Dry	5287	1187.67	296.92±16.11	368.00	92.00±7.01	206.67	51.67±4.27	1049.67	262.42±14.93	712.67	178.17±13.49	1384.00	346.00±25.81	378.33	94.58±1.41				
			Wet	2790	644.00	161.00±8.20	189.67	47.42±4.47	96.33	24.08±3.04	573.33	143.33±10.29	356.67	89.17±4.46	735.00	183.75±12.26	195.00	48.75±2.49				
	Total	UL	Overall	11206	2540.33	317.54±41.06	766.67	95.83±11.93	428.33	53.54±6.72	2057.67	257.21±33.00	1677.67	209.71±26.81	2856.33	357.04±46.82	879.00	109.88±12.39				
			Dry	7345	1675.00	418.75±26.77	495.33	123.83±10.05	278.00	69.54±9.99	1348.33	337.08±23.84	1100.00	275.00±20.22	1880.00	470.00±35.14	568.33	142.08±2.79				
			Wet	3861	865.33	216.33±17.94	271.33	67.83±6.32	150.33	37.58±4.00	709.33	177.33±16.11	577.67	144.42±10.14	976.33	244.08±22.08	310.67	77.67±4.09				
		ML	Overall	3886	861.00	107.63±16.09	287.33	35.92±4.58	147.00	18.38±3.01	863.67	107.96±13.04	431.67	53.96±11.22	1056.67	132.08±18.57	238.67	29.83±5.14				
			Dry	2618	582.33	145.58±14.78	188.00	47.00±3.67	102.33	25.58±2.50	559.67	139.92±9.65	313.00	78.25±13.56	701.00	175.25±18.36	171.67	42.92±2.64				
			Wet	1268	278.67	69.67±5.42	99.33	24.83±1.58	44.67	11.17±1.21	304.00	76.00±4.40	118.67	29.67±3.24	355.67	88.92±5.54	67.00	16.75±1.50				
		LL	Overall	1830	429.67	53.71±4.87	115.33	14.42±2.55	65.00	8.13±1.73	464.33	58.04±6.68	145.67	18.21±2.50	518.67	64.83±8.47	91.33	11.42±0.47				
			Dry	1175	262.67	65.67±3.42	81.67	20.42±2.30	47.33	11.83±1.85	293.67	73.42±6.36	98.00	24.50±1.55	342.67	85.67±6.00	49.00	12.25±0.64				
			Wet	655	167.00	41.75±1.93	33.67	8.42±1.03	17.67	4.42±1.18	170.67	42.67±3.16	47.67	11.92±0.69	176.00	44.00±3.03	42.33	10.58±0.37				
		Total	Overall	16922	3831.00	478.88±61.72	1169.33	146.17±18.82	640.33	80.04±10.84	3385.67	423.21±52.31	2255.00	281.88±39.66	4431.67	553.96±73.52	1209.00	151.13±17.79				
			Dry	11138	2520.00	630.00±44.44	765.00	191.25±15.24	427.67	106.92±6.66	2201.67	550.42±38.49	1511.00	377.75±32.39	2923.67	730.92±58.90	789.00	197.25±5.52				
			Wet	5784	1311.00	327.75±23.96	404.33	101.08±8.08	212.67	53.17±4.75	1184.00	296.00±22.34	744.00	186.00±12.76	1508.00	377.00±29.70	420.00	105.00±5.34				
Short grassland	Natural	UL	Overall	2009	448.33	56.04±7.97	144.67	18.08±2.69	76.67	9.58±1.33	377.00	47.13±6.23	292.67	36.58±5.52	497.33	62.17±9.11	172.33	21.54±2.54				
			Dry	1340	302.33	75.58±5.92	93.67	23.42±3.54	50.67	12.67±1.11	246.00	61.50±6.22	200.67	50.17±3.66	338.67	84.67±5.96	108.00	27.00±3.14				
			Wet	669	146.00	36.50±2.68	51.00	12.75±1.49	26.00	6.50±0.80	131.00	32.75±2.14	92.00	23.00±2.43	158.67	39.67±3.75	64.33	16.08±0.55				
		ML	Overall	534	128.00	16.00±2.36	33.67	4.21±0.50	16.33	2.04±0.51	130.67	16.33±1.42	47.33	5.92±1.67	150.67	18.83±2.51	27.33	3.42±0.50				
			Dry	345	84.67	21.17±2.67	20.00	5.00±0.71	10.33	2.58±0.92	79.33	19.83±0.91	35.67	8.92±2.50	97.67	24.42±2.84	17.33	4.33±0.56				
			Wet	189	43.33	10.83±1.00	13.67	3.42±0.50	6.00	1.50±0.44	51.33	12.83±0.65	11.67	2.92±0.83	53.00	13.25±0.67	10.00	2.50±0.52				
		LL	Overall	317	78.33	9.79±0.99	16.33	2.04±0.34	11.00	1.38±0.34	82.00	10.25±1.07	23.67	2.96±0.51	88.00	11.00±1.46	17.67	2.21±0.24				
			Dry	191	46.33	11.58±1.51	10.67	2.67±0.24	6.67	1.67±0.53	47.00	11.75±1.90	16.67	4.17±0.22	55.67	13.92±1.72	8.00	2.00±0.33				
			Wet	126	32.00	8.00±0.36	5.67	1.42±0.48	4.33	1.08±0.44	35.00	8.75±0.44	7.00	1.75±0.44	32.33	8.08±1.13	9.67	2.42±0.34				
		Total	Overall	2860	654.67	81.83±11.08	194.67	24.33±3.19	104.00	13.00±1.60	589.67	73.71±8.51	363.67	45.46±7.41	736.00	92.00±12.85	217.33	27.17±2.94				
			Dry	1876	433.33	108.33±9.72	124.33	31.08±3.82	67.67	16.92±0.89	372.33	93.08±8.96	253.00	63.25±5.89	492.00	123.00±10.44	133.33	33.33±3.81				
			Wet	984	221.33	55.33±3.17	70.33	17.58±1.59	36.33	9.08±0.95	217.33	54.33±2.69	110.67	27.67±3.23	244.00	61.00±4.58	84.00	21.00±0.62				
Flooded	UL	Overall	1799	402.33	50.29±6.75	122.67	15.33±2.43	74.67	9.33±1.83	324.67	40.58±5.33	275.00	34.38±5.54	442.67	55.33±8.97	157.00	19.63±1.93					
		Dry	1209	265.67	66.42±5.97	82.33	20.58±2.09	55.00	13.75±1.34	213.33	53.33±4.27	189.67	47.42±5.31	304.67	76.17±8.92	98.33	24.58±1.92					
		Wet	590	136.67	34.17±1.85	40.33	10.08±2.21	19.67	4.92±0.93	111.33	27.83±2.41	85.33	21.33±1.36	138.00	34.50±2.63	58.67	14.67±0.99					
	ML	Overall	504	117.33	14.67±1.28	37.00	4.63±0.48	13.67	1.71±0.28	127.00	15.88±0.96	41.00	5.13±1.32	139.00	17.38±1.54	29.00	3.63±0.35					
		Dry	300	70.00	17.50±1.43	21.00	5.25±0.82	9.00	2.25±0.32	72.67	18.17±0.62	27.33	6.83±2.30	82.33	20.58±2.02	17.67	4.42±0.34					
		Wet																				

Experimental site	Treatment	Soil layer	Season	Abundance	Seed condition (Abundance)						Seed coat surface (Abundance)				Seed appendages (Abundance)				
					Whole		Cracked		Split		Smooth		Rough		Absent		Present		
					Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	
Tall grassland	Total	LL	Wet	204	47.33	11.83±0.48	16.00	4.00±0.36	4.67	1.17±0.29	54.33	13.58±0.64	13.67	3.42±0.92	56.67	14.17±0.40	11.33	2.83±0.22	
			Overall	295	70.67	8.83±0.61	18.00	2.25±0.26	9.67	1.21±0.40	82.00	10.25±0.93	16.33	2.04±0.26	78.67	9.83±0.85	19.67	2.46±0.13	
			Dry	166	37.00	9.25±0.76	11.00	2.75±0.21	7.33	1.83±0.67	47.00	11.75±1.19	8.33	2.08±0.55	45.67	11.42±0.98	9.67	2.42±0.16	
			Wet	129	33.67	8.42±1.03	7.00	1.75±0.32	2.33	0.58±0.16	35.00	8.75±1.05	8.00	2.00±0.00	33.00	8.25±0.85	10.00	2.50±0.22	
		Total	Overall	2598	590.33	73.79±8.08	177.67	22.21±2.92	98.00	12.25±2.32	533.67	66.71±6.84	332.33	41.54±6.36	660.33	82.54±11.09	205.67	25.71±2.24	
			Dry	1675	372.67	93.17±7.20	114.33	28.58±2.68	71.33	17.83±1.77	333.00	83.25±5.49	225.33	56.33±6.20	432.67	108.17±11.26	125.67	31.42±0.16	
			Wet	923	217.67	54.42±1.57	63.33	15.83±2.33	26.67	6.67±1.06	200.67	50.17±2.44	107.00	26.75±2.12	227.67	56.92±3.01	80.00	20.00±1.27	
			Overall	3808	850.67	106.33±14.61	267.33	33.42±5.04	151.33	18.92±3.11	701.67	87.71±11.49	567.67	70.96±11.02	940.00	117.50±17.98	329.33	41.17±4.22	
		UL	Dry	2549	568.00	142.00±11.43	176.00	44.00±5.59	105.67	26.42±2.18	459.33	114.83±10.36	390.33	97.58±8.97	643.33	160.83±14.79	206.33	51.58±2.94	
			Wet	1259	282.67	70.67±4.08	91.33	22.83±3.58	45.67	11.42±1.66	242.33	60.58±4.33	177.33	44.33±3.68	296.67	74.17±6.15	123.00	30.75±1.51	
			Overall	1038	245.33	30.67±3.55	70.67	8.83±0.91	30.00	3.75±0.73	257.67	32.21±2.28	88.33	11.04±2.86	289.67	36.21±4.00	56.33	7.04±0.81	
			Dry	645	154.67	38.67±3.78	41.00	10.25±1.49	19.33	4.83±1.09	152.00	38.00±1.00	63.00	15.75±4.52	180.00	45.00±4.71	35.00	8.75±0.89	
		ML	Wet	393	90.67	22.67±1.38	29.67	7.42±0.55	10.67	2.67±0.72	105.67	26.42±0.98	25.33	6.33±1.71	109.67	27.42±1.04	21.33	5.33±0.59	
			Overall	612	149.00	18.63±1.33	34.33	4.29±0.54	20.67	2.58±0.70	164.00	20.50±1.95	40.00	5.00±0.55	166.67	20.83±2.26	37.33	4.67±0.24	
			Dry	357	83.33	20.83±1.90	21.67	5.42±0.44	14.00	3.50±1.20	94.00	23.50±3.09	25.00	6.25±0.39	101.33	25.33±2.56	17.67	4.42±0.44	
			Wet	255	65.67	16.42±1.20	12.67	3.17±0.55	6.67	1.75±0.53	70.00	17.50±1.48	15.00	3.75±0.44	65.33	16.33±1.93	19.67	4.92±0.16	
		Total	Overall	5458	1245.00	155.63±19.10	372.33	46.54±6.06	202.00	25.25±3.90	1123.33	140.42±15.29	696.00	87.00±13.75	1396.33	174.54±23.88	423.00	52.88±4.92	
			Dry	3551	806.00	201.50±16.78	238.67	59.67±6.47	139.00	34.75±2.63	705.33	176.33±14.37	478.33	119.58±12.09	924.67	231.17±21.65	259.00	64.75±3.91	
	Wet		1907	439.00	109.75±4.31	133.67	33.42±3.82	63.00	15.75±1.96	418.00	104.50±4.95	217.67	54.42±5.33	471.67	117.92±7.48	164.00	41.00±1.87		
	Overall		3838	878.33	109.79±14.90	254.33	31.79±3.62	146.67	18.33±2.08	703.67	87.96±12.24	575.67	71.96±8.46	982.67	122.83±15.82	296.67	37.08±4.41		
	Natural	UL	Dry	2505	580.33	145.08±11.09	163.33	40.83±2.06	91.33	22.83±2.02	469.33	117.33±9.01	365.67	91.42±7.53	642.00	160.50±12.08	193.00	48.25±0.83	
			Wet	1333	298.00	74.50±9.11	91.00	22.75±1.60	55.33	13.83±1.62	234.33	58.58±6.57	210.00	52.50±5.00	340.67	85.17±8.70	103.67	25.92±2.63	
			Overall	1492	320.67	40.08±6.99	118.00	14.75±1.92	58.67	7.33±1.33	309.33	38.67±5.50	188.00	23.50±5.05	406.67	50.83±8.43	90.67	11.33±2.04	
			Dry	1029	223.33	55.83±7.44	77.33	19.33±1.50	42.33	10.58±1.07	205.33	51.33±4.95	137.67	34.42±6.25	276.67	69.17±9.93	66.33	16.58±0.84	
		ML	Wet	463	97.33	24.33±2.67	40.67	10.17±1.00	16.33	4.08±0.28	104.00	26.00±3.12	50.33	12.58±0.60	130.00	32.50±0.33	24.33	6.08±0.63	
			Overall	655	145.67	18.21±2.24	44.67	5.58±1.11	28.00	3.50±1.11	160.00	20.00±2.92	58.33	7.29±1.66	187.33	23.42±3.58	31.00	3.88±0.39	
			Dry	441	95.33	23.83±1.03	32.00	8.00±1.27	19.67	4.92±0.76	105.00	26.25±3.43	42.00	10.50±2.32	129.00	32.25±2.38	18.00	4.50±0.52	
			Wet	214	50.33	12.58±1.11	12.67	3.17±0.48	8.33	2.08±0.66	55.00	13.75±1.38	16.33	4.08±0.76	58.33	14.58±1.46	13.00	3.25±0.42	
		Total	Overall	5985	1344.67	168.08±23.95	417.00	52.13±6.56	233.33	29.17±3.79	1173.00	146.63±20.40	822.00	102.75±14.57	1576.67	197.08±27.62	418.33	52.29±6.59	
			Dry	3975	899.00	224.75±19.32	272.67	68.17±4.55	153.33	38.33±2.74	779.67	194.92±16.42	545.33	136.33±14.11	1047.67	261.92±24.21	277.33	69.33±1.19	
			Wet	2010	445.67	111.42±12.71	144.33	36.08±2.94	80.00	20.00±1.89	393.33	98.33±10.86	276.67	69.17±6.27	529.00	132.25±13.11	141.00	35.25±2.76	
			Overall	3560	824.33	103.04±12.42	253.00	31.63±3.77	135.33	16.92±2.35	663.00	82.88±9.84	549.67	68.71±8.62	967.67	120.96±14.49	245.00	30.63±3.79	
		Flooded	UL	Dry	2291	539.67	134.92±2.88	164.00	41.00±1.99	86.00	21.50±2.70	430.33	107.58±3.57	359.33	89.83±6.67	628.67	157.17±7.06	161.00	40.25±1.94
				Wet	1269	284.67	71.17±5.87	89.00	22.25±1.98	49.33	12.33±2.11	232.67	58.17±5.68	190.33	47.58±2.19	339.00	84.75±7.47	84.00	21.00±1.16
				Overall	1356	307.33	38.42±6.11	103.33	12.92±2.20	57.67	7.21±1.11	318.67	39.83±6.35	149.67	18.71±3.56	372.33	46.54±6.77	96.00	12.00±2.63
				Dry	944	216.67	54.17±2.32	74.33	18.58±0.86	40.00	10.00±0.68	224.33	56.08±3.16	106.67	26.67±3.80	256.33	64.08±2.39	74.67	18.67±1.56
			ML	Wet	412	90.67	22.67±1.80	29.00	7.25±0.67	17.67	4.42±0.28	94.33	23.58±1.41	43.00	10.75±1.53	116.00	29.00±1.82	21.33	5.33±0.41
				Overall	563	135.67	16.96±1.66	37.67	4.71±1.07	16.33	2.33±0.52	146.00	18.25±2.70	43.67	5.46±0.86	167.33	20.92±3.01	22.33	2.79±0.18
	Dry			377	84.67	21.17±1.00	29.33	7.33±0.77	13.67	3.42±0.16	100.33	25.08±0.95	27.33	6.83±1.13	115.00	28.75±0.98	12.67	3.17±0.17	
	Wet			186	51.00	12.75±0.37	8.33	2.08±0.42	2.67	0.89±0.22	45.67	11.42±1.38	16.33	4.08±0.96	52.33	13.08±0.52	9.67	2.42±0.16	
	Total		Overall	5479	1267.33	158.42±20.07	394.00	49.25±6.89	209.33	26.17±3.78	1127.67	140.96±18.47	743.00	92.88±12.19	1507.33	188.42±24.14	363.33	45.42±6.37	
			Dry	3612	841.00	210.25±6.07	267.67	66.92±2.81	139.67	34.92±3.22	755.00	188.75±2.54	493.33	123.33±8.22	1000.00	250.00±9.93	248.33	62.08±1.44	
Wet			1867	426.33	106.58±7.17	126.33	31.58±2.39	69.67	17.42±2.31	372.67	93.17±7.92	249.67	62.42±2.66	507.33	126.83±9.65	115.00	28.75±1.40		
Overall			7398	1689.67	211.21±26.71	499.33	62.42±7.13	277.00	34.63±3.85	1356.00	169.50±21.75	1110.00	138.75±16.19	1916.33	239.54±29.01	549.67	68.71±8.39		
Total	UL	Dry	4796	1107.00	276.75±15.65	319.33	79.83±4.88	172.33	43.08±3.23	889.00	222.25±14.47	709.67	177.42±13.21	1236.67	309.17±21.01	362.00	90.50±2.18		
		Wet	2602	582.67	145.67±14.89	180.00	45.00±3.37	104.67	26.17±3.32	467.00	116.75±11.96	400.33	100.08±7.17	679.67	169.92±15.94	187.67	46.92±2.70		
		Overall	2848	615.67	76.96±12.58	216.67	27.08±3.92	117.00	14.63±2.45	606.00	75.75±10.86	343.33	42.92±8.62	767.00	95.88±14.63	182.33	22.79±4.44		
		Dry	1973	427.67	106.92±11.12	147.00	36.75±2.72	83.00	20.75±1.63	407.67	101.92±8.84	250.00	62.50±9.37	521.00	130.25±13.76	136.67	34.17±2.22		
	ML	Wet	875	188.00	47.00±4.12	69.67	17.42±1.38	34.00	8.50±0.55	198.33	49.58±3.97	93.33	23.33±1.80	246.00	61.50±4.62	45.67	11.42±0.95		
		Overall	1218	280.67	35.08±3.79	81.00	10.13±2.11	44.33	5.54±1.18	300.33	37.54±5.08	105.67	13.21±2.07	352.00	44.00±6.47	54.00	6.75±0.50		
		Dry	818	179.33	44.83±1.64	60.00	15.00±2.11	33.33	8.33±0.72	199.67	49.92±3.65	77.00	18.25±1.55	241.33	60.33±3.67	31.33	7.83±0.40		
		Wet	400	101.33	25.33±0.16	21.00	5.25±0.71	11.00	2.75±0.88	100.67	25.17±2.21	32.67	8.17±0.84	110.67	27.67±1.95	22.67	5.67±0.45		
	Total	Overall	11464	2586.00	323.25±42.86	797.00	99.63±13.04	438.33	54.79±7.10	2262.33	282.79±37.35	1559.00	194.88±26.38	3035.33	379.42±49.87	786.00	98.25±13.08		

Experimental site	Treatment	Soil layer	Season	Abundance	Seed condition (Abundance)						Seed coat surface (Abundance)				Seed appendages (Abundance)			
					Whole		Cracked		Split		Smooth		Rough		Absent		Present	
					Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
					Dry	7587	1714.00	428.50±28.14	526.33	131.58±9.23	288.67	72.17±4.63	1496.33	374.08±25.20	1032.67	258.17±22.35	1999.00	499.75±38.08
			Wet	3877	872.00	218.00±19.87	270.67	67.67±5.23	149.67	37.42±3.54	766.00	191.50±17.87	526.33	131.58±8.78	1036.33	259.08±22.45	256.00	64.00±3.55

Experiment 1- hand sorting, experiment 2- seed germination, UL- upper layer (0-5), ML- middle layer (5-10) and LL- lower layer (10-15).

Appendix Table 3.10. Soil seed bank physical characteristics (seed condition, surface and presence and absence of appendages) in terms of seed abundances and densities (m⁻²) recorded from short and tall riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental site	Treatment	Soil layer	Season	Abundance	Seed condition						Seed coat surface				Seed appendages			
					Whole		Cracked		Split		Smooth		Rough		Absent		Present	
					A	D	A	D	A	D	A	D	A	D	A	D	A	D
					Overall	5847	3980	782.42	1197	235.31	670	131.71	3242	637.34	2605	512.11	4440	872.85
Grassland	Natural	UL	Dry	3845	2648	1041.13	771	303.14	426	167.49	2146	843.75	1699	668.00	2942	1156.72	903	355.04
			Wet	2002	1332	523.71	426	167.49	244	95.93	1096	430.92	906	356.22	1498	588.98	504	198.16
			Overall	2026	1346	264.61	455	89.45	225	44.23	1320	259.50	706	138.79	1672	328.69	354	69.59
		ML	Dry	1374	924	363.29	292	114.81	158	62.12	854	335.77	520	204.45	1123	441.53	251	98.69
			Wet	652	422	165.92	163	64.09	67	26.34	466	183.22	186	73.13	549	215.85	103	40.50
			Overall	972	672	132.11	183	35.98	117	23.00	726	142.72	246	48.36	826	162.38	146	28.70
		LL	Dry	632	425	167.10	128	50.33	79	31.06	456	179.29	176	69.20	554	217.82	78	30.67
			Wet	340	247	97.11	55	21.62	38	14.94	270	106.16	70	27.52	272	106.94	68	26.74
			Overall	8845	5998	393.04	1835	120.25	1012	66.32	5288	346.52	3557	233.09	6938	454.64	1907	124.96
		Total	Dry	5851	3997	523.84	1191	156.09	663	86.89	3456	452.94	2395	313.88	4619	605.36	1232	161.46
			Wet	2994	2001	262.25	644	84.40	349	45.74	1832	240.10	1162	152.29	2319	303.92	675	88.46
			Overall	5359	3641	715.77	1103	216.84	615	120.90	2931	576.20	2428	477.31	4129	811.71	1230	241.80
	Flooded	UL	Dry	3500	2377	934.58	715	281.12	408	160.42	1899	746.64	1601	629.47	2698	1060.78	802	315.33
			Wet	1859	1264	496.97	388	152.55	207	81.39	1032	405.76	827	325.16	1431	562.63	428	168.28
			Overall	1860	1237	243.18	407	80.01	216	42.46	1271	249.86	589	115.79	1498	294.49	362	71.16
		ML	Dry	1244	823	323.58	272	106.94	149	58.58	825	324.37	419	164.74	980	385.31	264	103.80
			Wet	616	414	162.77	135	53.08	67	26.34	446	175.36	170	66.84	518	203.66	98	38.53
			Overall	858	617	121.29	163	32.04	78	15.33	667	131.12	191	37.55	730	143.51	128	25.16
		LL	Dry	543	363	142.72	117	46.00	63	24.77	425	167.10	118	46.39	474	186.36	69	27.13
			Wet	315	254	99.87	46	18.09	15	5.90	242	95.15	73	28.70	256	100.65	59	23.20
			Overall	8077	5495	360.08	1673	109.63	909	59.57	4869	319.06	3208	210.22	6357	416.57	1720	112.71
		Total	Dry	5287	3563	466.96	1104	144.69	620	81.26	3149	412.70	2138	280.20	4152	544.15	1135	148.75
			Wet	2790	1932	253.20	569	74.57	289	37.88	1720	225.42	1070	140.23	2205	288.98	585	76.67
			Overall	11206	7621	749.10	2300	226.08	1285	126.31	6173	606.77	5033	494.71	8569	842.28	2637	259.20
	Total	UL	Dry	7345	5025	987.85	1486	292.13	834	163.95	4045	795.20	3300	648.74	5640	1108.75	1705	335.18
			Wet	3861	2596	510.34	814	160.02	451	88.66	2128	418.34	1733	340.69	2929	575.80	932	183.22
			Overall	3886	2583	253.89	862	84.73	441	43.35	2591	254.68	1295	127.29	3170	311.59	716	70.38
		ML	Dry	2618	1747	343.44	564	110.88	307	60.35	1679	330.07	939	184.60	2103	413.42	515	101.24
			Wet	1268	836	164.35	298	58.58	134	26.34	912	179.29	356	69.99	1067	209.76	201	39.51
			Overall	1830	1289	126.70	346	34.01	195	19.17	1393	136.92	437	42.95	1556	152.94	274	26.93
		LL	Dry	1175	788	154.91	245	48.16	142	27.92	881	173.19	294	57.80	1028	202.09	147	28.90
			Wet	655	501	98.49	101	19.86	53	10.42	512	100.65	143	28.11	528	103.80	127	24.97
			Overall															

Experimental site	Treatment	Soil layer	Season	Abundance	Seed condition						Seed coat surface				Seed appendages				
					Whole		Cracked		Split		Smooth		Rough		Absent		Present		
					A	D	A	D	A	D	A	D	A	D	A	D	A	D	
Short grassland	Natural	Total	Overall	16922	11493	376.56	3508	114.94	1921	62.94	10157	332.79	6765	221.65	13295	435.60	3627	118.84	
			Dry	11138	7560	495.40	2295	150.39	1283	84.07	6605	432.82	4533	297.04	8771	574.76	2367	155.11	
			Wet	5784	3933	257.73	1213	79.49	638	41.81	3552	232.76	2232	146.26	4524	296.45	1260	82.57	
		UL	Overall	2009	1345	528.82	434	170.64	230	90.43	1131	444.68	878	345.21	1492	586.62	517	203.27	
			Dry	1340	907	713.22	281	220.96	152	119.53	738	580.33	602	473.38	1016	798.93	324	254.78	
			Wet	669	438	344.42	153	120.31	78	61.34	393	309.04	276	217.03	476	374.30	193	151.77	
		ML	Overall	534	384	150.98	101	39.71	49	19.27	392	154.12	142	55.83	452	177.71	82	32.24	
			Dry	345	254	199.73	60	47.18	31	24.38	238	187.15	107	84.14	293	230.40	52	40.89	
			Wet	189	130	102.23	41	32.24	18	14.15	154	121.10	35	27.52	159	125.03	30	23.59	
		LL	Overall	317	235	92.40	49	19.27	33	12.97	246	96.72	71	27.92	264	103.80	53	20.84	
			Dry	191	139	109.30	32	25.16	20	15.73	141	110.88	50	39.32	167	131.32	24	18.87	
			Wet	126	96	75.49	17	13.37	13	10.22	105	82.57	21	16.51	97	76.28	29	22.80	
		Total	Overall	2860	1964	257.40	584	76.54	312	40.89	1769	231.84	1091	142.98	2208	289.38	652	85.45	
			Dry	1876	1300	340.75	373	97.77	203	53.21	1117	292.78	759	198.95	1476	386.88	400	104.85	
			Wet	984	664	174.05	211	55.31	109	28.57	652	170.90	332	87.02	732	191.87	252	66.05	
	Flooded	UL	Overall	1799	1207	474.56	368	144.69	224	88.07	974	382.95	825	324.37	1328	522.14	471	185.19	
			Dry	1209	797	626.72	247	194.23	165	129.75	640	503.26	569	447.43	914	718.72	295	231.97	
			Wet	590	410	322.40	121	95.15	59	46.39	334	262.64	256	201.31	414	325.55	176	138.40	
		ML	Overall	504	352	138.40	111	43.64	41	16.12	381	149.80	123	48.36	417	163.95	87	34.21	
			Dry	300	210	165.13	63	49.54	27	21.23	218	171.42	82	64.48	247	194.23	53	41.68	
			Wet	204	142	111.66	48	37.74	14	11.01	163	128.17	41	32.24	170	133.68	34	26.74	
		LL	Overall	295	212	83.35	54	21.23	29	11.40	246	96.72	49	19.27	236	92.79	59	23.20	
			Dry	166	111	87.28	33	25.95	22	17.30	141	110.88	25	19.66	137	107.73	29	22.80	
			Wet	129	101	79.42	21	16.51	7	5.50	105	82.57	24	18.87	99	77.85	30	23.59	
		Total	Overall	2598	1771	232.10	533	69.85	294	38.53	1601	209.82	997	130.66	1981	259.63	617	80.86	
			Dry	1675	1118	293.05	343	89.91	214	56.09	999	261.85	676	177.19	1298	340.23	377	98.82	
			Wet	923	653	171.16	190	49.80	80	20.97	602	157.79	321	84.14	683	179.03	240	62.91	
		Total	UL	Overall	3808	2552	501.69	802	157.66	454	89.25	2105	413.82	1703	334.79	2820	554.38	988	194.23
				Dry	2549	1704	669.97	528	207.60	317	124.64	1378	541.79	1171	460.41	1930	758.83	619	243.38
				Wet	1259	848	333.41	274	107.73	137	53.86	727	285.84	532	209.17	890	349.93	369	145.08
			ML	Overall	1038	736	144.69	212	41.68	90	17.69	773	151.96	265	52.10	869	170.83	169	33.22
				Dry	645	464	182.43	123	48.36	58	22.80	456	179.29	189	74.31	540	212.31	105	41.28
				Wet	393	272	106.94	89	34.99	32	12.58	317	124.64	76	29.88	329	129.35	64	25.16
	LL		Overall	612	447	87.87	103	20.25	62	12.19	492	96.72	120	23.59	500	98.29	112	22.02	
			Dry	357	250	98.29	65	25.56	42	16.51	282	110.88	75	29.49	304	119.53	53	20.84	
			Wet	255	197	77.46	38	14.94	20	7.86	210	82.57	45	17.69	196	77.06	59	23.20	
	Total		Overall	5458	3735	244.75	1117	73.20	606	39.71	3370	220.83	2088	136.82	4189	274.50	1269	83.16	
			Dry	3551	2418	316.90	716	93.84	417	54.65	2116	277.32	1435	188.07	2774	363.56	777	101.83	
			Wet	1907	1317	172.60	401	52.55	189	24.77	1254	164.35	653	85.58	1415	185.45	492	64.48	
Tall grassland	Natural		UL	Overall	3838	2635	1036.01	763	299.99	440	173.00	2111	829.99	1727	679.01	2948	1159.08	890	349.93
				Dry	2505	1741	1369.03	490	385.31	274	215.46	1408	1107.18	1097	862.62	1926	1514.51	579	455.30
				Wet	1333	894	703.00	273	214.67	166	130.53	703	552.80	630	495.40	1022	803.65	311	244.55
		ML	Overall	1492	962	378.23	354	139.18	176	69.20	928	364.87	564	221.75	1220	479.67	272	106.94	
			Dry	1029	670	526.85	232	182.43	127	99.87	616	484.39	413	324.76	830	652.67	199	156.48	
			Wet	463	292	229.61	122	95.93	49	38.53	312	245.34	151	118.74	390	306.68	73	57.40	

Experimental site	Treatment	Soil layer	Season	Abundance	Seed condition					Seed coat surface				Seed appendages				
					Whole		Cracked		Split		Smooth		Rough		Absent		Present	
					A	D	A	D	A	D	A	D	A	D	A	D	A	D
		LL	Overall	655	437	171.82	134	52.69	84	33.03	480	188.72	175	68.81	562	220.96	93	36.57
			Dry	441	286	224.90	96	75.49	59	46.39	315	247.70	126	99.08	387	304.32	54	42.46
			Wet	214	151	118.74	38	29.88	25	19.66	165	129.75	49	38.53	175	137.61	39	30.67
		Total	Overall	5985	4034	528.69	1251	163.95	700	91.74	3519	461.19	2466	323.19	4730	619.91	1255	164.48
			Dry	3975	2697	706.93	818	214.41	460	120.57	2339	613.09	1636	428.82	3143	823.83	832	218.08
			Wet	2010	1337	350.45	433	113.50	240	62.91	1180	309.30	830	217.56	1587	415.98	423	110.88
	Flooded	UL	Overall	3560	2434	956.99	735	288.98	391	153.73	1957	769.44	1603	630.26	2801	1101.28	759	298.42
			Dry	2291	1580	1242.43	468	368.01	243	191.08	1259	990.01	1032	811.51	1784	1402.85	507	398.68
			Wet	1269	854	671.54	267	209.96	148	116.38	698	548.87	571	449.01	1017	799.72	252	198.16
		ML	Overall	1356	885	347.96	296	116.38	175	68.81	890	349.93	466	183.22	1081	425.02	275	108.12
			Dry	944	613	482.03	209	164.35	122	95.93	607	477.31	337	265.00	733	576.39	211	165.92
			Wet	412	272	213.89	87	68.41	53	41.68	283	222.54	129	101.44	348	273.65	64	50.33
		LL	Overall	563	405	159.24	109	42.86	49	19.27	421	165.53	142	55.83	494	194.23	69	27.13
			Dry	377	252	198.16	84	66.05	41	32.24	284	223.32	93	73.13	337	265.00	40	31.45
			Wet	186	153	120.31	25	19.66	8	6.29	137	107.73	49	38.53	157	123.46	29	22.80
		Total	Overall	5479	3724	488.06	1140	149.41	615	80.60	3268	428.30	2211	289.77	4376	573.51	1103	144.56
			Dry	3612	2445	640.87	761	199.47	406	106.42	2150	563.55	1462	383.21	2854	748.08	758	198.68
			Wet	1867	1279	335.25	379	99.34	209	54.78	1118	293.05	749	196.33	1522	398.94	345	90.43
	Total	UL	Overall	7398	5069	996.50	1498	294.49	831	163.36	4068	799.72	3330	654.64	5749	1130.18	1649	324.17
			Dry	4796	3321	1305.73	958	376.66	517	203.27	2667	1048.60	2129	837.07	3710	1458.68	1086	426.99
			Wet	2602	1748	687.27	540	212.31	314	123.46	1401	550.84	1201	472.20	2039	801.68	563	221.36
		ML	Overall	2848	1847	363.10	650	127.78	351	69.00	1818	357.40	1030	202.48	2301	452.35	547	107.53
			Dry	1973	1283	504.44	441	173.39	249	97.90	1223	480.85	750	294.88	1563	614.53	410	161.20
			Wet	875	564	221.75	209	82.17	102	40.10	595	233.94	280	110.09	738	290.16	137	53.86
		LL	Overall	1218	842	165.53	243	47.77	133	26.15	901	177.13	317	62.32	1056	207.60	162	31.85
			Dry	818	538	211.53	180	70.77	100	39.32	599	235.51	219	86.11	724	284.66	94	36.96
			Wet	400	304	119.53	63	24.77	33	12.97	302	118.74	98	38.53	332	130.53	68	26.74
		Total	Overall	11464	7758	508.37	2391	156.68	1315	86.17	6787	444.75	4677	306.48	9106	596.71	2358	154.52
			Dry	7587	5142	673.90	1579	206.94	866	113.50	4489	588.32	3098	406.02	5997	785.96	1590	208.38
			Wet	3877	2616	342.85	812	106.42	449	58.85	2298	301.17	1579	206.94	3109	407.46	768	100.65

Experiment 1- hand sorting, experiment 2- seed germination, A- abundance, D- density (m⁻²), UL- upper layer (0-5), ML- middle layer (5-10) and LL- lower layer (10-15).

Appendix Table 3.11. List of plant species (with their abbreviations) germinated from soil seed bank of short and tall riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Code	Family	Group	Class	Growth form	Life cycle
<i>Achyranthes aspera</i> L.	Aca	Amaranthaceae	An	Dicot	Herb	Annual
<i>Acmella uliginosa</i> (Sw.) Cass.	Acu	Compositae	An	Dicot	Herb	Annual
<i>Acroceras zizanioides</i> (Kunth) Dandy	Acz	Poaceae	An	Monocot	Grass	Perennial
<i>Acroceras munroanum</i> (Balansa) Henrard	Acm	Poaceae	An	Monocot	Grass	Perennial
<i>Adenostemma lavenia</i> (L.) Kuntze	Adl	Compositae	An	Dicot	Herb	Annual
<i>Adiantum caudatum</i> L.	Adc	Pteridaceae	Pt	Fern	Fern	Perennial

Plant species	Code	Family	Group	Class	Growth form	Life cycle
<i>Adiantum philippense</i> L.	Adp	Adiantaceae	Pt	Fern	Fern	Perennial
<i>Adiantum capillus-veneris</i> L.	Ada	Pteridaceae	Pt	Fern	Fern	Perennial
<i>Aeschynomene virginica</i> (L.) Britton & al.	Aev	Leguminosae	An	Dicot	Herb	Annual
<i>Ageratum conyzoides</i> (L.) L.	Agc	Compositae	An	Dicot	Herb	Annual
<i>Alpinia nigra</i> (Gaertn.) Burt	Aln	Zingiberaceae	An	Monocot	Herb	Perennial
<i>Alternanthera philoxeroides</i> (Mart.) Griseb.	Alh	Amaranthaceae	An	Dicot	Herb	Perennial
<i>Alternanthera pungens</i> Kunth	Alp	Amaranthaceae	An	Dicot	Herb	Perennial
<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	Als	Amaranthaceae	An	Dicot	Herb	Perennial
<i>Amaranthus spinosus</i> L.	Ams	Amaranthaceae	An	Dicot	Herb	Annual
<i>Amaranthus viridis</i> L.	Amv	Amaranthaceae	An	Dicot	Herb	Annual
<i>Ammannia multiflora</i> Roxb.	Amm	Lythraceae	An	Dicot	Herb	Annual
<i>Ampelopteris prolifera</i> (Retz.) Copel.	Amp	Thelypteridaceae	Pt	Fern	Fern	Perennial
<i>Anagallis arvensis</i> L.	Ana	Primulaceae	An	Dicot	Herb	Annual
<i>Apluda mutica</i> L.	Alm	Poaceae	An	Monocot	Grass	Perennial
<i>Arenaria serpyllifolia</i> L.	Ars	Caryophyllaceae	An	Dicot	Herb	Annual
<i>Aristida adscensionis</i> L.	Ara	Poaceae	An	Monocot	Grass	Annual
<i>Artemisia carvifolia</i> Buch.-Ham. ex Roxb.	Arc	Compositae	An	Dicot	Herb	Annual
<i>Arundinella bengalensis</i> (Spreng.) Druce	Arb	Poaceae	An	Monocot	Grass	Perennial
<i>Axonopus compressus</i> (Sw.) P.Beauv.	Axc	Poaceae	An	Monocot	Grass	Perennial
<i>Azolla pinnata</i> R. Br.	Azp	Salvinaceae	Pt	Fern	Fern	Perennial
<i>Bacopa monnieri</i> (L.) Wettst.	Bam	Plantaginaceae	An	Dicot	Herb	Perennial
<i>Blumea lacera</i> (Burm.f.) DC.	Bla	Compositae	An	Dicot	Herb	Annual
<i>Boerhavia diffusa</i> L.	Bod	Nyctaginaceae	An	Dicot	Herb	Perennial
<i>Brachiaria distachya</i> (L.) Stapf	Brd	Poaceae	An	Monocot	Grass	Perennial
<i>Brachiaria reptans</i> (L.) C.A.Gardner & C.E.Hubb.	Bre	Poaceae	An	Monocot	Grass	Annual
<i>Cajanus scarabaeoides</i> (L.) Thouars	Cas	Leguminosae	An	Dicot	Climber	Perennial
<i>Capillipedium assimile</i> (Steud.) A.Camus	Cpa	Poaceae	An	Monocot	Grass	Perennial
<i>Capsella bursa-pastoris</i> (L.) Medik.	Cab	Brassicaceae	An	Dicot	Herb	Annual
<i>Cardiospermum halicacabum</i> L.	Cah	Sapindaceae	An	Dicot	Climber	Perennial
<i>Carex vesicaria</i> L.	Cav	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Cenchrus ciliaris</i> L.	Cec	Poaceae	An	Monocot	Grass	Perennial
<i>Centella asiatica</i> (L.) Urb.	Cea	Apiaceae	An	Dicot	Herb	Perennial
<i>Centipeda minima</i> (L.) A.Braun & Asch.	Cem	Compositae	An	Dicot	Herb	Annual
<i>Centotheca lappacea</i> (L.) Desv.	Cel	Poaceae	An	Monocot	Grass	Perennial
<i>Ceratopteris thalictroides</i> (L.) Brongn.	Cet	Pteridaceae	Pt	Fern	Fern	Perennial
<i>Chenopodium album</i> L.	Cha	Amaranthaceae	An	Dicot	Herb	Annual
<i>Christella parasitica</i> (L.) Holttum	Chp	Thelypteridaceae	Pt	Fern	Fern	Perennial
<i>Chromolaena odorata</i> (L.) R.M.King & H.Rob.	Euo	Compositae	An	Dicot	Shrub	Perennial
<i>Chrysopogon aciculatus</i> (Retz.) Trin.	Cra	Poaceae	An	Monocot	Grass	Perennial
<i>Cissampelos pareira</i> L.	Cip	Menispermaceae	An	Dicot	Climber	Perennial
<i>Colocasia esculenta</i> (L.) Schott	Coe	Araceae	An	Monocot	Herb	Perennial

Plant species	Code	Family	Group	Class	Growth form	Life cycle
<i>Commelina benghalensis</i> L.	Cob	Commelinaceae	An	Monocot	Herb	Perennial
<i>Commelina diffusa</i> Burm.f.	Cod	Commelinaceae	An	Monocot	Herb	Perennial
<i>Cotula hemisphaerica</i> Wall. ex Benth. & Hook.f.	Coh	Compositae	An	Dicot	Herb	Annual
<i>Crassocephalum crepidioides</i> (Benth.) S.Moore	Crc	Compositae	An	Dicot	Herb	Perennial
<i>Cuphea carthagenensis</i> (Jacq.) J.F.Macbr.	Cuc	Lythraceae	An	Dicot	Herb	Perennial
<i>Cyathula prostrata</i> (L.) Blume	Cyp	Amaranthaceae	An	Dicot	Herb	Perennial
<i>Cynodon dactylon</i> (L.) Pers.	Cyd	Poaceae	An	Monocot	Grass	Perennial
<i>Cyperus compactus</i> Retz.	Cyo	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Cyperus compressus</i> L.	Cyc	Cyperaceae	An	Monocot	Sedge	Annual
<i>Cyperus cyperoides</i> (L.) Kuntze	Cpc	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Cyperus difformis</i> L.	Cyf	Cyperaceae	An	Monocot	Sedge	Annual
<i>Cyperus digitatus</i> Roxb.	Cyg	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Cyperus distans</i> L.f.	Cys	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Cyperus nutans</i> var. <i>eleusinoides</i> (Kunth) Haines	Cyn	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Cyperus eragrostis</i> Lam.	Cye	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Cyperus imbricatus</i> Retz.	Cym	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Cyperus iria</i> L.	Cyi	Cyperaceae	An	Monocot	Sedge	Annual
<i>Cyperus rotundus</i> L.	Cyr	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Cyperus squarrosus</i> L.	Cyq	Cyperaceae	An	Monocot	Sedge	Annual
<i>Cyperus strigosus</i> L.	Cyt	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Cyperus tenuispica</i> Steud.	Cyu	Cyperaceae	An	Monocot	Sedge	Annual
<i>Cyrtococcum oxyphyllum</i> (Steud.) Stapf	Cyx	Poaceae	An	Monocot	Grass	Perennial
<i>Cyrtococcum patens</i> (L.) A.Camus	Cya	Poaceae	An	Monocot	Grass	Perennial
<i>Dactylis glomerata</i> L.	Dag	Poaceae	An	Monocot	Grass	Perennial
<i>Dactyloctenium aegyptium</i> (L.) Willd.	Dae	Poaceae	An	Monocot	Grass	Annual
<i>Dentella repens</i> (L.) J.R.Forst. & G.Forst.	Der	Rubiaceae	An	Dicot	Herb	Annual
<i>Desmodium heterophyllum</i> (Willd.) DC.	Deh	Leguminosae	An	Dicot	Herb	Perennial
<i>Dichanthium annulatum</i> (Forssk.) Stapf	Dia	Poaceae	An	Monocot	Grass	Perennial
<i>Dichrocephala integrifolia</i> (L.f.) Kuntze	Din	Compositae	An	Dicot	Herb	Annual
<i>Dicranopteris linearis</i> (Burm. f.) Underw.	Dil	Gleicheniaceae	Pt	Fern	Fern	Perennial
<i>Digitaria ciliaris</i> (Retz.) Koeler	Dic	Poaceae	An	Monocot	Grass	Annual
<i>Digitaria setigera</i> Roth	Dis	Poaceae	An	Monocot	Grass	Annual
<i>Digitaria violascens</i> Link	Div	Poaceae	An	Monocot	Grass	Annual
<i>Diplazium esculentum</i> (Retz.) Sw.	Die	Athyriaceae	Pt	Fern	Fern	Perennial
<i>Drymaria cordata</i> (L.) Willd. ex Schult.	Drc	Caryophyllaceae	An	Dicot	Herb	Annual
<i>Duchesnea indica</i> (Jacks.) Focke	Dui	Rosaceae	An	Dicot	Herb	Perennial
<i>Dysphania ambrosioides</i> (L.) Mosyakin & Clemants	Dya	Amaranthaceae	An	Dicot	Herb	Annual
<i>Echinochloa colona</i> (L.) Link	Eco	Poaceae	An	Monocot	Grass	Annual
<i>Echinochloa crus-galli</i> (L.) P.Beauv.	Ecr	Poaceae	An	Monocot	Grass	Annual
<i>Eclipta prostrata</i> Lour.	Ecp	Compositae	An	Dicot	Herb	Annual
<i>Eichhornia crassipes</i> (Mart.) Solms	Eic	Pontederiaceae	An	Monocot	Herb	Perennial

Plant species	Code	Family	Group	Class	Growth form	Life cycle
<i>Eleocharis acutangula</i> (Roxb.) Schult.	Ela	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Eleusine indica</i> (L.) Gaertn.	Eli	Poaceae	An	Monocot	Grass	Annual
<i>Emilia sonchifolia</i> (L.) DC. ex DC.	Ems	Compositae	An	Dicot	Herb	Annual
<i>Enydra fluctuans</i> Lour.	Enf	Compositae	An	Dicot	Herb	Perennial
<i>Hippochaete debilis</i> (Roxb. ex Vaucher) Ching	Hid	Equisetaceae	Pt	Fern	Fern	Perennial
<i>Eragrostis amabilis</i> (L.) Wight & Arn.	Era	Poaceae	An	Monocot	Grass	Annual
<i>Eragrostis riparia</i> (Willd.) Nees	Eri	Poaceae	An	Monocot	Grass	Annual
<i>Eragrostis unioides</i> (Retz.) Nees ex Steud.	Eru	Poaceae	An	Monocot	Grass	Annual
<i>Erigeron bonariensis</i> L.	Erb	Compositae	An	Dicot	Herb	Annual
<i>Ethulia conyzoides</i> L.f.	Etc	Compositae	An	Dicot	Herb	Annual
<i>Euphorbia heterophylla</i> L.	Eue	Euphorbiaceae	An	Dicot	Herb	Annual
<i>Euphorbia hirta</i> L.	Euh	Euphorbiaceae	An	Dicot	Herb	Annual
<i>Euphorbia hypericifolia</i> L.	Euy	Euphorbiaceae	An	Dicot	Herb	Annual
<i>Euphorbia thymifolia</i> L.	Eut	Euphorbiaceae	An	Dicot	Herb	Annual
<i>Evolvulus nummularius</i> (L.) L	Evu	Convolvulaceae	An	Dicot	Herb	Annual
<i>Fimbristylis aestivalis</i> Vahl	Fia	Cyperaceae	An	Monocot	Sedge	Annual
<i>Fimbristylis dichotoma</i> (L.) Vahl	Fid	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Fimbristylis littoralis</i> Gaudich.	Fit	Cyperaceae	An	Monocot	Sedge	Annual
<i>Flemingia lineata</i> (L.) Aiton	Fli	Leguminosae	An	Dicot	Shrub	Perennial
<i>Floscopa scandens</i> Lour.	Fls	Commelinaceae	An	Monocot	Herb	Perennial
<i>Glinus lotoides</i> L.	Glo	Molluginaceae	An	Dicot	Herb	Annual
<i>Glinus oppositifolius</i> (L.) Aug.DC.	Glp	Molluginaceae	An	Dicot	Herb	Annual
<i>Gnaphalium pensylvanicum</i> Willd.	Gap	Compositae	An	Dicot	Herb	Annual
<i>Grangea maderaspatana</i>	Grm	Compositae	An	Dicot	Herb	Annual
<i>Heliotropium indicum</i> L.	Hei	Boraginaceae	An	Dicot	Herb	Annual
<i>Heliotropium ovalifolium</i> Forssk.	Heo	Boraginaceae	An	Dicot	Herb	Perennial
<i>Heliotropium strigosum</i> Willd.	Hes	Boraginaceae	An	Dicot	Herb	Perennial
<i>Hemarthria compressa</i> (L.f.) R.Br.	Hec	Poaceae	An	Monocot	Grass	Perennial
<i>Houttuynia cordata</i> Thunb.	Hoc	Saururaceae	An	Dicot	Herb	Perennial
<i>Hydrocotyle sibthorpioides</i> Lam.	Hds	Araliaceae	An	Dicot	Herb	Perennial
<i>Hymenachne amplexicaulis</i> (Rudge) Nees	Hya	Poaceae	An	Monocot	Grass	Perennial
<i>Hyptis suaveolens</i> (L.) Poit.	Hys	Lamiaceae	An	Dicot	Herb	Annual
<i>Ichnanthus pallens</i> (Sw.) Munro ex Benth.	Icp	Poaceae	An	Monocot	Grass	Perennial
<i>Impatiens tripetala</i> Roxb. ex DC.	Imt	Balsaminaceae	An	Dicot	Herb	Annual
<i>Imperata cylindrica</i> (L.) Raeusch.	Imc	Poaceae	An	Monocot	Grass	Perennial
<i>Isachne globosa</i> (Thunb.) Kuntze	Isg	Poaceae	An	Monocot	Grass	Perennial
<i>Juncus articulatus</i> L.	Jua	Juncaceae	An	Monocot	Rushes	Perennial
<i>Juncus prismatocarpus</i> R.Br.	Jup	Juncaceae	An	Monocot	Rushes	Perennial
<i>Kyllinga brevifolia</i> Rottb.	Kyb	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Laphangium luteoalbum</i> (L.) Tzvelev	Lal	Compositae	An	Dicot	Herb	Perennial
<i>Leersia hexandra</i> Sw.	Leh	Poaceae	An	Monocot	Grass	Perennial

Plant species	Code	Family	Group	Class	Growth form	Life cycle
<i>Lepidagathis incurva</i> Buch.-Ham. ex D. Don	Lei	Acanthaceae	An	Dicot	Herb	Perennial
<i>Leucas aspera</i> (Willd.) Link	Lea	Lamiaceae	An	Dicot	Herb	Annual
<i>Leucostegia immersa</i> Wall. ex C. Presl	Lem	Hypodematiaceae	Pt	Fern	Fern	Perennial
<i>Limnium laevigatum</i> (Humb. & Bonpl. ex Willd.) Hein	Lil	Hydrocharitaceae	An	Monocot	Herb	Perennial
<i>Lindernia crustacea</i> (L.) F.Muell.	Lic	Linderniaceae	An	Dicot	Herb	Perennial
<i>Lindernia ruelliioides</i> (Colsm.) Pennell	Lir	Linderniaceae	An	Dicot	Herb	Annual
<i>Ludwigia adscendens</i> (L.) H.Hara	Lua	Onagraceae	An	Dicot	Herb	Perennial
<i>Ludwigia octovalvis</i> (Jacq.) P.H.Raven	Luo	Onagraceae	An	Dicot	Herb	Perennial
<i>Lygodium flexuosum</i> (L.) Sw.	Lyf	Lygodiaceae	Pt	Fern	Fern	Perennial
<i>Lygodium microphyllum</i> (Cav.) R. Br.	Lym	Schizaeaceae	Pt	Fern	Fern	Perennial
<i>Marsilea quadrifolia</i> L.	Maq	Marsileaceae	Pt	Fern	Fern	Perennial
<i>Mazus pumilus</i> (Burm.f.) Steenis	Map	Phrymaceae	An	Dicot	Herb	Annual
<i>Mecardonia procumbens</i> (Mill.) Small	Mep	Plantaginaceae	An	Dicot	Herb	Perennial
<i>Melilotus albus</i> Medik.	Mea	Leguminosae	An	Dicot	Herb	Annual
<i>Merremia umbellata</i> (L.) Hallier f.	Meu	Convolvulaceae	An	Dicot	Climber	Perennial
<i>Mikania micrantha</i> Kunth	Mim	Compositae	An	Dicot	Climber	Perennial
<i>Monochoria hastata</i> (L.) Solms	Moh	Pontederiaceae	An	Monocot	Herb	Perennial
<i>Nelsonia canescens</i> (Lam.) Spreng.	Nec	Acanthaceae	An	Dicot	Herb	Annual
<i>Nymphoides cristata</i> (Roxb.) Kuntze	Nyc	Menyanthaceae	An	Dicot	Herb	Perennial
<i>Oldenlandia lineata</i> (Roxb.) Kuntze	Oli	Rubiaceae	An	Dicot	Herb	Perennial
<i>Oldenlandia tenelliflora</i> (Blume) Kuntze	Olt	Rubiaceae	An	Dicot	Herb	Perennial
<i>Onychium japonicum</i> (Thunb.) Kunze	Onj	Pteridaceae	Pt	Fern	Fern	Perennial
<i>Oplismenus burmannii</i> (Retz.) P.Beauv	Opb	Poaceae	An	Monocot	Grass	Annual
<i>Oplismenus compositus</i> (L.) P.Beauv.	Opc	Poaceae	An	Monocot	Grass	Perennial
<i>Ottolochloa nodosa</i> (Kunth) Dandy	Otn	Poaceae	An	Monocot	Grass	Perennial
<i>Oxalis corniculata</i> L.	Oxc	Oxalidaceae	An	Dicot	Herb	Annual
<i>Oxalis debilis</i> Kunth	Oxd	Oxalidaceae	An	Dicot	Herb	Perennial
<i>Oxalis latifolia</i> Kunth	Oxl	Oxalidaceae	An	Dicot	Herb	Perennial
<i>Panicum auritum</i> J.Presl ex Nees	Pau	Poaceae	An	Monocot	Grass	Perennial
<i>Panicum brevifolium</i> L.	Pab	Poaceae	An	Monocot	Grass	Annual
<i>Panicum notatum</i> Retz.	Pan	Poaceae	An	Monocot	Grass	Perennial
<i>Parthenium hysterophorus</i> L.	Pah	Compositae	An	Dicot	Herb	Annual
<i>Paspalidium flavidum</i> (Retz.) A.Camus	Paf	Poaceae	An	Monocot	Grass	Perennial
<i>Paspalum conjugatum</i> P.J.Bergiu	Pac	Poaceae	An	Monocot	Grass	Perennial
<i>Paspalum dilatatum</i> Poir.	Pad	Poaceae	An	Monocot	Grass	Perennial
<i>Paspalum scrobiculatum</i> L.	Pao	Poaceae	An	Monocot	Grass	Annual
<i>Peperomia pellucida</i> (L.) Kunth	Pep	Piperaceae	An	Dicot	Herb	Annual
<i>Persicaria barbata</i> (L.) H.Hara	Peb	Polygonaceae	An	Dicot	Herb	Perennial
<i>Persicaria chinensis</i> (L.) H. Gross	Pec	Polygonaceae	An	Dicot	Herb	Perennial
<i>Persicaria hydropiper</i> (L.) Delarbre	Poh	Polygonaceae	An	Dicot	Herb	Annual
<i>Persicaria orientalis</i> (L.) Spach	Por	Polygonaceae	An	Dicot	Herb	Annual

Plant species	Code	Family	Group	Class	Growth form	Life cycle
<i>Phyla nodiflora</i> (L.) Greene	Pho	Verbenaceae	An	Dicot	Herb	Perennial
<i>Phyllanthus niruri</i> L.	Phn	Phyllanthaceae	An	Dicot	Herb	Annual
<i>Phyllanthus virgatus</i> G.Forst.	Phv	Phyllanthaceae	An	Dicot	Herb	Annual
<i>Physalis minima</i> L.	Phm	Solanaceae	An	Dicot	Herb	Annual
<i>Pistia stratiotes</i> L.	Pis	Araceae	An	Monocot	Herb	Perennial
<i>Plantago major</i> L.	Plm	Plantaginaceae	An	Dicot	Herb	Perennial
<i>Plectranthus</i> sp.	Ple	Lamiaceae	An	Dicot	Herb	Perennial
<i>Poa annua</i> L.	Poa	Poaceae	An	Monocot	Grass	Annual
<i>Polycarpon prostratum</i> (Forssk.) Asch. & Schweinf.	Pop	Caryophyllaceae	An	Dicot	Herb	Annual
<i>Polygala arvensis</i> Willd.	Pov	Polygalaceae	An	Dicot	Herb	Perennial
<i>Polygonum plebeium</i> R.Br.	Plp	Polygonaceae	An	Dicot	Herb	Annual
<i>Polygonum posumbu</i> Buch.-Ham. ex D. Don	Pos	Polygonaceae	An	Dicot	Herb	Annual
<i>Portulaca oleracea</i> L.	Pol	Portulacaceae	An	Dicot	Herb	Annual
<i>Potentilla kleiniana</i> Wight & Arn.	Pok	Rosaceae	An	Dicot	Herb	Perennial
<i>Pouzolzia zeylanica</i> (L.) Benn.	Poz	Urticaceae	An	Dicot	Herb	Perennial
<i>Pycnus pumilus</i> (L.) Nees	Pyp	Cyperaceae	An	Monocot	Sedge	Annual
<i>Ranunculus cantoniensis</i> DC.	Rac	Ranunculaceae	An	Dicot	Herb	Perennial
<i>Ranunculus sceleratus</i> L.	Ras	Ranunculaceae	An	Dicot	Herb	Annual
<i>Rorippa indica</i> (L.) Hiern	Roi	Brassicaceae	An	Dicot	Herb	Perennial
<i>Rumex dentatus</i> L.	Rud	Polygonaceae	An	Dicot	Herb	Annual
<i>Rungia pectinata</i> (L.) Nees	Rup	Acanthaceae	An	Dicot	Herb	Annual
<i>Rungia repens</i> (L.) Nees	Rur	Acanthaceae	An	Dicot	Herb	Annual
<i>Saccharum</i> spp.	Sas	Poaceae	An	Monocot	Grass	Perennial
<i>Salvinia natans</i> (L.) All.	San	Salvinaceae	Pt	Fern	Fern	Annual
<i>Schoenoplectiella mucronata</i> (L.) J.Jung & H.K.Choi	Scm	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Scleria terrestris</i> (L.) Fassett	Sct	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Senna tora</i> (L.) Roxb.	Set	Leguminosae	An	Dicot	Herb	Perennial
<i>Setaria pumila</i> (Poir.) Roem. & Schult.	Nov	Poaceae	An	Monocot	Grass	Annual
<i>Setaria viridis</i> (L.) P.Beauv.	Sev	Poaceae	An	Monocot	Grass	Annual
<i>Sida acuta</i> Burm.f.	Sia	Malvaceae	An	Dicot	Herb	Perennial
<i>Solanum americanum</i> Mill.	Soa	Solanaceae	An	Dicot	Herb	Annual
<i>Solanum viarum</i> Dunal	Sov	Solanaceae	An	Dicot	Shrub	Perennial
<i>Sonchus oleraceus</i> (L.) L.	Sno	Compositae	An	Dicot	Herb	Annual
<i>Spermacoce pusilla</i> Wall.	Spu	Rubiaceae	An	Dicot	Herb	Annual
<i>Spirodela polyrrhiza</i> (L.) Schleid.	Spo	Araceae	An	Monocot	Herb	Perennial
<i>Sporobolus diandrus</i> (Retz.) P.Beauv.	Spd	Poaceae	An	Monocot	Grass	Perennial
<i>Sporobolus fertilis</i> (Steud.) Clayton	Spf	Poaceae	An	Monocot	Grass	Perennial
<i>Stellaria media</i> (L.) Vill.	Stm	Caryophyllaceae	An	Dicot	Herb	Annual
<i>Synedrella nodiflora</i> (L.) Gaertn.	Syn	Compositae	An	Dicot	Herb	Annual
<i>Tetragium dubium</i> (Lawson) Planch.	Ted	Vitaceae	An	Dicot	Climber	Perennial
<i>Themeda</i> spp.	Thv	Poaceae	An	Monocot	Grass	Perennial

Plant species	Code	Family	Group	Class	Growth form	Life cycle
<i>Thespis divaricata</i> DC.	Thd	Compositae	An	Dicot	Herb	Annual
<i>Tridax procumbens</i> (L.) L.	Trp	Compositae	An	Dicot	Herb	Annual
<i>Typhonium trilobatum</i> (L.) Schott	Tyt	Araceae	An	Monocot	Herb	Perennial
<i>Urochloa panicoides</i> P.Beauv.	Urp	Poaceae	An	Monocot	Grass	Perennial
<i>Verbena officinalis</i> L.	Veo	Verbenaceae	An	Dicot	Herb	Perennial
<i>Vicia sativa</i> L.	Vis	Leguminosae	An	Dicot	Herb	Annual
<i>Xanthium strumarium</i> L.	Xas	Compositae	An	Dicot	Herb	Annual
<i>Youngia japonica</i> (L.) DC.	Yoj	Compositae	An	Dicot	Herb	Annual
UI	UI 1	Unidentified	An	Dicot	Herb	UI
UI	UI 2	Unidentified	An	Dicot	Herb	UI
UI	UI 3	Unidentified	An	Dicot	Herb	UI
UI	UI 4	Unidentified	Pt	Fern	Fern	UI
UI	UI 5	Unidentified	An	Dicot	Herb	UI
UI	UI 6	Unidentified	An	Monocot	Grass	UI
UI	UI 7	Unidentified	An	Dicot	Herb	UI
UI	UI 8	Unidentified	Pt	Fern	Fern	UI
UI	UI 10	Unidentified	An	Dicot	Herb	UI
UI	UI 11	Unidentified	An	Dicot	Herb	UI
UI	UI 12	Unidentified	An	Dicot	Herb	UI
UI	UI 13	Unidentified	An	Dicot	Herb	UI
UI	UI 14	Unidentified	An	Dicot	Herb	UI
UI	UI 16	Unidentified	An	Dicot	Herb	UI
UI	UI 17	Unidentified	An	Dicot	Herb	UI
UI	UI 18	Unidentified	An	Dicot	Shrub	UI
UI	UI 19	Unidentified	An	Dicot	Climber	UI
UI	UI 20	Unidentified	An	Dicot	Herb	UI
UI	UI 21	Unidentified	An	Dicot	Herb	UI
UI	UI 22	Unidentified	An	Dicot	Herb	UI
UI	UI 24	Unidentified	An	Dicot	Herb	UI
UI	UI 25	Unidentified	An	Monocot	Grass	UI
UI	UI 26	Unidentified	An	Monocot	Grass	UI
UI	UI 27	Unidentified	An	Dicot	Herb	UI
UI	UI 28	Unidentified	An	Dicot	Herb	UI
UI	UI 29	Unidentified	An	Dicot	Herb	UI

An-angiosperms and Pt-pteridophytes.

Appendix Table 3.12. Plant species composition recorded from soil seed bank of short and tall riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

ES	Treatment	Season	Soil Layer	Species	Genus	Families	Number of species (n)														
							Group		Type				Growth Form						Life cycle		UI
							An	Pt	M	Di	F	G	Sd	R	C	H	F	Sh	Ann	Per	
GL	Natural	Overall	UL	179	121	47	169	10	67	102	10	47	15	1	7	95	10	4	76	87	16
			ML	121	89	36	113	8	46	67	8	31	13	0	3	64	8	2	52	57	12
			LL	70	56	29	66	4	26	40	4	16	10	0	1	39	4	0	31	34	5
			Total	208	135	51	196	12	76	120	12	50	20	1	7	114	12	4	85	99	24
		Dry	UL	153	107	43	144	9	60	84	9	41	15	1	5	78	9	4	66	75	12
			ML	108	82	33	102	6	44	58	6	30	13	0	3	54	6	2	47	52	9
			LL	67	54	28	63	4	26	37	4	16	10	0	1	36	4	0	29	33	5
			Total	169	113	43	160	9	68	92	9	44	20	1	5	86	9	4	70	81	18
		Wet	UL	133	99	41	126	7	49	77	7	33	12	1	4	74	7	2	58	66	9
			ML	100	82	34	93	7	37	56	7	23	12	0	2	54	7	2	45	49	6
			LL	60	54	29	56	4	21	35	4	15	6	0	1	34	4	0	28	29	3
			Total	149	110	45	140	9	52	88	9	34	13	1	4	86	9	2	64	74	11
	Flooded	Overall	UL	125	95	42	114	11	53	61	11	32	13	1	3	65	11	0	51	68	6
			ML	95	79	35	88	7	46	42	7	27	14	1	2	44	7	0	34	57	4
			LL	57	51	30	51	6	24	27	6	14	7	0	1	29	6	0	25	31	1
			Total	141	105	43	130	11	62	68	11	34	19	2	3	72	11	0	55	80	6
		Dry	UL	116	91	42	106	10	48	58	10	28	13	1	3	61	10	0	49	63	4
			ML	91	77	34	84	7	45	39	7	26	14	1	2	41	7	0	33	54	4
			LL	56	50	29	50	6	24	26	6	14	7	0	1	28	6	0	25	30	1
			Total	128	98	42	118	10	57	61	10	30	19	2	3	64	10	0	53	71	4
		Wet	UL	94	77	39	86	8	41	45	8	25	10	1	2	48	8	0	38	52	4
			ML	78	67	34	72	6	35	37	6	21	11	0	2	38	6	0	31	45	2
			LL	51	49	29	45	6	20	25	6	14	4	0	1	26	6	0	23	27	1
			Total	99	81	40	91	8	42	49	8	25	11	1	2	52	8	0	38	57	4
	Total	Overall	UL	206	141	54	190	16	76	114	16	49	16	1	7	113	16	4	82	106	18
			ML	140	105	43	130	10	57	73	10	35	15	1	3	74	10	2	55	72	13
			LL	77	63	34	71	6	29	42	6	16	10	0	1	44	6	0	32	40	5
			Total	245	162	58	227	18	90	137	18	54	23	2	7	137	18	4	94	125	26
		Dry	UL	176	125	50	162	14	68	94	14	43	16	1	5	93	14	4	72	91	13
			ML	126	97	40	118	8	55	63	8	34	15	1	3	63	8	2	50	66	10
			LL	73	60	33	67	6	29	38	6	16	10	0	1	40	6	0	30	38	5
			Total	200	136	50	186	14	81	105	14	48	23	2	5	104	14	4	79	102	19
		Wet	UL	145	109	48	134	11	54	80	11	34	12	1	4	81	11	2	59	76	10
			ML	108	90	40	99	9	41	58	9	24	12	0	2	59	9	2	46	56	6
			LL	65	59	33	59	6	23	36	6	15	6	0	1	37	6	0	28	34	3
			Total	163	122	52	150	13	57	93	13	35	13	1	4	95	13	2	65	86	12
SG	Natural	Overall	UL	121	82	34	116	5	47	69	5	30	14	1	0	70	5	1	62	52	7
			ML	89	69	29	86	3	33	53	3	21	11	0	0	53	3	1	46	36	7
			LL	54	44	24	53	1	19	34	1	11	8	0	0	34	1	0	27	24	3
			Total	139	91	37	134	5	51	83	5	31	17	1	0	84	5	1	69	57	13
		Dry	UL	121	82	34	116	5	47	69	5	30	14	1	0	70	5	1	62	52	7
			ML	82	65	27	79	3	32	47	3	20	11	0	0	47	3	1	42	35	5
			LL	52	43	23	51	1	19	32	1	11	8	0	0	32	1	0	26	23	3
			Total	121	82	33	117	4	46	71	4	27	17	1	0	71	4	1	61	50	10
		Wet	UL	96	72	32	93	3	37	56	3	23	11	1	0	57	3	1	50	41	5

ES	Treatment	Season	Soil Layer	Species	Genus	Families	Number of species (n)														
							Group		Type			Growth Form							Life cycle		UI
							An	Pt	M	Di	F	G	Sd	R	C	H	F	Sh	Ann	Per	
Flooded	Overall	ML	76	64	28	74	2	29	45	2	17	11	0	0	45	2	1	41	32	3	
		LL	46	42	24	45	1	15	30	1	10	5	0	0	30	1	0	25	20	1	
		Total	105	79	35	102	3	39	63	3	24	12	1	0	64	3	1	54	45	6	
		UL	92	72	38	84	8	38	46	8	20	11	1	0	52	8	0	42	46	4	
		ML	70	61	32	65	5	33	32	5	17	11	1	0	36	5	0	29	39	2	
		LL	44	41	25	41	3	17	24	3	9	5	0	0	27	3	0	21	23	0	
		Total	98	77	39	90	8	41	49	8	20	13	2	0	55	8	0	43	51	4	
		Dry	UL	88	72	38	80	8	36	44	8	18	11	1	0	50	8	0	40	46	2
			ML	68	60	31	63	5	32	31	5	16	11	1	0	35	5	0	28	38	2
			LL	43	40	24	40	3	17	23	3	9	5	0	0	26	3	0	21	22	0
			Total	92	75	38	84	8	39	45	8	18	13	2	0	51	8	0	41	49	2
			Wet	UL	72	59	35	67	5	31	36	5	17	9	1	0	40	5	0	33	36
	ML			62	54	31	58	4	28	30	4	15	10	0	0	33	4	0	28	33	1
	LL	40		39	24	37	3	15	22	3	9	4	0	0	24	3	0	20	20	0	
	Total	75		62	36	70	5	32	38	5	17	10	1	0	42	5	0	33	39	3	
	Total	UL		138	96	42	128	10	52	76	10	30	14	1	0	82	10	1	65	64	9
		ML		99	78	35	94	5	39	55	5	21	12	1	0	59	5	1	46	45	8
		LL	61	51	29	58	3	22	36	3	11	8	0	0	39	3	0	28	30	3	
		Total	160	108	45	150	10	58	92	10	31	18	2	0	98	10	1	73	72	15	
		Dry	UL	125	91	41	116	9	47	69	9	26	14	1	0	74	9	1	60	59	6
			ML	92	74	33	87	5	38	49	5	20	12	1	0	53	5	1	42	44	6
			LL	58	49	28	55	3	22	33	3	11	8	0	0	36	3	0	27	28	3
			Total	140	98	41	131	9	53	78	9	27	18	2	0	83	9	1	65	64	11
		Wet	UL	103	78	38	97	6	40	57	6	23	11	1	0	61	6	1	50	47	6
			ML	81	69	33	77	4	32	45	4	17	11	0	0	48	4	1	41	37	3
			LL	51	47	28	48	3	17	31	3	10	5	0	0	33	3	0	25	25	1
			Total	113	86	41	107	6	42	65	6	24	12	1	0	69	6	1	54	52	7

TG	Natural	Overall	UL	114	85	38	104	10	38	66	10	30	6	0	7	57	10	4	43	60	11
			ML	70	53	27	62	8	24	38	8	17	6	0	3	34	8	2	25	38	7
			LL	42	36	20	38	4	13	25	4	10	3	0	1	24	4	0	20	19	3
			Total	129	91	41	117	12	43	74	12	32	8	0	7	66	12	4	46	68	15
		Dry	UL	96	74	35	87	9	33	54	9	25	6	0	5	47	9	4	36	51	9
			ML	62	49	24	56	6	22	34	6	16	6	0	3	29	6	2	23	33	6
			LL	40	35	20	36	4	13	23	4	10	3	0	1	22	4	0	18	19	3
			Total	102	75	35	93	9	37	56	9	27	8	0	5	49	9	4	36	54	12
		Wet	UL	85	68	32	78	7	28	50	7	21	6	0	4	45	7	2	34	46	5
			ML	60	50	26	53	7	19	34	7	13	5	0	2	31	7	2	23	33	4
			LL	39	36	20	35	4	12	23	4	10	2	0	1	22	4	0	19	18	2
			Total	94	73	35	85	9	29	56	9	21	6	0	4	52	9	2	37	51	6
	Flooded	Overall	UL	74	57	28	67	7	30	37	7	21	8	0	3	35	7	0	29	42	3
			ML	57	46	19	52	5	27	25	5	18	9	0	2	23	5	0	20	34	3
			LL	34	31	18	30	4	13	17	4	10	3	0	1	16	4	0	18	15	1
			Total	86	64	29	79	7	36	43	7	23	12	0	3	41	7	0	33	50	3
		Dry	UL	68	53	26	62	6	26	36	6	18	8	0	3	33	6	0	28	37	3
			ML	54	44	18	49	5	27	22	5	18	9	0	2	20	5	0	20	31	3

ES	Treatment	Season	Soil Layer	Species	Genus	Families	Number of species (n)															
							Group		Type			Growth Form						Life cycle		UI		
							An	Pt	M	Di	F	G	Sd	R	C	H	F	Sh	Ann		Per	
Total			LL	34	31	18	30	4	13	17	4	10	3	0	1	16	4	0	18	15	1	
			Total	77	58	26	71	6	32	39	6	20	12	0	3	36	6	0	32	42	3	
			Wet	UL	59	49	27	53	6	23	30	6	15	7	0	2	29	6	0	23	34	2
				ML	45	38	19	41	4	19	22	4	12	7	0	2	20	4	0	17	26	2
				LL	31	30	18	27	4	11	16	4	10	1	0	1	15	4	0	16	14	1
				Total	62	51	28	56	6	23	33	6	15	7	0	2	32	6	0	23	37	2
		Overall	UL	131	93	41	119	12	46	73	12	34	9	0	7	65	12	4	48	72	11	
			ML	83	62	28	75	8	33	42	8	23	9	0	3	38	8	2	29	47	7	
			LL	44	37	20	40	4	14	26	4	10	4	0	1	25	4	0	22	19	3	
			Total	154	104	44	140	14	55	85	14	38	13	0	7	78	14	4	55	84	15	
		Dry	UL	110	80	37	100	10	40	60	10	29	9	0	5	53	10	4	41	60	9	
			ML	74	57	25	68	6	31	37	6	22	9	0	3	32	6	2	27	41	6	
	LL		42	36	20	38	4	14	24	4	10	4	0	1	23	4	0	20	19	3		
	Total		123	85	37	113	10	48	65	10	33	13	0	5	58	10	4	45	66	12		
	Wet		UL	94	73	36	85	9	32	53	9	22	8	0	4	49	9	2	35	54	5	
			ML	65	53	27	58	7	22	36	7	14	7	0	2	33	7	2	24	37	4	
		LL	39	36	20	35	4	12	23	4	10	2	0	1	22	4	0	19	18	2		
		Total	104	79	39	93	11	33	60	11	22	8	0	4	57	11	2	38	60	6		

ES- experimental sites, GL- grassland, SG- short grassland, TG- tall grassland, UL- upper layer (0-5), ML- middle layer (5-10), LL- lower layer (10-15), An- angiosperms, Pt- pteridophytes, M-Monocots, Di- Dicots, F- ferns, G- grasses, Sd- sedges, R- rushes, C- climbers, H- herbs, Sh- shrubs Ann- annual, Per- perennial, Deci- deciduous, n- number of species and UI- unidentified.

Appendix Table 3.13. Dominant plant families recorded from soil seed bank of short and tall riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Treatment	Soil layer	Overall		Dry season		Wet season	
			Family	n	Family	n	Family	n
Grassland	Natural	UL	Poaceae	45	Poaceae	39	Poaceae	33
			Compositae	22	Compositae	20	Compositae	17
			Cyperaceae	15	Cyperaceae	15	Cyperaceae	12
			Amaranthaceae	8	Amaranthaceae	7	Amaranthaceae	6
			Leguminosae	6	Leguminosae	5	Leguminosae	4
		ML	Poaceae	30	Poaceae	29	Poaceae	23
			Compositae	15	Compositae	15	Compositae	14
			Cyperaceae	13	Cyperaceae	13	Cyperaceae	12
			Amaranthaceae	5	Amaranthaceae	4	Amaranthaceae	5
			Acanthaceae	3	Acanthaceae	2	Acanthaceae	3
		LL	Poaceae	16	Poaceae	16	Poaceae	15
			Cyperaceae	10	Cyperaceae	10	Compositae	7
			Compositae	7	Compositae	6	Cyperaceae	6
			Euphorbiaceae	3	Acanthaceae	2	Acanthaceae	2
			Acanthaceae	2	Amaranthaceae	2	Euphorbiaceae	2

Experimental sites	Treatment	Soil layer	Overall		Dry season		Wet season	
			Family	n	Family	n	Family	n
		Total	Poaceae	47	Poaceae	41	Poaceae	34
			Compositae	24	Compositae	21	Compositae	18
			Cyperaceae	20	Cyperaceae	20	Cyperaceae	13
			Amaranthaceae	9	Amaranthaceae	7	Amaranthaceae	7
			Leguminosae	6	Leguminosae	5	Acanthaceae	4
	Flooded	UL	Poaceae	32	Poaceae	28	Poaceae	25
			Cyperaceae	13	Cyperaceae	13	Cyperaceae	10
			Compositae	10	Compositae	10	Compositae	8
			Polygonaceae	6	Polygonaceae	6	Amaranthaceae	4
			Amaranthaceae	5	Amaranthaceae	5	Polygonaceae	3
		ML	Poaceae	27	Poaceae	26	Poaceae	21
			Cyperaceae	14	Cyperaceae	14	Cyperaceae	11
			Compositae	8	Compositae	8	Compositae	6
			Amaranthaceae	4	Amaranthaceae	4	Amaranthaceae	4
			Rubiaceae	3	Araceae	2	Rubiaceae	3
		LL	Poaceae	14	Poaceae	14	Poaceae	14
			Cyperaceae	7	Cyperaceae	7	Compositae	5
			Compositae	5	Compositae	5	Cyperaceae	4
			Amaranthaceae	2	Amaranthaceae	2	Polygonaceae	2
			Caryophyllaceae	2	Caryophyllaceae	2	Acanthaceae	1
		Total	Poaceae	34	Poaceae	30	Poaceae	25
			Cyperaceae	19	Cyperaceae	19	Cyperaceae	11
			Compositae	11	Compositae	11	Compositae	8
			Polygonaceae	6	Polygonaceae	6	Amaranthaceae	4
			Amaranthaceae	5	Amaranthaceae	5	Polygonaceae	3
	Total	UL	Poaceae	47	Poaceae	41	Poaceae	34
			Compositae	23	Compositae	21	Compositae	17
			Cyperaceae	16	Cyperaceae	16	Cyperaceae	12
			Amaranthaceae	8	Amaranthaceae	7	Amaranthaceae	6
			Leguminosae	7	Leguminosae	6	Leguminosae	4
		ML	Poaceae	34	Poaceae	33	Poaceae	24
			Compositae	17	Compositae	17	Compositae	14
			Cyperaceae	15	Cyperaceae	15	Cyperaceae	12
			Amaranthaceae	5	Amaranthaceae	4	Amaranthaceae	5
			Rubiaceae	4	Caryophyllaceae	3	Rubiaceae	4
		LL	Poaceae	16	Poaceae	16	Poaceae	15
			Cyperaceae	10	Cyperaceae	10	Compositae	7
			Compositae	7	Compositae	6	Cyperaceae	6
			Euphorbiaceae	3	Acanthaceae	2	Acanthaceae	2
			Acanthaceae	2	Amaranthaceae	2	Euphorbiaceae	2

Experimental sites	Treatment	Soil layer	Overall		Dry season		Wet season	
			Family	n	Family	n	Family	n
Short grassland	Natural	Total	Poaceae	51	Poaceae	45	Poaceae	35
			Compositae	26	Compositae	23	Compositae	18
			Cyperaceae	23	Cyperaceae	23	Cyperaceae	13
			Amaranthaceae	9	Amaranthaceae	7	Amaranthaceae	7
			Leguminosae	7	Leguminosae	6	Acanthaceae	4
		UL	Poaceae	30	Poaceae	30	Poaceae	23
			Compositae	14	Compositae	14	Compositae	13
			Cyperaceae	14	Cyperaceae	14	Cyperaceae	11
			Amaranthaceae	6	Amaranthaceae	6	Amaranthaceae	4
			Polygonaceae	4	Polygonaceae	4	Acanthaceae	3
		ML	Poaceae	21	Poaceae	20	Poaceae	17
			Compositae	13	Compositae	13	Compositae	12
			Cyperaceae	11	Cyperaceae	11	Cyperaceae	11
			Acanthaceae	3	Amaranthaceae	3	Acanthaceae	3
			Amaranthaceae	3	Acanthaceae	2	Amaranthaceae	3
		LL	Poaceae	11	Poaceae	11	Poaceae	10
			Cyperaceae	8	Cyperaceae	8	Compositae	6
			Compositae	6	Compositae	6	Cyperaceae	5
			Acanthaceae	2	Acanthaceae	2	Acanthaceae	2
			Amaranthaceae	2	Amaranthaceae	2	Euphorbiaceae	2
		Total	Poaceae	31	Poaceae	27	Poaceae	24
			Cyperaceae	17	Cyperaceae	17	Compositae	13
			Compositae	15	Compositae	15	Cyperaceae	12
			Amaranthaceae	6	Amaranthaceae	6	Acanthaceae	4
			Acanthaceae	4	Polygonaceae	4	Amaranthaceae	4
	Flooded	UL	Poaceae	20	Poaceae	18	Poaceae	17
			Cyperaceae	11	Cyperaceae	11	Cyperaceae	9
			Compositae	9	Compositae	9	Compositae	7
			Amaranthaceae	4	Amaranthaceae	4	Amaranthaceae	3
			Polygonaceae	4	Polygonaceae	4	Polygonaceae	3
		ML	Poaceae	17	Poaceae	16	Poaceae	15
			Cyperaceae	11	Cyperaceae	11	Cyperaceae	10
			Compositae	6	Compositae	6	Compositae	5
			Amaranthaceae	3	Amaranthaceae	3	Amaranthaceae	3
			Araceae	2	Araceae	2	Polygonaceae	2
		LL	Poaceae	9	Poaceae	9	Poaceae	9
			Compositae	5	Compositae	5	Compositae	5
			Cyperaceae	5	Cyperaceae	5	Cyperaceae	4
			Amaranthaceae	2	Amaranthaceae	2	Polygonaceae	2
			Caryophyllaceae	2	Caryophyllaceae	2	Amaranthaceae	1

Experimental sites	Treatment	Soil layer	Overall		Dry season		Wet season	
			Family	n	Family	n	Family	n
	Total	Total	Poaceae	20	Poaceae	18	Poaceae	17
			Cyperaceae	13	Cyperaceae	13	Cyperaceae	10
			Compositae	9	Compositae	9	Compositae	7
			Amaranthaceae	4	Amaranthaceae	4	Amaranthaceae	3
			Polygonaceae	4	Polygonaceae	4	Polygonaceae	3
		UL	Poaceae	30	Poaceae	26	Poaceae	23
			Compositae	15	Compositae	15	Compositae	13
			Cyperaceae	14	Cyperaceae	14	Cyperaceae	11
			Amaranthaceae	6	Amaranthaceae	6	Amaranthaceae	4
			Leguminosae	4	Leguminosae	4	Acanthaceae	3
		ML	Poaceae	21	Poaceae	20	Poaceae	17
			Compositae	14	Compositae	14	Compositae	12
			Cyperaceae	12	Cyperaceae	12	Cyperaceae	11
			Acanthaceae	3	Amaranthaceae	3	Acanthaceae	3
			Amaranthaceae	3	Acanthaceae	2	Amaranthaceae	3
		LL	Poaceae	11	Poaceae	11	Poaceae	10
			Cyperaceae	8	Cyperaceae	8	Compositae	6
			Compositae	6	Compositae	6	Cyperaceae	5
			Acanthaceae	2	Acanthaceae	2	Acanthaceae	2
			Amaranthaceae	2	Amaranthaceae	2	Euphorbiaceae	2
	Total	Total	Poaceae	31	Poaceae	27	Poaceae	24
			Cyperaceae	18	Cyperaceae	18	Compositae	13
			Compositae	16	Compositae	16	Cyperaceae	12
			Amaranthaceae	6	Amaranthaceae	6	Acanthaceae	4
			Acanthaceae	4	Leguminosae	4	Amaranthaceae	4
Tall grassland	Natural	UL	Poaceae	28	Poaceae	23	Poaceae	21
			Compositae	15	Compositae	13	Compositae	11
			Amaranthaceae	6	Cyperaceae	6	Cyperaceae	6
			Cyperaceae	6	Amaranthaceae	5	Amaranthaceae	5
			Leguminosae	4	Lamiaceae	3	Leguminosae	3
		ML	Poaceae	16	Poaceae	15	Poaceae	13
			Compositae	9	Compositae	9	Compositae	9
			Cyperaceae	6	Cyperaceae	6	Cyperaceae	5
			Amaranthaceae	4	Amaranthaceae	3	Amaranthaceae	4
			Euphorbiaceae	2	Euphorbiaceae	2	Phyllanthaceae	2
		LL	Poaceae	10	Poaceae	10	Poaceae	10
			Compositae	6	Compositae	5	Compositae	6
			Cyperaceae	3	Cyperaceae	3	Cyperaceae	2
			Euphorbiaceae	3	Euphorbiaceae	2	Euphorbiaceae	2
			Polygonaceae	2	Polygonaceae	2	Polygonaceae	2

Experimental sites	Treatment	Soil layer	Overall		Dry season		Wet season	
			Family	n	Family	n	Family	n
		Total	Poaceae	29	Poaceae	24	Poaceae	21
			Compositae	16	Compositae	13	Compositae	12
			Cyperaceae	8	Cyperaceae	8	Amaranthaceae	6
			Amaranthaceae	7	Amaranthaceae	5	Cyperaceae	6
			Euphorbiaceae	4	Lamiaceae	3	Euphorbiaceae	3
	Flooded	UL	Poaceae	21	Poaceae	18	Poaceae	15
			Cyperaceae	8	Cyperaceae	8	Cyperaceae	7
			Compositae	6	Compositae	6	Compositae	6
			Polygonaceae	6	Polygonaceae	6	Amaranthaceae	3
			Amaranthaceae	3	Amaranthaceae	3	Polygonaceae	3
		ML	Poaceae	18	Poaceae	18	Poaceae	12
			Cyperaceae	9	Cyperaceae	9	Cyperaceae	7
			Compositae	5	Compositae	5	Compositae	4
			Rubiaceae	3	Amaranthaceae	2	Rubiaceae	3
			Amaranthaceae	2	Caryophyllaceae	2	Amaranthaceae	2
		LL	Poaceae	10	Poaceae	10	Poaceae	10
			Compositae	3	Compositae	3	Compositae	3
			Cyperaceae	3	Cyperaceae	3	Polygonaceae	2
			Caryophyllaceae	2	Caryophyllaceae	2	Acanthaceae	1
			Polygonaceae	2	Polygonaceae	2	Amaranthaceae	1
		Total	Poaceae	23	Poaceae	20	Poaceae	15
			Cyperaceae	12	Cyperaceae	12	Cyperaceae	7
			Compositae	7	Compositae	7	Compositae	6
			Polygonaceae	6	Polygonaceae	6	Amaranthaceae	3
			Amaranthaceae	3	Amaranthaceae	3	Polygonaceae	3
	Total	UL	Poaceae	32	Poaceae	27	Poaceae	22
			Compositae	15	Compositae	13	Compositae	11
			Cyperaceae	9	Cyperaceae	9	Cyperaceae	8
			Polygonaceae	7	Polygonaceae	6	Amaranthaceae	5
			Amaranthaceae	6	Amaranthaceae	5	Polygonaceae	4
		ML	Poaceae	22	Poaceae	21	Poaceae	14
			Compositae	10	Compositae	10	Compositae	9
			Cyperaceae	9	Cyperaceae	9	Cyperaceae	7
			Amaranthaceae	4	Amaranthaceae	3	Amaranthaceae	4
			Rubiaceae	3	Caryophyllaceae	2	Rubiaceae	3
		LL	Poaceae	10	Poaceae	10	Poaceae	10
			Compositae	6	Compositae	5	Compositae	6
			Cyperaceae	4	Cyperaceae	4	Cyperaceae	2
			Euphorbiaceae	3	Caryophyllaceae	2	Euphorbiaceae	2
			Caryophyllaceae	2	Euphorbiaceae	2	Polygonaceae	2

Experimental sites	Treatment	Soil layer	Overall		Dry season		Wet season	
			Family	n	Family	n	Family	n
		Total	Poaceae	35	Poaceae	30	Poaceae	22
			Compositae	17	Compositae	14	Compositae	12
			Cyperaceae	13	Cyperaceae	13	Cyperaceae	8
			Amaranthaceae	7	Polygonaceae	6	Amaranthaceae	6
			Polygonaceae	7	Amaranthaceae	5	Polygonaceae	4

UL- upper layer (0-5), ML- middle layer (5-10), LL- lower layer and n- number of species.

Appendix Table 3.14. Plant species showing highest mean seed abundances and densities (m^{-2}) recorded from short and tall riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Treatment	Soil layer	Overall				Dry season				Wet season						
			Species	A	Total	Mean±SE	D	Species	A	Total	Mean±SE	D	Species	A	Total	Mean±SE	D
GL	Natural	UL	Cynodon dactylon	8994	2998.00	374.75±36.16	1768.11	Cynodon dactylon	5564	1854.67	463.67±24.01	2187.62	Cynodon dactylon	3430	1143.33	285.83±16.01	1348.59
			Phyllanthus niruri	4718	1572.67	196.58±23.49	927.50	Phyllanthus niruri	3007	1002.33	250.58±18.29	1182.28	Phyllanthus niruri	1711	570.33	142.58±17.19	672.72
			Polygonum plebeium	4443	1481.00	185.13±23.25	873.44	Polygonum plebeium	2859	953.00	238.25±23.11	1124.09	Polygonum plebeium	1584	528.00	132.00±10.34	622.79
			Hemarthria compressa	4090	1363.33	170.42±23.47	804.04	Hemarthria compressa	2706	902.00	225.50±16.03	1063.93	Oxalis corniculata	1431	477.00	119.25±8.06	562.63
			Oxalis corniculata	3796	1265.33	158.17±15.90	746.25	Paspalum conjugatum	2405	801.67	200.42±16.72	945.58	Hemarthria compressa	1384	461.33	115.33±17.07	544.15
		ML	Cynodon dactylon	3434	1144.67	143.08±27.30	675.08	Cynodon dactylon	2485	828.33	207.08±26.71	977.04	Cynodon dactylon	949	316.33	79.08±5.75	373.12
			Phyllanthus niruri	1627	542.33	67.79±10.48	319.85	Phyllanthus niruri	1099	366.33	91.58±10.25	432.10	Phyllanthus niruri	528	176.00	44.00±5.51	207.60
			Hemarthria compressa	1548	516.00	64.50±9.62	304.32	Hemarthria compressa	1038	346.00	86.50±8.58	408.12	Hemarthria compressa	510	170.00	42.50±5.93	200.52
			Polygonum plebeium	1455	485.00	60.63±9.06	286.03	Polygonum plebeium	965	321.67	80.42±9.46	379.41	Polygonum plebeium	490	163.33	40.83±5.68	192.66
			Oxalis corniculata	1383	461.00	57.63±9.01	271.88	Oxalis corniculata	932	310.67	77.67±8.79	366.44	Lindernia crustacea	463	154.33	38.58±4.61	182.04
		LL	Cynodon dactylon	1554	518.00	64.75±8.08	305.50	Cynodon dactylon	1005	335.00	83.75±6.61	395.14	Cynodon dactylon	549	183.00	45.75±4.50	215.85
			Phyllanthus niruri	993	331.00	41.38±4.25	195.21	Phyllanthus niruri	619	206.33	51.58±3.24	243.38	Phyllanthus niruri	374	124.67	31.17±2.03	147.05
			Hemarthria compressa	911	303.67	37.96±4.64	179.09	Hemarthria compressa	580	193.33	48.33±4.71	228.04	Hemarthria compressa	331	110.33	27.58±2.55	130.14
			Polygonum plebeium	852	284.00	35.50±3.93	167.49	Polygonum plebeium	532	177.33	44.33±4.15	209.17	Polygonum plebeium	320	106.67	26.67±1.73	125.82
			Oxalis corniculata	807	269.00	33.63±3.44	158.65	Lindernia crustacea	503	167.67	41.92±3.68	197.77	Oxalis corniculata	307	102.33	25.58±2.55	120.70
		Total	Cynodon dactylon	13982	4660.67	582.58±71.03	916.23	Cynodon dactylon	9054	3018.00	754.50±56.39	1186.60	Cynodon dactylon	4928	1642.67	410.67±25.65	645.85
			Phyllanthus niruri	7338	2446.00	305.75±37.72	480.85	Phyllanthus niruri	4725	1575.00	393.75±29.70	619.25	Phyllanthus niruri	2613	871.00	217.75±24.40	342.45
			Polygonum plebeium	6750	2250.00	281.25±36.08	442.32	Polygonum plebeium	4356	1452.00	363.00±36.43	570.89	Polygonum plebeium	2394	798.00	199.50±17.06	313.75
			Hemarthria compressa	6549	2183.00	272.88±37.15	429.15	Hemarthria compressa	4324	1441.33	360.33±26.83	566.70	Hemarthria compressa	2225	741.67	185.42±24.91	291.60
			Oxalis corniculata	5986	1995.33	249.42±27.94	392.26	Oxalis corniculata	3797	1265.67	316.42±19.83	497.63	Oxalis corniculata	2189	729.67	182.42±16.04	286.89
	Flooded	UL	Cynodon dactylon	3801	1267.00	158.38±20.08	747.23	Cynodon dactylon	2409	803.00	200.75±21.70	947.16	Cynodon dactylon	1392	464.00	116.00±14.64	547.30
			Phyllanthus niruri	1972	657.33	82.17±6.98	387.67	Phyllanthus niruri	1172	390.67	97.67±2.14	460.80	Phyllanthus niruri	800	266.67	66.67±7.90	314.54
			Polygonum plebeium	1845	615.00	76.88±7.42	362.70	Polygonum plebeium	1116	372.00	93.00±7.67	438.78	Hemarthria compressa	762	254.00	63.50±5.13	299.60
			Hemarthria compressa	1796	598.67	74.83±5.15	353.07	Hemarthria compressa	1034	344.67	86.17±3.48	406.54	Polygonum plebeium	729	243.00	60.75±5.00	286.62
			Oxalis corniculata	1485	495.00	61.88±4.87	291.93	Oxalis corniculata	891	297.00	74.25±1.29	350.32	Alternanthera sessilis	636	212.00	53.00±6.52	250.06
		ML	Cynodon dactylon	1565	521.67	65.21±6.01	307.66	Cynodon dactylon	926	308.67	77.17±8.18	364.08	Cynodon dactylon	639	213.00	53.25±2.52	251.24
			Hemarthria compressa	820	273.33	34.17±2.95	161.20	Hemarthria compressa	490	163.33	40.83±3.01	192.66	Hemarthria compressa	330	110.00	27.50±1.39	129.75
			Phyllanthus niruri	742	247.33	30.92±2.81	145.87	Polygonum plebeium	438	146.00	36.50±3.76	172.21	Phyllanthus niruri	311	103.67	25.92±1.26	122.28
			Polygonum plebeium	725	241.67	30.21±3.02	142.53	Phyllanthus niruri	431	143.67	35.92±4.33	169.46	Polygonum plebeium	287	95.67	23.92±1.42	112.84
			Alternanthera sessilis	624	208.00	26.00±2.56	122.67	Alternanthera sessilis	371	123.67	30.92±2.83	145.87	Alternanthera sessilis	253	84.33	21.08±2.54	99.47
		LL	Cynodon dactylon	982	327.33	40.92±2.86	193.05	Cynodon dactylon	565	188.33	47.08±2.10	222.14	Cynodon dactylon	417	139.00	34.75±2.92	163.95
			Hemarthria compressa	684	228.00	28.50±1.93	134.47	Hemarthria compressa	388	129.33	32.33±2.31	152.55	Hemarthria compressa	296	98.67	24.67±1.48	116.38
			Phyllanthus niruri	584	194.67	24.33±2.29	114.81	Phyllanthus niruri	354	118.00	29.50±2.50	139.18	Phyllanthus niruri	230	76.67	19.17±0.67	90.43
			Polygonum plebeium	543	181.00	22.63±2.16	106.75	Polygonum plebeium	317	105.67	26.42±2.98	124.64	Polygonum plebeium	226	75.33	18.83±1.80	88.86
			Oxalis corniculata	467	155.67	19.46±1.58	91.81	Oxalis corniculata	266	88.67	22.17±2.04	104.58	Oxalis corniculata	201	67.00	16.75±1.60	79.03
		Total	Cynodon dactylon	6348	2116.00	264.50±28.19	415.98	Cynodon dactylon	3900	1300.00	325.00±30.11	511.13	Cynodon dactylon	2448	816.00	204.00±18.99	320.83
			Hemarthria compressa	3300	1100.00	137.50±9.83	216.25	Phyllanthus niruri	1957	652.33	163.08±7.53	256.48	Hemarthria compressa	1388	462.67	115.67±7.67	181.91

Experimental sites	Treatment	Soil layer	Overall				Dry season				Wet season										
			Species	A	Total	Mean±SE	D	Species	A	Total	Mean±SE	D	Species	A	Total	Mean±SE	D				
			Phyllanthus niruri	3298	1099.33	137.42±11.13	216.11	Hemarthria compressa	1912	637.33	159.33±8.60	250.58	Phyllanthus niruri	1341	447.00	111.75±9.05	175.75				
SG	Total	Polygonum plebeium	3113	1037.67	129.71±11.83	203.99	Polygonum plebeium	1871	623.67	155.92±12.06	245.21	Polygonum plebeium	1242	414.00	103.50±7.08	162.77					
		Oxalis corniculata	2546	848.67	106.08±7.69	166.84	Oxalis corniculata	1500	500.00	125.00±3.86	196.59	Alternanthera sessilis	1049	349.67	87.42±9.62	137.48					
		Cynodon dactylon	12795	4265.00	533.13±55.21	1257.67	Cynodon dactylon	7973	2657.67	664.42±44.02	1567.39	Cynodon dactylon	4822	1607.33	401.83±28.24	947.94					
		Phyllanthus niruri	6690	2230.00	278.75±29.98	657.58	Phyllanthus niruri	4179	1393.00	348.25±19.25	821.54	Phyllanthus niruri	2511	837.00	209.25±24.56	493.63					
		Polygonum plebeium	6288	2096.00	262.00±29.41	618.07	Polygonum plebeium	3975	1325.00	331.25±24.80	781.43	Polygonum plebeium	2313	771.00	192.75±14.94	454.71					
		Hemarthria compressa	5886	1962.00	245.25±28.54	578.56	Hemarthria compressa	3740	1246.67	311.67±19.28	735.24	Hemarthria compressa	2146	715.33	178.83±22.12	421.88					
		Oxalis corniculata	5281	1760.33	220.04±20.38	519.09	Oxalis corniculata	3256	1085.33	271.33±9.75	640.09	Oxalis corniculata	2025	675.00	168.75±9.49	398.09					
		Cynodon dactylon	4999	1666.33	208.29±32.72	491.37	Cynodon dactylon	3411	1137.00	284.25±32.93	670.56	Cynodon dactylon	1588	529.33	132.33±7.97	312.18					
		Phyllanthus niruri	2369	789.67	98.71±12.82	232.86	Phyllanthus niruri	1530	510.00	127.50±13.18	300.78	Hemarthria compressa	840	280.00	70.00±7.30	165.13					
		ML	Hemarthria compressa	2368	789.33	98.67±12.45	232.76	Hemarthria compressa	1528	509.33	127.33±11.05	300.39	Phyllanthus niruri	839	279.67	69.92±6.40	164.94				
			Polygonum plebeium	2180	726.67	90.83±11.81	214.28	Polygonum plebeium	1403	467.67	116.92±12.66	275.81	Polygonum plebeium	777	259.00	64.75±6.08	152.75				
			Oxalis corniculata	1977	659.00	82.38±10.87	194.33	Oxalis corniculata	1275	425.00	106.25±10.87	250.65	Oxalis corniculata	702	234.00	58.50±7.32	138.00				
			Cynodon dactylon	2536	845.33	105.67±10.72	249.27	Cynodon dactylon	1570	523.33	130.83±8.40	308.64	Cynodon dactylon	966	322.00	80.50±6.59	189.90				
			Hemarthria compressa	1595	531.67	66.46±6.51	156.78	Phyllanthus niruri	973	324.33	81.08±5.51	191.28	Hemarthria compressa	627	209.00	52.25±3.94	123.26				
		LL	Phyllanthus niruri	1577	525.67	65.71±6.46	155.01	Hemarthria compressa	968	322.67	80.67±6.89	190.30	Phyllanthus niruri	604	201.33	50.33±2.58	118.74				
			Polygonum plebeium	1395	465.00	58.13±5.84	137.12	Polygonum plebeium	849	283.00	70.75±6.57	166.90	Polygonum plebeium	546	182.00	45.50±3.12	107.34				
			Oxalis corniculata	1274	424.67	53.08±4.88	125.23	Oxalis corniculata	766	255.33	63.83±4.39	150.59	Oxalis corniculata	508	169.33	42.33±3.86	99.87				
			Cynodon dactylon	20330	6776.67	847.08±98.02	666.10	Cynodon dactylon	12954	4318.00	1079.50±84.00	848.86	Cynodon dactylon	7376	2458.67	614.67±42.07	483.34				
			Phyllanthus niruri	10636	3545.33	443.17±48.62	348.48	Phyllanthus niruri	6682	2227.33	556.83±36.25	437.87	Phyllanthus niruri	3954	1318.00	329.50±33.22	259.10				
		Total	Polygonum plebeium	9863	3287.67	410.96±46.81	323.16	Hemarthria compressa	6236	2078.67	519.67±34.97	408.64	Polygonum plebeium	3636	1212.00	303.00±24.06	238.26				
			Hemarthria compressa	9849	3283.00	410.38±46.86	322.70	Polygonum plebeium	6227	2075.67	518.92±43.30	408.05	Hemarthria compressa	3613	1204.33	301.08±32.54	236.76				
			Oxalis corniculata	8532	2844.00	355.50±35.39	279.55	Oxalis corniculata	5297	1765.67	441.42±22.83	347.11	Oxalis corniculata	3235	1078.33	269.58±20.03	211.99				
			Cynodon dactylon	7504	2501.33	312.67±26.10	2950.38	Cynodon dactylon	4543	1514.33	378.58±12.25	3572.38	Cynodon dactylon	2961	987.00	246.75±11.53	2328.38				
			Lindernia crustacea	3413	1137.67	142.21±13.31	1341.90	Lindernia crustacea	2110	703.33	175.83±5.76	1659.20	Lindernia crustacea	1303	434.33	108.58±6.34	1024.61				
		Natural	UL	Polygonum plebeium	3085	1028.33	128.54±13.51	1212.94	Polygonum plebeium	1905	635.00	158.75±13.41	1497.99	Polygonum plebeium	1180	393.33	98.33±8.00	927.89			
				Phyllanthus niruri	2874	958.00	119.75±12.92	1129.98	Hemarthria compressa	1774	591.33	147.83±10.49	1394.98	Phyllanthus niruri	1102	367.33	91.83±9.75	866.56			
				Hemarthria compressa	2826	942.00	117.75±13.28	1111.11	Phyllanthus niruri	1772	590.67	147.67±12.84	1393.41	Oxalis corniculata	1059	353.00	88.25±4.57	832.74			
				Cynodon dactylon	3080	1026.67	128.33±24.33	1210.98	Cynodon dactylon	2217	739.00	184.75±24.92	1743.34	Cynodon dactylon	863	287.67	71.92±4.53	678.62			
				Lindernia crustacea	1357	452.33	56.54±7.51	533.54	Lindernia crustacea	894	298.00	74.50±5.22	703.00	Lindernia crustacea	463	154.33	38.58±4.61	364.08			
				ML	Hemarthria compressa	1233	411.00	51.38±6.49	484.78	Hemarthria compressa	808	269.33	67.33±3.84	635.37	Hemarthria compressa	425	141.67	35.42±3.48	334.20		
					Oxalis corniculata	1064	354.67	44.33±6.68	418.34	Fimbristylis aestivalis	711	237.00	59.25±3.57	559.09	Polygonum plebeium	365	121.67	30.42±3.90	287.02		
					Polygonum plebeium	1049	349.67	43.71±5.81	412.44	Oxalis corniculata	710	236.67	59.17±6.65	558.31	Oxalis corniculata	354	118.00	29.50±4.15	278.37		
					Cynodon dactylon	1282	427.33	53.42±6.10	504.05	Cynodon dactylon	819	273.00	68.25±4.07	644.02	Cynodon dactylon	463	154.33	38.58±3.20	364.08		
					Lindernia crustacea	797	265.67	33.21±3.79	313.36	Lindernia crustacea	503	167.67	41.92±3.68	395.53	Lindernia crustacea	294	98.00	24.50±1.72	231.19		
				LL	Hemarthria compressa	687	229.00	28.63±3.04	270.11	Hemarthria compressa	424	141.33	35.33±3.38	333.41	Hemarthria compressa	263	87.67	21.92±1.29	206.81		
					Polygonum plebeium	614	204.67	25.58±2.55	241.41	Polygonum plebeium	380	126.67	31.67±2.13	298.81	Phyllanthus niruri	239	79.67	19.92±0.71	187.94		
					Phyllanthus niruri	605	201.67	25.21±2.32	237.87	Fimbristylis aestivalis	375	125.00	31.25±2.24	294.88	Polygonum plebeium	234	78.00	19.50±1.07	184.01		
					Cynodon dactylon	11866	3955.33	494.42±55.84	1555.14	Cynodon dactylon	7579	2526.33	631.58±40.66	1986.58	Cynodon dactylon	4287	1429.00	357.25±18.90	1123.69		
					Lindernia crustacea	5567	1855.67	231.96±24.27	729.60	Lindernia crustacea	3507	1169.00	292.25±13.27	919.24	Lindernia crustacea	2060	686.67	171.67±12.19	539.96		
				Total	Polygonum plebeium	4748	1582.67	197.83±21.61	622.26	Hemarthria compressa	3006	1002.00	250.50±16.22	787.92	Polygonum plebeium	1779	593.00	148.25±12.17	466.30		
					Hemarthria compressa	4746	1582.00	197.75±22.31	622.00	Polygonum plebeium	2969	989.67	247.42±19.78	778.22	Hemarthria compressa	1740	580.00	145.00±14.33	456.08		
					Oxalis corniculata	4437	1479.00	184.88±20.06	581.51	Oxalis corniculata	2798	932.67	233.17±15.09	733.40	Phyllanthus niruri	1666	555.33	138.83±13.23	436.69		
					Cynodon dactylon	2989	996.33	124.54±15.89	1175.20	Cynodon dactylon	1856	618.67	154.67±21.05	1459.46	Cynodon dactylon	1133	377.67	94.42±11.41	890.93		
					Lindernia crustacea	1291	430.33	53.79±4.17	507.59	Lindernia crustacea	761	253.67	63.42±2.64	598.41	Phyllanthus niruri	546	182.00	45.50±4.09	429.35		
				Flooded	UL	Polygonum plebeium	1280	426.67	53.33±4.31	503.26	Polygonum plebeium	755	251.67	62.92±3.87	593.69	Hemarthria compressa	531	177.00	44.25±2.52	417.55	
						Phyllanthus niruri	1203	401.00	50.13±2.99	472.99	Phyllanthus niruri	657	219.00	54.75±3.28	516.63	Lindernia crustacea	530	176.67	44.17±3.53	416.76	
						Hemarthria compressa	1171	390.33	48.79±2.14	460.41	Hemarthria compressa	640	213.33	53.33±1.14	503.26	Polygonum plebeium	525	175.00	43.75±3.22	412.83	
						Cynodon dactylon	1261	420.33	52.54±4.74	495.79	Cynodon dactylon	745	248.33	62.08±6.21	585.83	Cynodon dactylon	516	172.00	43.00±2.33	405.76	
						Lindernia crustacea	595	198.33	24.79±2.19	233.94	Lindernia crustacea	358	119.33	29.83±2.25	281.51	Hemarthria compressa	254	84.67	21.17±0.65	199.73	
						ML	Hemarthria compressa	592	197.33	24.67±1.76	232.76	Hemarthria compressa	338	112.67	28.17±2.41	265.79	Lindernia crustacea	237	79.00	19.75±0.64	186.36
							Polygonum plebeium	525	175.00	21.88±1.96	206.42	Polygonum plebeium	305	101.67	25.42±2.70	239.84	Polygonum plebeium	220	73.33	18.33±1.52	173.00
							Phyllanthus niruri	480	160.00	20.00±1.82	188.72	Alternanthera sessilis	266	88.67	22.17±1.31	209.17	Phyllanthus niruri	214	71.33	17.83±1.26	168.28
							Cynodon dactylon	752	250.67	31.33±1.89	295.67	Cynodon dactylon	419	139.67	34.92±1.67	329.48	Cynodon dactylon	333	111.00	27.75±2.29	261.85

Experimental sites	Treatment	Soil layer	Overall				Dry season				Wet season						
			Species	A	Total	Mean±SE	D	Species	A	Total	Mean±SE	D	Species	A	Total	Mean±SE	D
TG	Total	Total	<i>Hemarthria compressa</i>	479	159.67	19.96±1.21	188.33	<i>Hemarthria compressa</i>	260	86.67	21.67±1.74	204.45	<i>Hemarthria compressa</i>	219	73.00	18.25±1.38	172.21
			<i>Polygonum plebeium</i>	406	135.33	16.92±1.30	159.63	<i>Phyllanthus niruri</i>	233	77.67	19.42±1.71	183.22	<i>Polygonum plebeium</i>	180	60.00	15.00±1.50	141.54
			<i>Lindernia crustacea</i>	404	134.67	16.83±1.21	158.84	<i>Lindernia crustacea</i>	226	75.33	18.83±1.54	177.71	<i>Lindernia crustacea</i>	178	59.33	14.83±1.34	139.97
			<i>Phyllanthus niruri</i>	404	134.67	16.83±1.27	158.84	<i>Polygonum plebeium</i>	226	75.33	18.83±1.78	177.71	<i>Phyllanthus niruri</i>	171	57.00	14.25±0.39	134.47
			<i>Cynodon dactylon</i>	5002	1667.33	208.42±21.79	655.55	<i>Cynodon dactylon</i>	3020	1006.67	251.67±27.47	791.59	<i>Cynodon dactylon</i>	1982	660.67	165.17±14.61	519.51
			<i>Lindernia crustacea</i>	2290	763.33	95.42±6.94	300.12	<i>Lindernia crustacea</i>	1345	448.33	112.08±5.13	352.55	<i>Hemarthria compressa</i>	1004	334.67	83.67±4.34	263.16
			<i>Hemarthria compressa</i>	2242	747.33	93.42±4.66	293.83	<i>Polygonum plebeium</i>	1286	428.67	107.17±6.29	337.08	<i>Lindernia crustacea</i>	945	315.00	78.75±3.65	247.70
			<i>Polygonum plebeium</i>	2211	737.00	92.13±6.77	289.77	<i>Hemarthria compressa</i>	1238	412.67	103.17±4.35	324.50	<i>Phyllanthus niruri</i>	931	310.33	77.58±4.49	244.03
			<i>Phyllanthus niruri</i>	2087	695.67	86.96±4.99	273.52	<i>Phyllanthus niruri</i>	1156	385.33	96.33±6.13	303.01	<i>Polygonum plebeium</i>	925	308.33	77.08±4.85	242.46
			<i>Cynodon dactylon</i>	10493	3497.67	437.21±40.25	2062.79	<i>Cynodon dactylon</i>	6399	2133.00	533.25±32.16	2515.92	<i>Cynodon dactylon</i>	4094	1364.67	341.17±19.41	1609.66
	UL	<i>Lindernia crustacea</i>	4704	1568.00	196.00±16.65	924.75	<i>Lindernia crustacea</i>	2871	957.00	239.25±6.21	1128.80	<i>Lindernia crustacea</i>	1833	611.00	152.75±2.85	720.69	
		<i>Polygonum plebeium</i>	4365	1455.00	181.88±17.05	858.10	<i>Polygonum plebeium</i>	2660	886.67	221.67±13.47	1045.84	<i>Polygonum plebeium</i>	1705	568.33	142.08±10.91	670.36	
		<i>Phyllanthus niruri</i>	4077	1359.00	169.88±14.85	801.49	<i>Phyllanthus niruri</i>	2429	809.67	202.42±12.49	955.02	<i>Phyllanthus niruri</i>	1648	549.33	137.33±12.92	647.95	
		<i>Hemarthria compressa</i>	3997	1332.33	166.54±15.15	785.76	<i>Hemarthria compressa</i>	2414	804.67	201.17±10.53	949.12	<i>Hemarthria compressa</i>	1583	527.67	131.92±12.68	622.40	
		<i>Cynodon dactylon</i>	4341	1447.00	180.88±28.50	853.39	<i>Cynodon dactylon</i>	2962	987.33	246.83±29.10	1164.58	<i>Cynodon dactylon</i>	1379	459.67	114.92±6.50	542.19	
		<i>Lindernia crustacea</i>	1952	650.67	81.33±9.65	383.74	<i>Lindernia crustacea</i>	1252	417.33	104.33±7.45	492.25	<i>Lindernia crustacea</i>	700	233.33	58.33±5.14	275.22	
		<i>Hemarthria compressa</i>	1825	608.33	76.04±7.97	358.77	<i>Hemarthria compressa</i>	1146	382.00	95.50±5.28	450.58	<i>Hemarthria compressa</i>	679	226.33	56.58±4.02	266.97	
		<i>Polygonum plebeium</i>	1574	524.67	65.58±7.37	309.43	<i>Polygonum plebeium</i>	989	329.67	82.42±6.73	388.85	<i>Polygonum plebeium</i>	585	195.00	48.75±4.41	230.01	
		<i>Fimbristylis aestivalis</i>	1479	493.00	61.63±7.75	290.75	<i>Fimbristylis aestivalis</i>	969	323.00	80.75±5.36	380.99	<i>Phyllanthus niruri</i>	539	179.67	44.92±3.81	211.92	
		<i>Cynodon dactylon</i>	2034	678.00	84.75±7.70	399.86	<i>Cynodon dactylon</i>	1238	412.67	103.17±5.72	486.75	<i>Cynodon dactylon</i>	796	265.33	66.33±4.21	312.97	
	ML	<i>Lindernia crustacea</i>	1201	400.33	50.04±4.81	236.10	<i>Lindernia crustacea</i>	729	243.00	60.75±4.93	286.62	<i>Hemarthria compressa</i>	482	160.67	40.17±2.55	189.51	
		<i>Hemarthria compressa</i>	1166	388.67	48.58±4.12	229.22	<i>Hemarthria compressa</i>	684	228.00	57.00±5.05	268.93	<i>Lindernia crustacea</i>	472	157.33	39.33±2.71	185.58	
		<i>Polygonum plebeium</i>	1020	340.00	42.50±3.53	200.52	<i>Polygonum plebeium</i>	606	202.00	50.50±3.36	238.26	<i>Polygonum plebeium</i>	414	138.00	34.50±2.09	162.77	
		<i>Phyllanthus niruri</i>	1009	336.33	42.04±3.41	198.36	<i>Phyllanthus niruri</i>	599	199.67	49.92±3.42	235.51	<i>Phyllanthus niruri</i>	410	136.67	34.17±1.04	161.20	
		<i>Cynodon dactylon</i>	16868	5622.67	702.83±75.75	1105.34	<i>Cynodon dactylon</i>	10599	3533.00	883.25±64.83	1389.09	<i>Cynodon dactylon</i>	6269	2089.67	522.42±29.51	821.60	
		<i>Lindernia crustacea</i>	7857	2619.00	327.38±30.60	514.86	<i>Lindernia crustacea</i>	4852	1617.33	404.33±18.03	635.89	<i>Lindernia crustacea</i>	3005	1001.67	250.42±9.79	393.83	
		<i>Hemarthria compressa</i>	6988	2329.33	291.17±26.68	457.92	<i>Polygonum plebeium</i>	4255	1418.33	354.58±22.54	557.65	<i>Hemarthria compressa</i>	2744	914.67	228.67±18.26	359.62	
		<i>Polygonum plebeium</i>	6959	2319.67	289.96±27.70	456.02	<i>Hemarthria compressa</i>	4244	1414.67	353.67±19.58	556.21	<i>Polygonum plebeium</i>	2704	901.33	225.33±16.99	354.38	
		<i>Phyllanthus niruri</i>	6513	2171.00	271.38±24.99	426.79	<i>Phyllanthus niruri</i>	3916	1305.33	326.33±24.54	513.22	<i>Phyllanthus niruri</i>	2597	865.67	216.42±17.29	340.36	
		<i>Apluda mutica</i>	1851	617.00	77.13±12.04	727.77	<i>Apluda mutica</i>	1266	422.00	105.50±9.17	995.52	<i>Phyllanthus niruri</i>	609	203.00	50.75±7.75	478.89	
	UL	<i>Phyllanthus niruri</i>	1844	614.67	76.83±10.79	725.01	<i>Phyllanthus niruri</i>	1235	411.67	102.92±5.46	971.14	<i>Christella parasitica</i>	586	195.33	48.83±9.77	460.80	
		<i>Pouzolzia zeylanica</i>	1803	601.00	75.13±11.03	708.89	<i>Pouzolzia zeylanica</i>	1224	408.00	102.00±5.24	962.49	<i>Apluda mutica</i>	585	195.00	48.75±7.47	460.01	
		<i>Merremia umbellata</i>	1725	575.00	71.88±12.53	678.23	<i>Merremia umbellata</i>	1208	402.67	100.67±10.15	949.91	<i>Pouzolzia zeylanica</i>	579	193.00	48.25±7.68	455.30	
		<i>Christella parasitica</i>	1625	541.67	67.71±10.15	638.91	<i>Christella parasitica</i>	1039	346.33	86.58±12.17	817.02	<i>Imperata cylindrica</i>	537	179.00	44.75±7.59	422.27	
		<i>Pouzolzia zeylanica</i>	695	231.67	28.96±5.56	273.26	<i>Pouzolzia zeylanica</i>	502	167.33	41.83±4.92	394.75	<i>Phyllanthus niruri</i>	203	67.67	16.92±2.42	159.63	
		<i>Phyllanthus niruri</i>	680	226.67	28.33±4.65	267.36	<i>Phyllanthus niruri</i>	477	159.00	39.75±2.86	375.09	<i>Pouzolzia zeylanica</i>	193	64.33	16.08±3.07	151.77	
		<i>Imperata cylindrica</i>	586	195.33	24.42±5.95	230.40	<i>Imperata cylindrica</i>	470	156.67	39.17±4.43	369.58	<i>Christella parasitica</i>	156	52.00	13.00±1.46	122.67	
		<i>Apluda mutica</i>	573	191.00	23.88±4.58	225.29	<i>Apluda mutica</i>	422	140.67	35.17±3.15	331.84	<i>Saccharum spp.</i>	152	50.67	12.67±3.53	119.53	
		<i>Christella parasitica</i>	546	182.00	22.75±4.44	214.67	<i>Christella parasitica</i>	390	130.00	32.50±5.13	306.68	<i>Apluda mutica</i>	151	50.33	12.58±1.72	118.74	
		<i>Phyllanthus niruri</i>	388	129.33	16.17±2.08	152.55	<i>Phyllanthus niruri</i>	253	84.33	21.08±1.20	198.95	<i>Phyllanthus niruri</i>	135	45.00	11.25±1.61	106.16	
	ML	<i>Pouzolzia zeylanica</i>	354	118.00	14.75±2.21	139.18	<i>Pouzolzia zeylanica</i>	237	79.00	19.75±1.55	186.36	<i>Pouzolzia zeylanica</i>	117	39.00	9.75±1.95	92.00	
		<i>Imperata cylindrica</i>	324	108.00	13.50±2.22	127.39	<i>Apluda mutica</i>	213	71.00	17.75±1.05	167.49	<i>Imperata cylindrica</i>	114	38.00	9.50±1.36	89.64	
		<i>Merremia umbellata</i>	322	107.33	13.42±2.29	126.60	<i>Imperata cylindrica</i>	210	70.00	17.50±3.24	165.13	<i>Merremia umbellata</i>	113	37.67	9.42±1.08	88.86	
		<i>Apluda mutica</i>	314	104.67	13.08±2.03	123.46	<i>Merremia umbellata</i>	209	69.67	17.42±3.57	164.35	<i>Apluda mutica</i>	101	33.67	8.42±1.89	79.42	
		<i>Phyllanthus niruri</i>	2912	970.67	121.33±17.42	381.64	<i>Phyllanthus niruri</i>	1965	655.00	163.75±9.40	515.06	<i>Phyllanthus niruri</i>	947	315.67	78.92±11.30	248.22	
		<i>Pouzolzia zeylanica</i>	2852	950.67	118.83±18.45	373.78	<i>Pouzolzia zeylanica</i>	1963	654.33	163.58±10.64	514.53	<i>Pouzolzia zeylanica</i>	889	296.33	74.08±11.87	233.02	
		<i>Apluda mutica</i>	2738	912.67	114.08±18.05	358.84	<i>Apluda mutica</i>	1901	633.67	158.42±11.62	498.28	<i>Apluda mutica</i>	837	279.00	69.75±8.64	219.39	
		<i>Merremia umbellata</i>	2561	853.67	106.71±18.80	335.64	<i>Merremia umbellata</i>	1807	602.33	150.58±15.60	473.64	<i>Christella parasitica</i>	830	276.67	69.17±12.56	217.56	
		<i>Imperata cylindrica</i>	2448	816.00	102.00±15.76	320.83	<i>Imperata cylindrica</i>	1681	560.33	140.08±11.61	440.62	<i>Imperata cylindrica</i>	767	255.67	63.92±7.57	201.04	
		<i>Apluda mutica</i>	949	316.33	39.54±5.45	373.12	<i>Apluda mutica</i>	637	212.33	53.08±0.95	500.90	<i>Apluda mutica</i>	312	104.00	26.00±3.94	245.34	
	Flooded	UL	<i>Cynodon dactylon</i>	812	270.67	33.83±5.05	319.26	<i>Cynodon dactylon</i>	553	184.33	46.08±2.50	434.85	<i>Christella parasitica</i>	271	90.33	22.58±3.77	213.10
			<i>Christella parasitica</i>	808	269.33	33.67±4.59	317.68	<i>Christella parasitica</i>	537	179.00	44.75±1.55	422.27	<i>Cynodon dactylon</i>	259	86.33	21.58±3.57	203.66
			<i>Phyllanthus niruri</i>	769	256.33	32.04±4.68	302.35	<i>Phyllanthus niruri</i>	515	171.67	42.92±2.48	404.97	<i>Phyllanthus niruri</i>	254	84.67	21.17±4.18	199.73
<i>Imperata cylindrica</i>			732	244.00	30.50±3.97	287.80	<i>Imperata cylindrica</i>	480	160.00	40.00±1.35	377.45	<i>Imperata cylindrica</i>	252	84.00	21.00±3.37	198.16	

Experimental sites	Treatment	Soil layer	Overall				Dry season				Wet season										
			Species	A	Total	Mean±SE	D	Species	A	Total	Mean±SE	D	Species	A	Total	Mean±SE	D				
Total	ML	Apluda mutica	328	109.33	13.67±1.32	128.96	Apluda mutica	197	65.67	16.42±1.62	154.91	Apluda mutica	131	43.67	10.92±0.71	103.01					
			Christella parasitica	308	102.67	12.83±1.36	121.10	Christella parasitica	191	63.67	15.92±1.42	150.19	Cynodon dactylon	123	41.00	10.25±0.48	96.72				
				Cynodon dactylon	304	101.33	12.67±1.33	119.53	Imperata cylindrica	182	60.67	15.17±1.97	143.12	Christella parasitica	117	39.00	9.75±0.53	92.00			
					Imperata cylindrica	275	91.67	11.46±1.71	108.12	Cynodon dactylon	181	60.33	15.08±2.02	142.33	Phyllanthus niruri	97	32.33	8.08±0.94	76.28		
						Phyllanthus niruri	262	87.33	10.92±1.35	103.01	Phyllanthus niruri	165	55.00	13.75±1.51	129.75	Imperata cylindrica	93	31.00	7.75±0.71	73.13	
							Apluda mutica	257	85.67	10.71±1.10	101.05	Apluda mutica	151	50.33	12.58±1.46	118.74	Apluda mutica	106	35.33	8.83±1.09	83.35
		Cynodon dactylon						230	76.67	9.58±1.09	90.43	Cynodon dactylon	146	48.67	12.17±0.75	114.81	Imperata cylindrica	101	33.67	8.42±1.20	79.42
			Christella parasitica					223	74.33	9.29±1.17	87.68	Christella parasitica	142	47.33	11.83±1.40	111.66	Cynodon dactylon	84	28.00	7.00±0.76	66.05
				Imperata cylindrica				222	74.00	9.25±0.94	87.28	Merremia umbellata	135	45.00	11.25±1.55	106.16	Christella parasitica	81	27.00	6.75±0.37	63.69
					Merremia umbellata			213	71.00	8.88±1.24	83.75	Hemarthria compressa	128	42.67	10.67±0.61	100.65	Merremia umbellata	78	26.00	6.50±0.99	61.34
						Total		Apluda mutica	1534	511.33	63.92±7.41	201.04	Apluda mutica	985	328.33	82.08±2.64	258.18	Apluda mutica	549	183.00	45.75±5.39
							Cynodon dactylon		1346	448.67	56.08±7.18	176.40	Cynodon dactylon	880	293.33	73.33±4.43	230.66	Christella parasitica	469	156.33	39.08±4.47
	Christella parasitica	1339							446.33	55.79±6.83	175.49	Christella parasitica	870	290.00	72.50±3.40	228.04	Cynodon dactylon	466	155.33	38.83±4.72	122.15
		Imperata cylindrica	1229						409.67	51.21±5.90	161.07	Phyllanthus niruri	801	267.00	66.75±3.64	209.96	Imperata cylindrica	446	148.67	37.17±4.33	116.90
			Phyllanthus niruri	1211					403.67	50.46±6.80	158.71	Imperata cylindrica	783	261.00	65.25±3.50	205.24	Phyllanthus niruri	410	136.67	34.17±5.08	107.47
				Apluda mutica	2800				933.33	116.67±17.29	550.44	Apluda mutica	1903	634.33	158.58±9.89	748.21	Apluda mutica	897	299.00	74.75±11.20	352.68
					UL			Phyllanthus niruri	2613	871.00	108.88±15.38	513.68	Phyllanthus niruri	1750	583.33	145.83±7.22	688.06	Phyllanthus niruri	863	287.67	71.92±11.85
							Pouzolzia zeylanica		2496	832.00	104.00±14.81	490.68	Pouzolzia zeylanica	1686	562.00	140.50±5.36	662.89	Christella parasitica	857	285.67	71.42±13.22
	Christella parasitica								2433	811.00	101.38±14.27	478.30	Merremia umbellata	1670	556.67	139.17±11.20	656.60	Pouzolzia zeylanica	810	270.00	67.50±10.36
		Merremia umbellata							2389	796.33	99.54±16.56	469.65	Christella parasitica	1576	525.33	131.33±13.29	619.64	Imperata cylindrica	789	263.00	65.75±10.72
			Phyllanthus niruri						942	314.00	39.25±5.91	185.19	Imperata cylindrica	652	217.33	54.33±6.01	256.35	Phyllanthus niruri	300	100.00	25.00±3.08
				Pouzolzia zeylanica					915	305.00	38.13±6.62	179.88	Phyllanthus niruri	642	214.00	53.50±4.29	252.42	Apluda mutica	282	94.00	23.50±1.55
						ML		Apluda mutica	901	300.33	37.54±5.63	177.13	Pouzolzia zeylanica	642	214.00	53.50±5.70	252.42	Christella parasitica	273	91.00	22.75±1.89
							Imperata cylindrica		861	287.00	35.88±7.53	169.26	Apluda mutica	619	206.33	51.58±3.73	243.38	Pouzolzia zeylanica	273	91.00	22.75±3.78
	Christella parasitica								854	284.67	35.58±5.56	167.89	Christella parasitica	581	193.67	48.42±5.54	228.43	Saccharum spp.	210	70.00	17.50±4.29
		Apluda mutica							571	190.33	23.79±2.98	112.25	Phyllanthus niruri	374	124.67	31.17±2.12	147.05	Imperata cylindrica	215	71.67	17.92±2.02
			Phyllanthus niruri						568	189.33	23.67±3.11	111.66	Apluda mutica	364	121.33	30.33±2.45	143.12	Apluda mutica	207	69.00	17.25±2.64
				Imperata cylindrica					546	182.00	22.75±2.99	107.34	Merremia umbellata	344	114.67	28.67±5.04	135.25	Phyllanthus niruri	194	64.67	16.17±1.81
					LL			Merremia umbellata	535	178.33	22.29±3.38	105.17	Cynodon dactylon	332	110.67	27.67±3.05	130.53	Merremia umbellata	191	63.67	15.92±0.91
							Cynodon dactylon		502	167.33	20.92±3.14	98.69	Imperata cylindrica	331	110.33	27.58±4.69	130.14	Pouzolzia zeylanica	172	57.33	14.33±1.99
	Apluda mutica								4272	1424.00	178.00±25.26	279.94	Apluda mutica	2886	962.00	240.50±13.42	378.23	Apluda mutica	1386	462.00	115.50±13.92
		Phyllanthus niruri							4123	1374.33	171.79±24.20	270.18	Phyllanthus niruri	2766	922.00	230.50±12.99	362.51	Phyllanthus niruri	1357	452.33	113.08±16.36
			Pouzolzia zeylanica						3894	1298.00	162.25±23.60	255.17	Pouzolzia zeylanica	2639	879.67	219.92±11.84	345.86	Christella parasitica	1299	433.00	108.25±16.44
				Christella parasitica					3770	1256.67	157.08±22.59	247.04	Merremia umbellata	2518	839.33	209.83±17.69	330.00	Pouzolzia zeylanica	1255	418.33	104.58±15.59
						Imperata cylindrica		3677	1225.67	153.21±21.48	240.95	Christella parasitica	2471	823.67	205.92±22.85	323.84	Imperata cylindrica	1213	404.33	101.08±11.83	158.97

Experiment 1- hand sorting, experiment 2- seed germination, GL- grassland, SG- short grassland, TG- tall grassland, A- abundance, D- density (m⁻²), UL- upper layer (0-5), ML- middle layer (5-10) and LL- lower layer (10-15).

Appendix Table 3.15. Overall and seasonal plant species seed abundances and densities (m⁻²) recorded from different soil layers of riverine alluvial grasslands soil seed bank during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Achyranthes aspera</i>	10	0.98	0	0.00	10	1.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	0.33	0	0.00	10	0.66
<i>Acnema uliginosa</i>	604	59.37	336	66.05	268	52.69	198	19.46	109	21.43	89	17.50	0	0.00	0	0.00	0	0.00	802	26.28	445	29.16	357	23.39
<i>Acroceras zizanioides</i>	1135	111.56	821	161.40	314	61.73	375	36.86	288	56.62	87	17.10	248	24.38	174	34.21	74	14.55	1758	57.60	1283	84.07	475	31.13
<i>Acroceras munroanum</i>	54	5.31	0	0.00	54	10.62	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	54	1.77	0	0.00	54	3.54
<i>Adenostemma lavenia</i>	0	0.00	0	0.00	0	0.00	5	0.49	5	0.98	0	0.00	0	0.00	0	0.00	0	0.00	5	0.16	5	0.33	0	0.00
<i>Adiantum caudatum</i>	870	85.52	585	115.00	285	56.03	298	29.29	188	36.96	110	21.62	140	13.76	88	17.30	52	10.22	1308	42.86	861	56.42	447	29.29
<i>Adiantum philippense</i>	75	7.37	75	14.74	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	75	2.46	75	4.91	0	0.00

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Adiantum capillus-veneris</i>	5	0.49	0	0.00	5	0.98	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.16	0	0.00	5	0.33
<i>Aeschynomene aspera</i>	55	5.41	55	10.81	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	55	1.80	55	3.60	0	0.00
<i>Ageratum conyzoides</i>	1321	129.85	819	161.00	502	98.69	541	53.18	325	63.89	216	42.46	370	36.37	224	44.04	146	28.70	2232	73.13	1368	89.64	864	56.62
<i>Alpinia nigra</i>	74	7.27	51	10.03	23	4.52	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	74	2.42	51	3.34	23	1.51
<i>Alternanthera philoxeroides</i>	146	14.35	146	28.70	0	0.00	0	0.00	0	0.00	0	0.00	70	6.88	70	13.76	0	0.00	216	7.08	216	14.15	0	0.00
<i>Alternanthera pungens</i>	1772	174.18	999	196.39	773	151.96	516	50.72	287	56.42	229	45.02	0	0.00	0	0.00	0	0.00	2288	74.97	1286	84.27	1002	65.66
<i>Alternanthera sessilis</i>	4852	476.92	3054	600.38	1798	353.46	1760	173.00	1145	225.09	615	120.90	1092	107.34	676	132.89	416	81.78	7704	252.42	4875	319.45	2829	185.38
<i>Amaranthus spinosus</i>	228	22.41	114	22.41	114	22.41	125	12.29	72	14.15	53	10.42	0	0.00	0	0.00	0	0.00	353	11.57	186	12.19	167	10.94
<i>Amaranthus viridis</i>	491	48.26	284	55.83	207	40.69	203	19.95	121	23.79	82	16.12	0	0.00	0	0.00	0	0.00	694	22.74	405	26.54	289	18.94
<i>Ammannia multiflora</i>	40	3.93	40	7.86	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	40	1.31	40	2.62	0	0.00
<i>Ampelopteris prolifera</i>	598	58.78	598	117.56	0	0.00	194	19.07	194	38.14	0	0.00	0	0.00	0	0.00	0	0.00	792	25.95	792	51.90	0	0.00
<i>Anagallis arvensis</i>	7	0.69	0	0.00	7	1.38	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	7	0.23	0	0.00	7	0.46
<i>Apluda mutica</i>	2800	275.22	1903	374.11	897	176.34	901	88.56	619	121.69	282	55.44	571	56.13	364	71.56	207	40.69	4272	139.97	2886	189.12	1386	90.82
<i>Arenaria serpyllifolia</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	8	0.79	8	1.57	0	0.00	8	0.26	8	0.52	0	0.00
<i>Aristida adscensionis</i>	103	10.12	103	20.25	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	103	3.37	103	6.75	0	0.00
<i>Artemisia carvifolia</i>	111	10.91	111	21.82	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	111	3.64	111	7.27	0	0.00
<i>Arundinella bengalensis</i>	372	36.57	372	73.13	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	372	12.19	372	24.38	0	0.00
<i>Axonopus compressus</i>	1914	188.13	1261	247.90	653	128.37	724	71.16	511	100.46	213	41.87	423	41.58	277	54.45	146	28.70	3061	100.29	2049	134.27	1012	66.32
<i>Azolla pinnata</i>	375	36.86	286	56.22	89	17.50	52	5.11	36	7.08	16	3.15	59	5.80	53	10.42	6	1.18	486	15.92	375	24.57	111	7.27
<i>Bacopa monnieri</i>	10	0.98	0	0.00	10	1.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	0.33	0	0.00	10	0.66
<i>Blumea lacera</i>	3	0.29	0	0.00	3	0.59	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.10	0	0.00	3	0.20
<i>Boerhavia diffusa</i>	0	0.00	0	0.00	0	0.00	5	0.49	0	0.00	5	0.98	0	0.00	0	0.00	0	0.00	5	0.16	0	0.00	5	0.33
<i>Brachiaria distachya</i>	635	62.42	635	124.83	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	635	20.81	635	41.61	0	0.00
<i>Brachiaria reptans</i>	226	22.21	226	44.43	0	0.00	98	9.63	98	19.27	0	0.00	0	0.00	0	0.00	0	0.00	324	10.62	324	21.23	0	0.00
<i>Cajanus scarabaeoides</i>	10	0.98	0	0.00	10	1.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	0.33	0	0.00	10	0.66
<i>Capillipedium assimile</i>	73	7.18	0	0.00	73	14.35	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	73	2.39	0	0.00	73	4.78
<i>Capsella bursa-pastoris</i>	5	0.49	5	0.98	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.16	5	0.33	0	0.00
<i>Cardiospermum halicacabum</i>	146	14.35	146	28.70	0	0.00	37	3.64	37	7.27	0	0.00	0	0.00	0	0.00	0	0.00	183	6.00	183	11.99	0	0.00
<i>Carex vesicaria</i>	536	52.69	294	57.80	242	47.57	238	23.39	132	25.95	106	20.84	157	15.43	93	18.28	64	12.58	931	30.50	519	34.01	412	27.00
<i>Cenchrus ciliaris</i>	568	55.83	333	65.46	235	46.20	263	25.85	168	33.03	95	18.68	152	14.94	97	19.07	55	10.81	983	32.21	598	39.19	385	25.23
<i>Centella asiatica</i>	1025	100.75	659	129.55	366	71.95	267	26.24	138	27.13	129	25.36	143	14.06	94	18.48	49	9.63	1435	47.02	891	58.39	544	35.65
<i>Centipeda minima</i>	1257	123.56	674	132.50	583	114.61	335	32.93	250	49.15	85	16.71	170	16.71	103	20.25	67	13.17	1762	57.73	1027	67.30	735	48.16
<i>Centothea lappacea</i>	50	4.91	0	0.00	50	9.83	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	50	1.64	0	0.00	50	3.28
<i>Ceratopteris thalictroides</i>	37	3.64	37	7.27	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	37	1.21	37	2.42	0	0.00
<i>Chenopodium album</i>	50	4.91	40	7.86	10	1.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	50	1.64	40	2.62	10	0.66
<i>Christella parasitica</i>	2943	289.28	1923	378.04	1020	200.52	1093	107.43	717	140.95	376	73.92	640	62.91	394	77.46	246	48.36	4676	153.21	3034	198.82	1642	107.60
<i>Chromolaena odorata</i>	23	2.26	23	4.52	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	23	0.75	23	1.51	0	0.00
<i>Chrysopogon aciculatus</i>	800	78.63	502	98.69	298	58.58	340	33.42	220	43.25	120	23.59	225	22.12	132	25.95	93	18.28	1365	44.72	854	55.96	511	33.49
<i>Cissampelos pareira</i>	5	0.49	0	0.00	5	0.98	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.16	0	0.00	5	0.33
<i>Colocasia esculenta</i>	5	0.49	5	0.98	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.16	5	0.33	0	0.00
<i>Commelina benghalensis</i>	225	22.12	134	26.34	91	17.89	64	6.29	29	5.70	35	6.88	0	0.00	0	0.00	0	0.00	289	9.47	163	10.68	126	8.26
<i>Commelina diffusa</i>	15	1.47	0	0.00	15	2.95	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	15	0.49	0	0.00	15	0.98
<i>Cotula hemisphaerica</i>	1538	151.18	963	189.31	575	113.04	330	32.44	193	37.94	137	26.93	0	0.00	0	0.00	0	0.00	1868	61.20	1156	75.75	712	46.66
<i>Crassocephalum crepidioides</i>	3	0.29	0	0.00	3	0.59	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.10	0	0.00	3	0.20
<i>Cuphea carthagenensis</i>	1523	149.70	1018	200.13	505	99.28	597	58.68	451	88.66	146	28.70	0	0.00	0	0.00	0	0.00	2120	69.46	1469	96.26	651	42.66
<i>Cyathula prostrata</i>	0	0.00	0	0.00	0	0.00	9	0.88	0	0.00	9	1.77	0	0.00	0	0.00	0	0.00	9	0.29	0	0.00	9	0.59
<i>Cynodon dactylon</i>	12795	1257.67	7973	1567.39	4822	947.94	4999	491.37	3411	670.56	1588	312.18	2536	249.27	1570	308.64	966	189.90	20330	666.10	12954	848.86	7376	483.34
<i>Cyperus compactus</i>	15	1.47	15	2.95	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	15	0.49	15	0.98	0	0.00
<i>Cyperus compressus</i>																								

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Cyperus distans</i>	528	51.90	266	52.29	262	51.51	216	21.23	96	18.87	120	23.59	0	0.00	0	0.00	0	0.00	744	24.38	362	23.72	382	25.03
<i>Cyperus eleusinoides</i>	0	0.00	0	0.00	0	0.00	2	0.20	2	0.39	0	0.00	0	0.00	0	0.00	0	0.00	2	0.07	2	0.13	0	0.00
<i>Cyperus eragrostis</i>	1018	100.06	653	128.37	365	71.75	404	39.71	260	51.11	144	28.31	313	30.77	186	36.57	127	24.97	1735	56.85	1099	72.02	636	41.68
<i>Cyperus imbricatus</i>	354	34.80	165	32.44	189	37.15	200	19.66	86	16.91	114	22.41	0	0.00	0	0.00	0	0.00	554	18.15	251	16.45	303	19.86
<i>Cyperus iria</i>	795	78.14	505	99.28	290	57.01	372	36.57	222	43.64	150	29.49	0	0.00	0	0.00	0	0.00	1167	38.24	727	47.64	440	28.83
<i>Cyperus rotundus</i>	654	64.28	654	128.57	0	0.00	0	0.00	0	0.00	0	0.00	235	23.10	235	46.20	0	0.00	889	29.13	889	58.26	0	0.00
<i>Cyperus squarrosus</i>	790	77.65	518	101.83	272	53.47	310	30.47	177	34.80	133	26.15	212	20.84	133	26.15	79	15.53	1312	42.99	828	54.26	484	31.72
<i>Cyperus strigosus</i>	0	0.00	0	0.00	0	0.00	14	1.38	14	2.75	0	0.00	0	0.00	0	0.00	0	0.00	14	0.46	14	0.92	0	0.00
<i>Cyperus tenuispica</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	20	1.97	20	3.93	0	0.00	20	0.66	20	1.31	0	0.00
<i>Cyrtococcum oxyphyllum</i>	0	0.00	0	0.00	0	0.00	50	4.91	50	9.83	0	0.00	0	0.00	0	0.00	0	0.00	50	1.64	50	3.28	0	0.00
<i>Cyrtococcum patens</i>	71	6.98	57	11.21	14	2.75	32	3.15	26	5.11	6	1.18	0	0.00	0	0.00	0	0.00	103	3.37	83	5.44	20	1.31
<i>Dactylis glomerata</i>	14	1.38	14	2.75	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	14	0.46	14	0.92	0	0.00
<i>Dactyloctenium aegyptium</i>	298	29.29	163	32.04	135	26.54	133	13.07	63	12.38	70	13.76	0	0.00	0	0.00	0	0.00	431	14.12	226	14.81	205	13.43
<i>Dentella repens</i>	0	0.00	0	0.00	0	0.00	7	0.69	0	0.00	7	1.38	0	0.00	0	0.00	0	0.00	7	0.23	0	0.00	7	0.46
<i>Desmodium heterophyllum</i>	91	8.94	78	15.33	13	2.56	0	0.00	0	0.00	0	0.00	47	4.62	40	7.86	7	1.38	138	4.52	118	7.73	20	1.31
<i>Dichanthium annulatum</i>	922	90.63	466	91.61	456	89.64	364	35.78	198	38.92	166	32.63	0	0.00	0	0.00	0	0.00	1286	42.14	664	43.51	622	40.76
<i>Dichrocephala integrifolia</i>	475	46.69	319	62.71	156	30.67	151	14.84	82	16.12	69	13.56	0	0.00	0	0.00	0	0.00	626	20.51	401	26.28	225	14.74
<i>Dicranopteris linearis</i>	0	0.00	0	0.00	0	0.00	3	0.29	0	0.00	3	0.59	0	0.00	0	0.00	0	0.00	3	0.10	0	0.00	3	0.20
<i>Digitaria ciliaris</i>	4620	454.12	2925	575.02	1695	333.22	1605	157.76	1045	205.43	560	110.09	1044	102.62	658	129.35	386	75.88	7269	238.17	4628	303.27	2641	173.06
<i>Digitaria setigera</i>	125	12.29	125	24.57	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	125	4.10	125	8.19	0	0.00
<i>Digitaria violascens</i>	241	23.69	0	0.00	241	47.38	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	241	7.90	0	0.00	241	15.79
<i>Diplazium esculentum</i>	62	6.09	53	10.42	9	1.77	38	3.74	32	6.29	6	1.18	0	0.00	0	0.00	0	0.00	100	3.28	85	5.57	15	0.98
<i>Drymaria cordata</i>	0	0.00	0	0.00	0	0.00	10	0.98	10	1.97	0	0.00	0	0.00	0	0.00	0	0.00	10	0.33	10	0.66	0	0.00
<i>Duchesnea indica</i>	1005	98.79	659	129.55	346	68.02	388	38.14	224	44.04	164	32.24	219	21.53	133	26.15	86	16.91	1612	52.82	1016	66.58	596	39.06
<i>Dysphania ambrosioides</i>	76	7.47	76	14.94	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	76	2.49	76	4.98	0	0.00
<i>Echinochloa colona</i>	70	6.88	0	0.00	70	13.76	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	70	2.29	0	0.00	70	4.59
<i>Echinochloa crus-galli</i>	1273	125.13	799	157.07	474	93.18	490	48.16	291	57.21	199	39.12	0	0.00	0	0.00	0	0.00	1763	57.76	1090	71.43	673	44.10
<i>Eclipta prostrata</i>	1115	109.60	715	140.56	400	78.63	443	43.54	268	52.69	175	34.40	340	33.42	184	36.17	156	30.67	1898	62.19	1167	76.47	731	47.90
<i>Eichhornia crassipes</i>	191	18.77	112	22.02	79	15.53	88	8.65	50	9.83	38	7.47	68	6.68	40	7.86	28	5.50	347	11.37	202	13.24	145	9.50
<i>Eleocharis acutangula</i>	0	0.00	0	0.00	0	0.00	225	22.12	133	26.15	92	18.09	0	0.00	0	0.00	0	0.00	225	7.37	133	8.72	92	6.03
<i>Eleusine indica</i>	149	14.65	117	23.00	32	6.29	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	149	4.88	117	7.67	32	2.10
<i>Emilia sonchifolia</i>	16	1.57	16	3.15	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	16	0.52	16	1.05	0	0.00
<i>Enhydra fluctuans</i>	9	0.88	9	1.77	0	0.00	8	0.79	8	1.57	0	0.00	0	0.00	0	0.00	0	0.00	17	0.56	17	1.11	0	0.00
<i>Equisetum debile</i>	188	18.48	85	16.71	103	20.25	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	188	6.16	85	5.57	103	6.75
<i>Eragrostis amabilis</i>	113	11.11	113	22.21	0	0.00	54	5.31	54	10.62	0	0.00	0	0.00	0	0.00	0	0.00	167	5.47	167	10.94	0	0.00
<i>Eragrostis riparia</i>	257	25.26	216	42.46	41	8.06	109	10.71	71	13.96	38	7.47	0	0.00	0	0.00	0	0.00	366	11.99	287	18.81	79	5.18
<i>Eragrostis unioloides</i>	144	14.15	55	10.81	89	17.50	0	0.00	0	0.00	0	0.00	89	8.75	37	7.27	52	10.22	233	7.63	92	6.03	141	9.24
<i>Erigeron bonariensis</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.10	0	0.00	1	0.20	1	0.03	0	0.00	1	0.07
<i>Ethulia conyzoides</i>	2497	245.44	1530	300.78	967	190.10	903	88.76	606	119.13	297	58.39	617	60.65	363	71.36	254	49.93	4017	131.62	2499	163.76	1518	99.47
<i>Euphorbia heterophylla</i>	17	1.67	0	0.00	17	3.34	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	17	0.56	0	0.00	17	1.11
<i>Euphorbia hirta</i>	725	71.26	393	77.26	332	65.27	254	24.97	123	24.18	131	25.75	239	23.49	131	25.75	108	21.23	1218	39.91	647	42.40	571	37.42
<i>Euphorbia hypericifolia</i>	569	55.93	569	111.86	0	0.00	165	16.22	165	32.44	0	0.00	76	7.47	76	14.94	0	0.00	810	26.54	810	53.08	0	0.00
<i>Euphorbia thymifolia</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	31	3.05	0	0.00	31	6.09	31	1.02	0	0.00	31	2.03
<i>Evolvulus nummularius</i>	846	83.16	547	107.53	299	58.78	237	23.30	146	28.70	91	17.89	0	0.00	0	0.00	0	0.00	1083	35.48	693	45.41	390	25.56
<i>Fimbristylis aestivalis</i>	3565	350.42	2191	430.72	1374	270.11	1479	145.38	969	190.49	510	100.26	932	91.61	585	115.00	347	68.22	5976	195.80	3745	245.41	2231	146.20
<i>Fimbristylis dichotoma</i>	45	4.42	45	8.85	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	45	1.47	45	2.95	0	0.00
<i>Fimbristylis littoralis</i>	40	3.93	40	7.86	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	40	1.31	40	2.62	0	0.00
<i>Flemingia lineata</i>	299	29.39	214	42.07	85	16.71	74	7.27	52	10.22	22	4.32	0	0.00	0	0.00	0	0.00	373	12.22	266	17.43	107	7.01
<i>Floscopa scandens</i>	0	0.00	0																					

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
Grangea maderaspatana	3586	352.48	2014	395.93	1572	309.04	1344	132.11	812	159.63	532	104.58	827	81.29	443	87.09	384	75.49	5757	188.63	3269	214.21	2488	163.04
Heliotropium indicum	1005	98.79	597	117.36	408	80.21	424	41.68	255	50.13	169	33.22	371	36.47	215	42.27	156	30.67	1800	58.98	1067	69.92	733	48.03
Heliotropium ovalifolium	42	4.13	0	0.00	42	8.26	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	42	1.38	0	0.00	42	2.75
Heliotropium strigosum	19	1.87	19	3.74	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	19	0.62	19	1.25	0	0.00
Hemarthria compressa	5886	578.56	3740	735.24	2146	421.88	2368	232.76	1528	300.39	840	165.13	1595	156.78	968	190.30	627	123.26	9849	322.70	6236	408.64	3613	236.76
Houttuynia cordata	3	0.29	0	0.00	3	0.59	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.10	0	0.00	3	0.20
Hydrocotyle sibthorpioides	140	13.76	43	8.45	97	19.07	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	140	4.59	43	2.82	97	6.36
Hymenachne amplexicaulis	23	2.26	18	3.54	5	0.98	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	23	0.75	18	1.18	5	0.33
Hyptis suaveolens	1409	138.50	788	154.91	621	122.08	348	34.21	183	35.98	165	32.44	266	26.15	143	28.11	123	24.18	2023	66.28	1114	73.00	909	59.57
Ichnanthus pallens	0	0.00	0	0.00	0	0.00	5	0.49	5	0.98	0	0.00	0	0.00	0	0.00	0	0.00	5	0.16	5	0.33	0	0.00
Impatiens tripetala	9	0.88	0	0.00	9	1.77	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	9	0.29	0	0.00	9	0.59
Imperata cylindrica	2270	223.13	1481	291.15	789	155.11	861	84.63	652	128.17	209	41.09	546	53.67	331	65.07	215	42.27	3677	120.48	2464	161.46	1213	79.49
Isachne globosa	188	18.48	103	20.25	85	16.71	148	14.55	95	18.68	53	10.42	0	0.00	0	0.00	0	0.00	336	11.01	198	12.97	138	9.04
Juncus articulatus	67	6.59	47	9.24	20	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	67	2.20	47	3.08	20	1.31
Juncus prismatocarpus	0	0.00	0	0.00	0	0.00	12	1.18	12	2.36	0	0.00	0	0.00	0	0.00	0	0.00	12	0.39	12	0.79	0	0.00
Kyllinga brevifolia	1800	176.93	1198	235.51	602	118.35	551	54.16	328	64.48	223	43.84	82	8.06	60	11.80	22	4.32	2433	79.72	1586	103.93	847	55.50
Laphangium luteoalbum	1774	174.37	1177	231.38	597	117.36	577	56.72	344	67.63	233	45.80	411	40.40	249	48.95	162	31.85	2762	90.50	1770	115.99	992	65.00
Leersia hexandra	54	5.31	54	10.62	0	0.00	17	1.67	17	3.34	0	0.00	0	0.00	0	0.00	0	0.00	71	2.33	71	4.65	0	0.00
Lepidagathis incurva	0	0.00	0	0.00	0	0.00	34	3.34	22	4.32	12	2.36	41	4.03	25	4.91	16	3.15	75	2.46	47	3.08	28	1.83
Leucas aspera	314	30.86	182	35.78	132	25.95	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	314	10.29	182	11.93	132	8.65
Leucostegia immersa	5	0.49	5	0.98	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.16	5	0.33	0	0.00
Limnobiium laevigatum	568	55.83	387	76.08	181	35.58	192	18.87	143	28.11	49	9.63	145	14.25	95	18.68	50	9.83	905	29.65	625	40.96	280	18.35
Lindernia crustacea	4704	462.37	2871	564.40	1833	360.34	1952	191.87	1252	246.13	700	137.61	1201	118.05	729	143.31	472	92.79	7857	257.43	4852	317.95	3005	196.91
Lindernia ruellifolides	157	15.43	157	30.86	0	0.00	87	8.55	87	17.10	0	0.00	0	0.00	0	0.00	0	0.00	244	7.99	244	15.99	0	0.00
Ludwigia adscendens	149	14.65	84	16.51	65	12.78	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	149	4.88	84	5.50	65	4.26
Ludwigia octovalvis	107	10.52	107	21.03	0	0.00	65	6.39	65	12.78	0	0.00	0	0.00	0	0.00	0	0.00	172	5.64	172	11.27	0	0.00
Lygodium flexuosum	821	80.70	540	106.16	281	55.24	303	29.78	208	40.89	95	18.68	148	14.55	101	19.86	47	9.24	1272	41.68	849	55.63	423	27.72
Lygodium microphyllum	72	7.08	46	9.04	26	5.11	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	72	2.36	46	3.01	26	1.70
Marsilea quadrifolia	468	46.00	343	67.43	125	24.57	143	14.06	108	21.23	35	6.88	144	14.15	102	20.05	42	8.26	755	24.74	553	36.24	202	13.24
Mazus pumilus	1484	145.87	771	151.57	713	140.17	364	35.78	199	39.12	165	32.44	283	27.82	128	25.16	155	30.47	2131	69.82	1098	71.95	1033	67.69
Mecardonia procumbens	1303	128.08	1029	202.29	274	53.86	342	33.62	255	50.13	87	17.10	263	25.85	190	37.35	73	14.35	1908	62.51	1474	96.59	434	28.44
Melilotus albus	19	1.87	19	3.74	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	19	0.62	19	1.25	0	0.00
Merremia umbellata	2389	234.82	1670	328.30	719	141.35	705	69.30	504	99.08	201	39.51	535	52.59	344	67.63	191	37.55	3629	118.90	2518	165.00	1111	72.80
Mikania micrantha	793	77.95	519	102.03	274	53.86	313	30.77	216	42.46	97	19.07	0	0.00	0	0.00	0	0.00	1106	36.24	735	48.16	371	24.31
Monochoria hastata	10	0.98	10	1.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	0.33	10	0.66	0	0.00
Nelsonia canescens	22	2.16	0	0.00	22	4.32	26	2.56	0	0.00	26	5.11	0	0.00	0	0.00	0	0.00	48	1.57	0	0.00	48	3.15
Nymphoides cristata	12	1.18	12	2.36	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	12	0.39	12	0.79	0	0.00
Oldenlandia lineata	0	0.00	0	0.00	0	0.00	14	1.38	0	0.00	14	2.75	0	0.00	0	0.00	0	0.00	14	0.46	0	0.00	14	0.92
Oldenlandia tenelliflora	0	0.00	0	0.00	0	0.00	36	3.54	0	0.00	36	7.08	0	0.00	0	0.00	0	0.00	36	1.18	0	0.00	36	2.36
Onychium japonicum	45	4.42	0	0.00	45	8.85	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	45	1.47	0	0.00	45	2.95
Opismenus burmanni	614	60.35	438	86.11	176	34.60	225	22.12	167	32.83	58	11.40	130	12.78	90	17.69	40	7.86	969	31.75	695	45.54	274	17.95
Opismenus compositus	248	24.38	248	48.75	0	0.00	98	9.63	98	19.27	0	0.00	0	0.00	0	0.00	0	0.00	346	11.34	346	22.67	0	0.00
Ottochloa nodosa	0	0.00	0	0.00	0	0.00	3	0.29	3	0.59	0	0.00	0	0.00	0	0.00	0	0.00	3	0.10	3	0.20	0	0.00
Oxalis corniculata	5281	519.09	3256	640.09	2025	398.09	1977	194.33	1275	250.65	702	138.00	1274	125.23	766	150.59	508	99.87	8532	279.55	5297	347.11	3235	211.99
Oxalis debilis	0	0.00	0	0.00	0	0.00	36	3.54	36	7.08	0	0.00	38	3.74	38	7.47	0	0.00	74	2.42	74	4.85	0	0.00
Oxalis latifolia	5	0.49	0	0.00	5	0.98	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.16	0	0.00	5	0.33
Panicum auritum	29	2.85	29	5.70	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	29	0.95	29	1.90	0	0.00
Panicum brevifolium	171	16.81	0	0.00	171	33.62	68	6.68	0	0.00	68	13.37	0	0.00	0	0.00	0	0.00	239	7.83	0	0.00	239	15.66
Panicum notatum	1282	126.01	695																					

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Paspalum dilatatum</i>	494	48.56	355	69.79	139	27.33	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	494	16.19	355	23.26	139	9.11
<i>Paspalum scrobiculatum</i>	99	9.73	99	19.46	0	0.00	27	2.65	27	5.31	0	0.00	0	0.00	0	0.00	0	0.00	126	4.13	126	8.26	0	0.00
<i>Peperomia pellucida</i>	2278	223.91	1458	286.62	820	161.20	613	60.25	392	77.06	221	43.45	420	41.28	241	47.38	179	35.19	3311	108.48	2091	137.02	1220	79.95
<i>Persicaria barbata</i>	84	8.26	51	10.03	33	6.49	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	84	2.75	51	3.34	33	2.16
<i>Persicaria chinensis</i>	4	0.39	4	0.79	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	4	0.13	4	0.26	0	0.00
<i>Persicaria hydropiper</i>	685	67.33	461	90.63	224	44.04	354	34.80	207	40.69	147	28.90	294	28.90	167	32.83	127	24.97	1333	43.68	835	54.72	498	32.63
<i>Persicaria orientalis</i>	47	4.62	47	9.24	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	47	1.54	47	3.08	0	0.00
<i>Phylla nodiflora</i>	111	10.91	82	16.12	29	5.70	28	2.75	17	3.34	11	2.16	24	2.36	18	3.54	6	1.18	163	5.34	117	7.67	46	3.01
<i>Phyllanthus niruri</i>	6690	657.58	4179	821.54	2511	493.63	2369	232.86	1530	300.78	839	164.94	1577	155.01	973	191.28	604	118.74	10636	348.48	6682	437.87	3954	259.10
<i>Phyllanthus virgatus</i>	0	0.00	0	0.00	0	0.00	12	1.18	0	0.00	12	2.36	0	0.00	0	0.00	0	0.00	12	0.39	0	0.00	12	0.79
<i>Physalis minima</i>	96	9.44	96	18.87	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	96	3.15	96	6.29	0	0.00
<i>Pistia stratiotes</i>	78	7.67	78	15.33	0	0.00	46	4.52	46	9.04	0	0.00	40	3.93	40	7.86	0	0.00	164	5.37	164	10.75	0	0.00
<i>Plantago major</i>	14	1.38	0	0.00	14	2.75	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	14	0.46	0	0.00	14	0.92
<i>Plectranthus sp.</i>	5	0.49	5	0.98	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.16	5	0.33	0	0.00
<i>Poa annua</i>	0	0.00	0	0.00	0	0.00	56	5.50	30	5.90	26	5.11	43	4.23	27	5.31	16	3.15	99	3.24	57	3.74	42	2.75
<i>Polycarpon prostratum</i>	2764	271.68	1898	373.12	866	170.24	747	73.43	502	98.69	245	48.16	567	55.73	359	70.57	208	40.89	4078	133.61	2759	180.79	1319	86.43
<i>Polygala arvensis</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.49	0	0.00	5	0.98	5	0.16	0	0.00	5	0.33
<i>Polygonum plebeium</i>	6288	618.07	3975	781.43	2313	454.71	2180	214.28	1403	275.81	777	152.75	1395	137.12	849	166.90	546	107.34	9863	323.16	6227	408.05	3636	238.26
<i>Polygonum posumbo</i>	61	6.00	61	11.99	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	61	2.00	61	4.00	0	0.00
<i>Portulaca oleracea</i>	0	0.00	0	0.00	0	0.00	7	0.69	0	0.00	7	1.38	0	0.00	0	0.00	0	0.00	7	0.23	0	0.00	7	0.46
<i>Potentilla kleiniana</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.49	0	0.00	5	0.98	5	0.16	0	0.00	5	0.33
<i>Pouzolzia zeylanica</i>	3710	364.67	2526	496.58	1184	232.76	1390	136.63	954	187.54	436	85.71	887	87.19	567	111.46	320	62.91	5987	196.16	4047	265.20	1940	127.13
<i>Pycreus pumilus</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	22	2.16	22	4.32	0	0.00	22	0.72	22	1.44	0	0.00
<i>Ranunculus cantoniensis</i>	14	1.38	14	2.75	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	14	0.46	14	0.92	0	0.00
<i>Ranunculus sceleratus</i>	86	8.45	30	5.90	56	11.01	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	86	2.82	30	1.97	56	3.67
<i>Rorippa indica</i>	3851	378.53	2485	488.52	1366	268.54	1374	135.06	952	187.15	422	82.96	883	86.79	523	102.82	360	70.77	6108	200.13	3960	259.50	2148	140.76
<i>Rumex dentatus</i>	32	3.15	0	0.00	32	6.29	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	32	1.05	0	0.00	32	2.10
<i>Rungia pectinata</i>	309	30.37	162	31.85	147	28.90	145	14.25	70	13.76	75	14.74	93	9.14	59	11.60	34	6.68	547	17.92	291	19.07	256	16.78
<i>Rungia repens</i>	316	31.06	197	38.73	119	23.39	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	316	10.35	197	12.91	119	7.80
<i>Saccharum spp.</i>	1364	134.07	827	162.58	537	105.57	700	68.81	490	96.33	210	41.28	343	33.71	235	46.20	108	21.23	2407	78.86	1552	101.70	855	56.03
<i>Salvinia natans</i>	39	3.83	39	7.67	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	39	1.28	39	2.56	0	0.00
<i>Scirpus mucronatus</i>	0	0.00	0	0.00	0	0.00	16	1.57	16	3.15	0	0.00	0	0.00	0	0.00	0	0.00	16	0.52	16	1.05	0	0.00
<i>Scleria terrestris</i>	1219	119.82	839	164.94	380	74.70	484	47.57	325	63.89	159	31.26	0	0.00	0	0.00	0	0.00	1703	55.80	1164	76.28	539	35.32
<i>Senna tora</i>	19	1.87	7	1.38	12	2.36	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	19	0.62	7	0.46	12	0.79
<i>Setaria pumila</i>	3215	316.01	2087	410.28	1128	221.75	1304	128.17	861	169.26	443	87.09	811	79.72	519	102.03	292	57.40	5330	174.64	3467	227.19	1863	122.08
<i>Setaria viridis</i>	112	11.01	112	22.02	0	0.00	48	4.72	48	9.44	0	0.00	0	0.00	0	0.00	0	0.00	160	5.24	160	10.48	0	0.00
<i>Sida acuta</i>	29	2.85	29	5.70	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	29	0.95	29	1.90	0	0.00
<i>Solanum americanum</i>	371	36.47	209	41.09	162	31.85	226	22.21	122	23.98	104	20.45	187	18.38	103	20.25	84	16.51	784	25.69	434	28.44	350	22.94
<i>Solanum viarum</i>	287	28.21	159	31.26	128	25.16	162	15.92	100	19.66	62	12.19	0	0.00	0	0.00	0	0.00	449	14.71	259	16.97	190	12.45
<i>Sonchus oleraceus</i>	3	0.29	3	0.59	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.10	3	0.20	0	0.00
<i>Spermacoce pusilla</i>	21	2.06	17	3.34	4	0.79	10	0.98	8	1.57	2	0.39	0	0.00	0	0.00	0	0.00	31	1.02	25	1.64	6	0.39
<i>Spirodela polyrrhiza</i>	194	19.07	96	18.87	98	19.27	65	6.39	29	5.70	36	7.08	0	0.00	0	0.00	0	0.00	259	8.49	125	8.19	134	8.78
<i>Sporobolus diandrus</i>	136	13.37	116	22.80	20	3.93	62	6.09	51	10.03	11	2.16	0	0.00	0	0.00	0	0.00	198	6.49	167	10.94	31	2.03
<i>Sporobolus fertilis</i>	96	9.44	57	11.21	39	7.67	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	96	3.15	57	3.74	39	2.56
<i>Stellaria media</i>	381	37.45	222	43.64	159	31.26	215	21.13	124	24.38	91	17.89	0	0.00	0	0.00	0	0.00	596	19.53	346	22.67	250	16.38
<i>Synedrella nodiflora</i>	44	4.32	30	5.90	14	2.75	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	44	1.44	30	1.97	14	0.92
<i>Tetragstigma dubium</i>	12	1.18	12	2.36	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	12	0.39	12	0.79	0	0.00
<i>Themeda spp.</i>	162	15.92	83	16.32	79	15.53	89	8.75	50	9.83	39	7.67	0	0.00	0	0.00	0	0.00	251	8.22	133	8.72	118	7.73
<i>Thespis divaricata</i>	264	25.95	155	30.47	109	21.43	114	11.21	60	11.80	54	10.62	0	0.00	0	0.00	0	0.00	378	12.38	215	14.09	163	

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Verbena officinalis</i>	9	0.88	9	1.77	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	9	0.29	9	0.59	0	0.00
<i>Vicia sativa</i>	21	2.06	21	4.13	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	21	0.69	21	1.38	0	0.00
<i>Xanthium strumarium</i>	148	14.55	80	15.73	68	13.37	83	8.16	44	8.65	39	7.67	0	0.00	0	0.00	0	0.00	231	7.57	124	8.13	107	7.01
<i>Youngia japonica</i>	4	0.39	4	0.79	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	4	0.13	4	0.26	0	0.00
UI 1	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	11	1.08	11	2.16	0	0.00	11	0.36	11	0.72	0	0.00
UI 2	38	3.74	0	0.00	38	7.47	20	1.97	0	0.00	20	3.93	0	0.00	0	0.00	0	0.00	58	1.90	0	0.00	58	3.80
UI 3	8	0.79	8	1.57	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	8	0.26	8	0.52	0	0.00
UI 4	0	0.00	0	0.00	0	0.00	4	0.39	0	0.00	4	0.79	0	0.00	0	0.00	0	0.00	4	0.13	0	0.00	4	0.26
UI 5	693	68.12	314	61.73	379	74.51	314	30.86	169	33.22	145	28.51	0	0.00	0	0.00	0	0.00	1007	32.99	483	31.65	524	34.34
UI 6	0	0.00	0	0.00	0	0.00	5	0.49	5	0.98	0	0.00	0	0.00	0	0.00	0	0.00	5	0.16	5	0.33	0	0.00
UI 7	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	15	1.47	15	2.95	0	0.00	15	0.49	15	0.98	0	0.00
UI 8	333	32.73	228	44.82	105	20.64	97	9.53	66	12.97	31	6.09	66	6.49	45	8.85	21	4.13	496	16.25	339	22.21	157	10.29
UI 10	104	10.22	63	12.38	41	8.06	45	4.42	35	6.88	10	1.97	26	2.56	19	3.74	7	1.38	175	5.73	117	7.67	58	3.80
UI 11	71	6.98	71	13.96	0	0.00	25	2.46	25	4.91	0	0.00	0	0.00	0	0.00	0	0.00	96	3.15	96	6.29	0	0.00
UI 12	0	0.00	0	0.00	0	0.00	10	0.98	0	0.00	10	1.97	0	0.00	0	0.00	0	0.00	10	0.33	0	0.00	10	0.66
UI 13	7	0.69	7	1.38	0	0.00	2	0.20	2	0.39	0	0.00	0	0.00	0	0.00	0	0.00	9	0.29	9	0.59	0	0.00
UI 14	20	1.97	0	0.00	20	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	20	0.66	0	0.00	20	1.31
UI 16	3	0.29	0	0.00	3	0.59	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.10	0	0.00	3	0.20
UI 17	153	15.04	114	22.41	39	7.67	0	0.00	0	0.00	0	0.00	76	7.47	50	9.83	26	5.11	229	7.50	164	10.75	65	4.26
UI 18	6	0.59	6	1.18	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	6	0.20	6	0.39	0	0.00
UI 19	9	0.88	9	1.77	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	9	0.29	9	0.59	0	0.00
UI 20	0	0.00	0	0.00	0	0.00	10	0.98	10	1.97	0	0.00	0	0.00	0	0.00	0	0.00	10	0.33	10	0.66	0	0.00
UI 21	57	5.60	57	11.21	0	0.00	17	1.67	17	3.34	0	0.00	0	0.00	0	0.00	0	0.00	74	2.42	74	4.85	0	0.00
UI 22	0	0.00	0	0.00	0	0.00	7	0.69	7	1.38	0	0.00	0	0.00	0	0.00	0	0.00	7	0.23	7	0.46	0	0.00
UI 24	25	2.46	0	0.00	25	4.91	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	25	0.82	0	0.00	25	1.64
UI 25	44	4.32	44	8.65	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	44	1.44	44	2.88	0	0.00
UI 26	24	2.36	24	4.72	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	24	0.79	24	1.57	0	0.00
UI 27	0	0.00	0	0.00	0	0.00	12	1.18	12	2.36	0	0.00	0	0.00	0	0.00	0	0.00	12	0.39	12	0.79	0	0.00
UI 28	6	0.59	0	0.00	6	1.18	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	6	0.20	0	0.00	6	0.39
UI 29	147	14.45	56	11.01	91	17.89	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	147	4.82	56	3.67	91	5.96
UI (premature mortality)	6682	656.80	4406	866.16	2276	447.43	2180	214.28	1609	316.31	571	112.25	660	64.87	473	92.99	187	36.76	9522	311.98	6488	425.15	3034	198.82

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.16. Overall and seasonal plant species total seed abundances recorded from different soil layers of riverine alluvial grasslands soil seed bank during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Achyranthes aspera</i>	3.33	0.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	3.33	0.00	3.33
<i>Acmella uliginosa</i>	201.33	112.00	89.33	66.00	36.33	29.67	0.00	0.00	0.00	267.33	148.33	119.00
<i>Acroceras zizanioides</i>	378.33	273.67	104.67	125.00	96.00	29.00	82.67	58.00	24.67	586.00	427.67	158.33
<i>Acroceras munroanum</i>	18.00	0.00	18.00	0.00	0.00	0.00	0.00	0.00	0.00	18.00	0.00	18.00
<i>Adenostemma lavenia</i>	0.00	0.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Adiantum caudatum</i>	290.00	195.00	95.00	99.33	62.67	36.67	46.67	29.33	17.33	436.00	287.00	149.00
<i>Adiantum philippense</i>	25.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	25.00	0.00
<i>Adiantum capillus-veneris</i>	1.67	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	1.67
<i>Aeschynomene aspera</i>	18.33	18.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.33	18.33	0.00
<i>Ageratum conyzoides</i>	440.33	273.00	167.33	180.33	108.33	72.00	123.33	74.67	48.67	744.00	456.00	288.00

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Alpinia nigra</i>	24.67	17.00	7.67	0.00	0.00	0.00	0.00	0.00	0.00	24.67	17.00	7.67
<i>Alternanthera philoxeroides</i>	48.67	48.67	0.00	0.00	0.00	0.00	23.33	23.33	0.00	72.00	72.00	0.00
<i>Alternanthera pungens</i>	590.67	333.00	257.67	172.00	95.67	76.33	0.00	0.00	0.00	762.67	428.67	334.00
<i>Alternanthera sessilis</i>	1617.33	1018.00	599.33	586.67	381.67	205.00	364.00	225.33	138.67	2568.00	1625.00	943.00
<i>Amaranthus spinosus</i>	76.00	38.00	38.00	41.67	24.00	17.67	0.00	0.00	0.00	117.67	62.00	55.67
<i>Amaranthus viridis</i>	163.67	94.67	69.00	67.67	40.33	27.33	0.00	0.00	0.00	231.33	135.00	96.33
<i>Ammannia multiflora</i>	13.33	13.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.33	13.33	0.00
<i>Ampelopteris prolifera</i>	199.33	199.33	0.00	64.67	64.67	0.00	0.00	0.00	0.00	264.00	264.00	0.00
<i>Anagallis arvensis</i>	2.33	0.00	2.33	0.00	0.00	0.00	0.00	0.00	0.00	2.33	0.00	2.33
<i>Apluda mutica</i>	933.33	634.33	299.00	300.33	206.33	94.00	190.33	121.33	69.00	1424.00	962.00	462.00
<i>Arenaria serpyllifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	2.67	2.67	0.00	2.67	2.67	0.00
<i>Aristida adscensionis</i>	34.33	34.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34.33	34.33	0.00
<i>Artemisia carvifolia</i>	37.00	37.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37.00	37.00	0.00
<i>Arundinella bengalensis</i>	124.00	124.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	124.00	124.00	0.00
<i>Axonopus compressus</i>	638.00	420.33	217.67	241.33	170.33	71.00	141.00	92.33	48.67	1020.33	683.00	337.33
<i>Azolla pinnata</i>	125.00	95.33	29.67	17.33	12.00	5.33	19.67	17.67	2.00	162.00	125.00	37.00
<i>Bacopa monnieri</i>	3.33	0.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	3.33	0.00	3.33
<i>Blumea lacera</i>	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
<i>Boerhavia diffusa</i>	0.00	0.00	0.00	1.67	0.00	1.67	0.00	0.00	0.00	1.67	0.00	1.67
<i>Brachiaria distachya</i>	211.67	211.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	211.67	211.67	0.00
<i>Brachiaria reptans</i>	75.33	75.33	0.00	32.67	32.67	0.00	0.00	0.00	0.00	108.00	108.00	0.00
<i>Cajanus scarabaeoides</i>	3.33	0.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	3.33	0.00	3.33
<i>Capillipedium assimile</i>	24.33	0.00	24.33	0.00	0.00	0.00	0.00	0.00	0.00	24.33	0.00	24.33
<i>Capsella bursa-pastoris</i>	1.67	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Cardiospermum halicacabum</i>	48.67	48.67	0.00	12.33	12.33	0.00	0.00	0.00	0.00	61.00	61.00	0.00
<i>Carex vesicaria</i>	178.67	98.00	80.67	79.33	44.00	35.33	52.33	31.00	21.33	310.33	173.00	137.33
<i>Cenchrus ciliaris</i>	189.33	111.00	78.33	87.67	56.00	31.67	50.67	32.33	18.33	327.67	199.33	128.33
<i>Centella asiatica</i>	341.67	219.67	122.00	89.00	46.00	43.00	47.67	31.33	16.33	478.33	297.00	181.33
<i>Centipeda minima</i>	419.00	224.67	194.33	111.67	83.33	28.33	56.67	34.33	22.33	587.33	342.33	245.00
<i>Centothea lappacea</i>	16.67	0.00	16.67	0.00	0.00	0.00	0.00	0.00	0.00	16.67	0.00	16.67
<i>Ceratopteris thalictroides</i>	12.33	12.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.33	12.33	0.00
<i>Chenopodium album</i>	16.67	13.33	3.33	0.00	0.00	0.00	0.00	0.00	0.00	16.67	13.33	3.33
<i>Christella parasitica</i>	981.00	641.00	340.00	364.33	239.00	125.33	213.33	131.33	82.00	1558.67	1011.33	547.33
<i>Chromolaena odorata</i>	7.67	7.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.67	7.67	0.00
<i>Chrysopogon aciculatus</i>	266.67	167.33	99.33	113.33	73.33	40.00	75.00	44.00	31.00	455.00	284.67	170.33
<i>Cissampelos pareira</i>	1.67	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	1.67
<i>Colocasia esculenta</i>	1.67	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Commelina benghalensis</i>	75.00	44.67	30.33	21.33	9.67	11.67	0.00	0.00	0.00	96.33	54.33	42.00
<i>Commelina diffusa</i>	5.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	5.00
<i>Cotula hemisphaerica</i>	512.67	321.00	191.67	110.00	64.33	45.67	0.00	0.00	0.00	622.67	385.33	237.33
<i>Crassocephalum crepidioides</i>	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
<i>Cuphea carthagenensis</i>	507.67	339.33	168.33	199.00	150.33	48.67	0.00	0.00	0.00	706.67	489.67	217.00
<i>Cyathula prostrata</i>	0.00	0.00	0.00	3.00	0.00	3.00	0.00	0.00	0.00	3.00	0.00	3.00
<i>Cynodon dactylon</i>	4265.00	2657.67	1607.33	1666.33	1137.00	529.33	845.33	523.33	322.00	6776.67	4318.00	2458.67
<i>Cyperus compactus</i>	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00
<i>Cyperus compressus</i>	437.33	287.00	150.33	174.00	111.67	62.33	117.00	73.00	44.00	728.33	471.67	256.67
<i>Cyperus cyperoides</i>	46.33	39.67	6.67	19.33	13.67	5.67	0.00	0.00	0.00	65.67	53.33	12.33
<i>Cyperus difformis</i>	69.33	32.33	37.00	0.00	0.00	0.00	0.00	0.00	0.00	69.33	32.33	37.00
<i>Cyperus digitatus</i>	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00	0.00	8.00	8.00	0.00
<i>Cyperus distans</i>	176.00	88.67	87.33	72.00	32.00	40.00	0.00	0.00	0.00	248.00	120.67	127.33
<i>Cyperus eleusinoides</i>	0.00	0.00	0.00	0.67	0.67	0.00	0.00	0.00	0.00	0.67	0.67	0.00
<i>Cyperus eragrostis</i>	339.33	217.67	121.67	134.67	86.67	48.00	104.33	62.00	42.33	578.33	366.33	212.00
<i>Cyperus imbricatus</i>	118.00	55.00	63.00	66.67	28.67	38.00	0.00	0.00	0.00	184.67	83.67	101.00

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Cyperus iria</i>	265.00	168.33	96.67	124.00	74.00	50.00	0.00	0.00	0.00	389.00	242.33	146.67
<i>Cyperus rotundus</i>	218.00	218.00	0.00	0.00	0.00	0.00	78.33	78.33	0.00	296.33	296.33	0.00
<i>Cyperus squarrosus</i>	263.33	172.67	90.67	103.33	59.00	44.33	70.67	44.33	26.33	437.33	276.00	161.33
<i>Cyperus strigosus</i>	0.00	0.00	0.00	4.67	4.67	0.00	0.00	0.00	0.00	4.67	4.67	0.00
<i>Cyperus tenuispica</i>	0.00	0.00	0.00	0.00	0.00	0.00	6.67	6.67	0.00	6.67	6.67	0.00
<i>Cyrtococcum oxyphyllum</i>	0.00	0.00	0.00	16.67	16.67	0.00	0.00	0.00	0.00	16.67	16.67	0.00
<i>Cyrtococcum patens</i>	23.67	19.00	4.67	10.67	8.67	2.00	0.00	0.00	0.00	34.33	27.67	6.67
<i>Dactylis glomerata</i>	4.67	4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67	4.67	0.00
<i>Dactyloctenium aegyptium</i>	99.33	54.33	45.00	44.33	21.00	23.33	0.00	0.00	0.00	143.67	75.33	68.33
<i>Dentella repens</i>	0.00	0.00	0.00	2.33	0.00	2.33	0.00	0.00	0.00	2.33	0.00	2.33
<i>Desmodium heterophyllum</i>	30.33	26.00	4.33	0.00	0.00	0.00	15.67	13.33	2.33	46.00	39.33	6.67
<i>Dichanthium annulatum</i>	307.33	155.33	152.00	121.33	66.00	55.33	0.00	0.00	0.00	428.67	221.33	207.33
<i>Dichrocephala integrifolia</i>	158.33	106.33	52.00	50.33	27.33	23.00	0.00	0.00	0.00	208.67	133.67	75.00
<i>Dicranopteris linearis</i>	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00	1.00
<i>Digitaria ciliaris</i>	1540.00	975.00	565.00	535.00	348.33	186.67	348.00	219.33	128.67	2423.00	1542.67	880.33
<i>Digitaria setigera</i>	41.67	41.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41.67	41.67	0.00
<i>Digitaria violascens</i>	80.33	0.00	80.33	0.00	0.00	0.00	0.00	0.00	0.00	80.33	0.00	80.33
<i>Diplazium esculentum</i>	20.67	17.67	3.00	12.67	10.67	2.00	0.00	0.00	0.00	33.33	28.33	5.00
<i>Drymaria cordata</i>	0.00	0.00	0.00	3.33	3.33	0.00	0.00	0.00	0.00	3.33	3.33	0.00
<i>Duchesnea indica</i>	335.00	219.67	115.33	129.33	74.67	54.67	73.00	44.33	28.67	537.33	338.67	198.67
<i>Dysphania ambrosioides</i>	25.33	25.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.33	25.33	0.00
<i>Echinochloa colona</i>	23.33	0.00	23.33	0.00	0.00	0.00	0.00	0.00	0.00	23.33	0.00	23.33
<i>Echinochloa crus-galli</i>	424.33	266.33	158.00	163.33	97.00	66.33	0.00	0.00	0.00	587.67	363.33	224.33
<i>Eclipta prostrata</i>	371.67	238.33	133.33	147.67	89.33	58.33	113.33	61.33	52.00	632.67	389.00	243.67
<i>Eichhornia crassipes</i>	63.67	37.33	26.33	29.33	16.67	12.67	22.67	13.33	9.33	115.67	67.33	48.33
<i>Eleocharis acutangula</i>	0.00	0.00	0.00	75.00	44.33	30.67	0.00	0.00	0.00	75.00	44.33	30.67
<i>Eleusine indica</i>	49.67	39.00	10.67	0.00	0.00	0.00	0.00	0.00	0.00	49.67	39.00	10.67
<i>Emilia sonchifolia</i>	5.33	5.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.33	5.33	0.00
<i>Enhydra fluctuans</i>	3.00	3.00	0.00	2.67	2.67	0.00	0.00	0.00	0.00	5.67	5.67	0.00
<i>Equisetum debile</i>	62.67	28.33	34.33	0.00	0.00	0.00	0.00	0.00	0.00	62.67	28.33	34.33
<i>Eragrostis amabilis</i>	37.67	37.67	0.00	18.00	18.00	0.00	0.00	0.00	0.00	55.67	55.67	0.00
<i>Eragrostis riparia</i>	85.67	72.00	13.67	36.33	23.67	12.67	0.00	0.00	0.00	122.00	95.67	26.33
<i>Eragrostis unioloides</i>	48.00	18.33	29.67	0.00	0.00	0.00	29.67	12.33	17.33	77.67	30.67	47.00
<i>Erigeron bonariensis</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.33	0.33	0.00	0.33
<i>Ethulia conyzoides</i>	832.33	510.00	322.33	301.00	202.00	99.00	205.67	121.00	84.67	1339.00	833.00	506.00
<i>Euphorbia heterophylla</i>	5.67	0.00	5.67	0.00	0.00	0.00	0.00	0.00	0.00	5.67	0.00	5.67
<i>Euphorbia hirta</i>	241.67	131.00	110.67	84.67	41.00	43.67	79.67	43.67	36.00	406.00	215.67	190.33
<i>Euphorbia hypericifolia</i>	189.67	189.67	0.00	55.00	55.00	0.00	25.33	25.33	0.00	270.00	270.00	0.00
<i>Euphorbia thymifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	10.33	0.00	10.33	10.33	0.00	10.33
<i>Evolvulus nummularius</i>	282.00	182.33	99.67	79.00	48.67	30.33	0.00	0.00	0.00	361.00	231.00	130.00
<i>Fimbristylis aestivalis</i>	1188.33	730.33	458.00	493.00	323.00	170.00	310.67	195.00	115.67	1992.00	1248.33	743.67
<i>Fimbristylis dichotoma</i>	15.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	15.00	0.00
<i>Fimbristylis littoralis</i>	13.33	13.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.33	13.33	0.00
<i>Flemingia lineata</i>	99.67	71.33	28.33	24.67	17.33	7.33	0.00	0.00	0.00	124.33	88.67	35.67
<i>Floscopa scandens</i>	0.00	0.00	0.00	0.33	0.00	0.33	0.00	0.00	0.00	0.33	0.00	0.33
<i>Glinus lotoides</i>	220.00	112.00	108.00	71.33	28.00	43.33	0.00	0.00	0.00	291.33	140.00	151.33
<i>Glinus oppositifolius</i>	204.67	133.67	71.00	0.00	0.00	0.00	30.33	20.00	10.33	235.00	153.67	81.33
<i>Gnaphalium pensylvanicum</i>	171.33	107.00	64.33	59.00	37.00	22.00	0.00	0.00	0.00	230.33	144.00	86.33
<i>Grangea maderaspatana</i>	1195.33	671.33	524.00	448.00	270.67	177.33	275.67	147.67	128.00	1919.00	1089.67	829.33
<i>Heliotropium indicum</i>	335.00	199.00	136.00	141.33	85.00	56.33	123.67	71.67	52.00	600.00	355.67	244.33
<i>Heliotropium ovalifolium</i>	14.00	0.00	14.00	0.00	0.00	0.00	0.00	0.00	0.00	14.00	0.00	14.00
<i>Heliotropium strigosum</i>	6.33	6.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33	6.33	0.00
<i>Hemarthria compressa</i>	1962.00	1246.67	715.33	789.33	509.33	280.00	531.67	322.67	209.00	3283.00	2078.67	1204.33

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Houttuynia cordata</i>	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
<i>Hydrocotyle sibthorpioides</i>	46.67	14.33	32.33	0.00	0.00	0.00	0.00	0.00	0.00	46.67	14.33	32.33
<i>Hymenachne amplexicaulis</i>	7.67	6.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	7.67	6.00	1.67
<i>Hyptis suaveolens</i>	469.67	262.67	207.00	116.00	61.00	55.00	88.67	47.67	41.00	674.33	371.33	303.00
<i>Ichnanthus pallens</i>	0.00	0.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Impatiens tripetala</i>	3.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	3.00
<i>Imperata cylindrica</i>	756.67	493.67	263.00	287.00	217.33	69.67	182.00	110.33	71.67	1225.67	821.33	404.33
<i>Isachne globosa</i>	62.67	34.33	28.33	49.33	31.67	17.67	0.00	0.00	0.00	112.00	66.00	46.00
<i>Juncus articulatus</i>	22.33	15.67	6.67	0.00	0.00	0.00	0.00	0.00	0.00	22.33	15.67	6.67
<i>Juncus prismatocarpus</i>	0.00	0.00	0.00	4.00	4.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00
<i>Kyllinga brevifolia</i>	600.00	399.33	200.67	183.67	109.33	74.33	27.33	20.00	7.33	811.00	528.67	282.33
<i>Laphangium luteoalbum</i>	591.33	392.33	199.00	192.33	114.67	77.67	137.00	83.00	54.00	920.67	590.00	330.67
<i>Leersia hexandra</i>	18.00	18.00	0.00	5.67	5.67	0.00	0.00	0.00	0.00	23.67	23.67	0.00
<i>Lepidagathis incurva</i>	0.00	0.00	0.00	11.33	7.33	4.00	13.67	8.33	5.33	25.00	15.67	9.33
<i>Leucas aspera</i>	104.67	60.67	44.00	0.00	0.00	0.00	0.00	0.00	0.00	104.67	60.67	44.00
<i>Leucostegia immersa</i>	1.67	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Limnobiium laevigatum</i>	189.33	129.00	60.33	64.00	47.67	16.33	48.33	31.67	16.67	301.67	208.33	93.33
<i>Lindernia crustacea</i>	1568.00	957.00	611.00	650.67	417.33	233.33	400.33	243.00	157.33	2619.00	1617.33	1001.67
<i>Lindernia ruellioides</i>	52.33	52.33	0.00	29.00	29.00	0.00	0.00	0.00	0.00	81.33	81.33	0.00
<i>Ludwigia adscendens</i>	49.67	28.00	21.67	0.00	0.00	0.00	0.00	0.00	0.00	49.67	28.00	21.67
<i>Ludwigia octovalvis</i>	35.67	35.67	0.00	21.67	21.67	0.00	0.00	0.00	0.00	57.33	57.33	0.00
<i>Lygodium flexuosum</i>	273.67	180.00	93.67	101.00	69.33	31.67	49.33	33.67	15.67	424.00	283.00	141.00
<i>Lygodium microphyllum</i>	24.00	15.33	8.67	0.00	0.00	0.00	0.00	0.00	0.00	24.00	15.33	8.67
<i>Marsilea quadrifolia</i>	156.00	114.33	41.67	47.67	36.00	11.67	48.00	34.00	14.00	251.67	184.33	67.33
<i>Mazus pumilus</i>	494.67	257.00	237.67	121.33	66.33	55.00	94.33	42.67	51.67	710.33	366.00	344.33
<i>Mecardonia procumbens</i>	434.33	343.00	91.33	114.00	85.00	29.00	87.67	63.33	24.33	636.00	491.33	144.67
<i>Melilotus albus</i>	6.33	6.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33	6.33	0.00
<i>Merremia umbellata</i>	796.33	556.67	239.67	235.00	168.00	67.00	178.33	114.67	63.67	1209.67	839.33	370.33
<i>Mikania micrantha</i>	264.33	173.00	91.33	104.33	72.00	32.33	0.00	0.00	0.00	368.67	245.00	123.67
<i>Monochoria hastata</i>	3.33	3.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33	3.33	0.00
<i>Nelsonia canescens</i>	7.33	0.00	7.33	8.67	0.00	8.67	0.00	0.00	0.00	16.00	0.00	16.00
<i>Nymphoides cristata</i>	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00
<i>Oldenlandia lineata</i>	0.00	0.00	0.00	4.67	0.00	4.67	0.00	0.00	0.00	4.67	0.00	4.67
<i>Oldenlandia tenelliflora</i>	0.00	0.00	0.00	12.00	0.00	12.00	0.00	0.00	0.00	12.00	0.00	12.00
<i>Onychium japonicum</i>	15.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	15.00
<i>Oplismenus burmanni</i>	204.67	146.00	58.67	75.00	55.67	19.33	43.33	30.00	13.33	323.00	231.67	91.33
<i>Oplismenus compositus</i>	82.67	82.67	0.00	32.67	32.67	0.00	0.00	0.00	0.00	115.33	115.33	0.00
<i>Ottochloa nodosa</i>	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00
<i>Oxalis corniculata</i>	1760.33	1085.33	675.00	659.00	425.00	234.00	424.67	255.33	169.33	2844.00	1765.67	1078.33
<i>Oxalis debilis</i>	0.00	0.00	0.00	12.00	12.00	0.00	12.67	12.67	0.00	24.67	24.67	0.00
<i>Oxalis latifolia</i>	1.67	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	1.67
<i>Panicum auritum</i>	9.67	9.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.67	9.67	0.00
<i>Panicum brevifolium</i>	57.00	0.00	57.00	22.67	0.00	22.67	0.00	0.00	0.00	79.67	0.00	79.67
<i>Panicum notatum</i>	427.33	231.67	195.67	148.67	78.67	70.00	0.00	0.00	0.00	576.00	310.33	265.67
<i>Parthenium hysterophorus</i>	50.33	29.00	21.33	26.33	15.67	10.67	0.00	0.00	0.00	76.67	44.67	32.00
<i>Paspalidium flavidum</i>	98.00	49.33	48.67	0.00	0.00	0.00	0.00	0.00	0.00	98.00	49.33	48.67
<i>Paspalum conjugatum</i>	1579.33	1046.67	532.67	572.67	389.67	183.00	353.33	230.00	123.33	2505.33	1666.33	839.00
<i>Paspalum dilatatum</i>	164.67	118.33	46.33	0.00	0.00	0.00	0.00	0.00	0.00	164.67	118.33	46.33
<i>Paspalum scrobiculatum</i>	33.00	33.00	0.00	9.00	9.00	0.00	0.00	0.00	0.00	42.00	42.00	0.00
<i>Peperomia pellucida</i>	759.33	486.00	273.33	204.33	130.67	73.67	140.00	80.33	59.67	1103.67	697.00	406.67
<i>Persicaria barbata</i>	28.00	17.00	11.00	0.00	0.00	0.00	0.00	0.00	0.00	28.00	17.00	11.00
<i>Persicaria chinensis</i>	1.33	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33	1.33	0.00
<i>Persicaria hydropiper</i>	228.33	153.67	74.67	118.00	69.00	49.00	98.00	55.67	42.33	444.33	278.33	166.00

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Persicaria orientalis</i>	15.67	15.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.67	15.67	0.00
<i>Phyla nodiflora</i>	37.00	27.33	9.67	9.33	5.67	3.67	8.00	6.00	2.00	54.33	39.00	15.33
<i>Phyllanthus niruri</i>	2230.00	1393.00	837.00	789.67	510.00	279.67	525.67	324.33	201.33	3545.33	2227.33	1318.00
<i>Phyllanthus virgatus</i>	0.00	0.00	0.00	4.00	0.00	4.00	0.00	0.00	0.00	4.00	0.00	4.00
<i>Physalis minima</i>	32.00	32.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.00	32.00	0.00
<i>Pistia stratiotes</i>	26.00	26.00	0.00	15.33	15.33	0.00	13.33	13.33	0.00	54.67	54.67	0.00
<i>Plantago major</i>	4.67	0.00	4.67	0.00	0.00	0.00	0.00	0.00	0.00	4.67	0.00	4.67
<i>Plectranthus sp.</i>	1.67	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Poa annua</i>	0.00	0.00	0.00	18.67	10.00	8.67	14.33	9.00	5.33	33.00	19.00	14.00
<i>Polycarpon prostratum</i>	921.33	632.67	288.67	249.00	167.33	81.67	189.00	119.67	69.33	1359.33	919.67	439.67
<i>Polygala arvensis</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	1.67	1.67	0.00	1.67
<i>Polygonum plebeium</i>	2096.00	1325.00	771.00	726.67	467.67	259.00	465.00	283.00	182.00	3287.67	2075.67	1212.00
<i>Polygonum posumbo</i>	20.33	20.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.33	20.33	0.00
<i>Portulaca oleracea</i>	0.00	0.00	0.00	2.33	0.00	2.33	0.00	0.00	0.00	2.33	0.00	2.33
<i>Potentilla kleiniana</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	1.67	1.67	0.00	1.67
<i>Pouzolzia zeylanica</i>	1236.67	842.00	394.67	463.33	318.00	145.33	295.67	189.00	106.67	1995.67	1349.00	646.67
<i>Pycnus pumilus</i>	0.00	0.00	0.00	0.00	0.00	0.00	7.33	7.33	0.00	7.33	7.33	0.00
<i>Ranunculus cantoniensis</i>	4.67	4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67	4.67	0.00
<i>Ranunculus sceleratus</i>	28.67	10.00	18.67	0.00	0.00	0.00	0.00	0.00	0.00	28.67	10.00	18.67
<i>Rorippa indica</i>	1283.67	828.33	455.33	458.00	317.33	140.67	294.33	174.33	120.00	2036.00	1320.00	716.00
<i>Rumex dentatus</i>	10.67	0.00	10.67	0.00	0.00	0.00	0.00	0.00	0.00	10.67	0.00	10.67
<i>Rungia pectinata</i>	103.00	54.00	49.00	48.33	23.33	25.00	31.00	19.67	11.33	182.33	97.00	85.33
<i>Rungia repens</i>	105.33	65.67	39.67	0.00	0.00	0.00	0.00	0.00	0.00	105.33	65.67	39.67
<i>Saccharum spp.</i>	454.67	275.67	179.00	233.33	163.33	70.00	114.33	78.33	36.00	802.33	517.33	285.00
<i>Salvinia natans</i>	13.00	13.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.00	13.00	0.00
<i>Scirpus mucronatus</i>	0.00	0.00	0.00	5.33	5.33	0.00	0.00	0.00	0.00	5.33	5.33	0.00
<i>Scleria terrestris</i>	406.33	279.67	126.67	161.33	108.33	53.00	0.00	0.00	0.00	567.67	388.00	179.67
<i>Senna tora</i>	6.33	2.33	4.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33	2.33	4.00
<i>Setaria pumila</i>	1071.67	695.67	376.00	434.67	287.00	147.67	270.33	173.00	97.33	1776.67	1155.67	621.00
<i>Setaria viridis</i>	37.33	37.33	0.00	16.00	16.00	0.00	0.00	0.00	0.00	53.33	53.33	0.00
<i>Sida acuta</i>	9.67	9.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.67	9.67	0.00
<i>Solanum americanum</i>	123.67	69.67	54.00	75.33	40.67	34.67	62.33	34.33	28.00	261.33	144.67	116.67
<i>Solanum viarum</i>	95.67	53.00	42.67	54.00	33.33	20.67	0.00	0.00	0.00	149.67	86.33	63.33
<i>Sonchus oleraceus</i>	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00
<i>Spermacoce pusilla</i>	7.00	5.67	1.33	3.33	2.67	0.67	0.00	0.00	0.00	10.33	8.33	2.00
<i>Spirodela polyrrhiza</i>	64.67	32.00	32.67	21.67	9.67	12.00	0.00	0.00	0.00	86.33	41.67	44.67
<i>Sporobolus diandrus</i>	45.33	38.67	6.67	20.67	17.00	3.67	0.00	0.00	0.00	66.00	55.67	10.33
<i>Sporobolus fertilis</i>	32.00	19.00	13.00	0.00	0.00	0.00	0.00	0.00	0.00	32.00	19.00	13.00
<i>Stellaria media</i>	127.00	74.00	53.00	71.67	41.33	30.33	0.00	0.00	0.00	198.67	115.33	83.33
<i>Synedrella nodiflora</i>	14.67	10.00	4.67	0.00	0.00	0.00	0.00	0.00	0.00	14.67	10.00	4.67
<i>Tetrastigma dubium</i>	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00
<i>Themeda spp.</i>	54.00	27.67	26.33	29.67	16.67	13.00	0.00	0.00	0.00	83.67	44.33	39.33
<i>Thespis divaricata</i>	88.00	51.67	36.33	38.00	20.00	18.00	0.00	0.00	0.00	126.00	71.67	54.33
<i>Tridax procumbens</i>	0.00	0.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Typhonium trilobatum</i>	0.67	0.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.00	0.67
<i>Urochloa panicoides</i>	17.00	17.00	0.00	11.67	11.67	0.00	3.33	3.33	0.00	32.00	32.00	0.00
<i>Verbena officinalis</i>	3.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.00	0.00
<i>Vicia sativa</i>	7.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00	7.00	0.00
<i>Xanthium strumarium</i>	49.33	26.67	22.67	27.67	14.67	13.00	0.00	0.00	0.00	77.00	41.33	35.67
<i>Youngia japonica</i>	1.33	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33	1.33	0.00
UI 1	0.00	0.00	0.00	0.00	0.00	0.00	3.67	3.67	0.00	3.67	3.67	0.00
UI 2	12.67	0.00	12.67	6.67	0.00	6.67	0.00	0.00	0.00	19.33	0.00	19.33
UI 3	2.67	2.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67	2.67	0.00

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
UI 4	0.00	0.00	0.00	1.33	0.00	1.33	0.00	0.00	0.00	1.33	0.00	1.33
UI 5	231.00	104.67	126.33	104.67	56.33	48.33	0.00	0.00	0.00	335.67	161.00	174.67
UI 6	0.00	0.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	1.67	1.67	0.00
UI 7	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00	5.00	5.00	0.00
UI 8	111.00	76.00	35.00	32.33	22.00	10.33	22.00	15.00	7.00	165.33	113.00	52.33
UI 10	34.67	21.00	13.67	15.00	11.67	3.33	8.67	6.33	2.33	58.33	39.00	19.33
UI 11	23.67	23.67	0.00	8.33	8.33	0.00	0.00	0.00	0.00	32.00	32.00	0.00
UI 12	0.00	0.00	0.00	3.33	0.00	3.33	0.00	0.00	0.00	3.33	0.00	3.33
UI 13	2.33	2.33	0.00	0.67	0.67	0.00	0.00	0.00	0.00	3.00	3.00	0.00
UI 14	6.67	0.00	6.67	0.00	0.00	0.00	0.00	0.00	0.00	6.67	0.00	6.67
UI 16	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
UI 17	51.00	38.00	13.00	0.00	0.00	0.00	25.33	16.67	8.67	76.33	54.67	21.67
UI 18	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	0.00
UI 19	3.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.00	0.00
UI 20	0.00	0.00	0.00	3.33	3.33	0.00	0.00	0.00	0.00	3.33	3.33	0.00
UI 21	19.00	19.00	0.00	5.67	5.67	0.00	0.00	0.00	0.00	24.67	24.67	0.00
UI 22	0.00	0.00	0.00	2.33	2.33	0.00	0.00	0.00	0.00	2.33	2.33	0.00
UI 24	8.33	0.00	8.33	0.00	0.00	0.00	0.00	0.00	0.00	8.33	0.00	8.33
UI 25	14.67	14.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.67	14.67	0.00
UI 26	8.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00	0.00
UI 27	0.00	0.00	0.00	4.00	4.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00
UI 28	2.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00
UI 29	49.00	18.67	30.33	0.00	0.00	0.00	0.00	0.00	0.00	49.00	18.67	30.33
UK (premature mortality)	2227.33	1468.67	758.67	726.67	536.33	190.33	220.00	157.67	62.33	3174.00	2162.67	1011.33

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.17. Overall and seasonal plant species mean seed abundances recorded from different soil layers of riverine alluvial grasslands soil seed bank during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Achyranthes aspera</i>	3.33±0.00	0.00	3.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00
<i>Acmella uliginosa</i>	25.17±2.98	28.00±5.04	22.33±3.27	8.25±1.45	9.08±2.83	7.42±1.17	0.00	0.00	0.00	33.42±4.12	37.08±7.15	29.75±4.38
<i>Acroceras zizanioides</i>	47.29±8.52	68.42±2.03	26.17±6.08	15.63±3.51	24.00±2.61	7.25±1.95	10.33±1.93	14.50±1.16	6.17±2.10	73.25±13.59	106.92±3.01	39.58±9.86
<i>Acroceras munroanum</i>	18.00±0.00	0.00	18.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.00±0.00	0.00	18.00±0.00
<i>Adenostemma lavenia</i>	0.00	0.00	0.00	0.83±0.17	0.83±0.17	0.00	0.00	0.00	0.00	0.83±0.17	0.83±0.17	0.00
<i>Adiantum caudatum</i>	36.25±5.21	48.75±4.24	23.75±2.14	12.42±1.72	15.67±2.27	9.17±1.27	5.83±0.82	7.33±1.11	4.33±0.65	54.50±7.04	71.75±5.36	37.25±2.11
<i>Adiantum philippense</i>	25.00±0.00	25.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00±0.00	25.00±0.00	0.00
<i>Adiantum capillus-veneris</i>	1.67±0.00	0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00
<i>Aeschynomene aspera</i>	4.58±0.28	4.58±0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.58±0.28	4.58±0.28	0.00
<i>Ageratum conyzoides</i>	55.04±6.92	68.25±10.04	41.83±2.54	22.54±2.27	27.08±2.85	18.00±1.51	15.42±1.83	18.67±2.81	12.17±0.87	93.00±10.67	114.00±14.92	72.00±3.85
<i>Alpinia nigra</i>	3.08±0.64	4.25±0.64	1.92±0.77	0.00	0.00	0.00	0.00	0.00	0.00	3.08±0.64	4.25±0.64	1.92±0.77
<i>Alternanthera philoxeroides</i>	24.33±3.00	24.33±3.00	0.00	0.00	0.00	0.00	11.67±1.67	11.67±1.67	0.00	36.00±4.67	36.00±4.67	0.00
<i>Alternanthera pungens</i>	73.83±8.98	83.25±16.48	64.42±6.78	21.5±3.93	23.92±7.88	19.08±2.45	0.00	0.00	0.00	95.33±12.13	107.17±23.12	83.50±7.71
<i>Alternanthera sessilis</i>	202.17±22.70	254.50±17.38	149.83±16.66	73.33±10.19	95.42±12.08	51.25±3.62	45.50±4.68	56.33±3.99	34.67±2.84	321.00±37.08	406.25±33.01	235.75±21.95
<i>Amaranthus spinosus</i>	9.50±0.67	9.50±1.27	9.50±0.7	5.21±0.47	6.00±0.36	4.42±0.70	0.00	0.00	0.00	14.71±0.92	15.50±1.58	13.92±1.00
<i>Amaranthus viridis</i>	20.46±2.00	23.67±2.67	17.25±2.16	8.46±1.19	10.08±2.11	6.83±0.62	0.00	0.00	0.00	28.92±3.10	33.75±4.74	24.08±2.60
<i>Ammannia multiflora</i>	13.33±0.00	13.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.33±0.00	13.33±0.00	0.00
<i>Ampelopteris prolifera</i>	49.83±20.30	49.83±20.30	0.00	16.17±7.46	16.17±7.46	0.00	0.00	0.00	0.00	66.00±27.33	66.00±27.33	0.00

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Anagallis arvensis</i>	2.33±0.00	0.00	2.33±0	0.00	0.00	0.00	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00
<i>Apluda mutica</i>	116.67±17.29	158.58±9.89	74.75±11.2	37.54±5.63	51.58±3.73	23.50±1.55	23.79±2.98	30.33±2.45	17.25±2.64	178.00±25.26	240.50±13.42	115.50±13.92
<i>Arenaria serpyllifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	2.67±0.00	2.67±0.00	0.00	2.67±0.00	2.67±0.00	0.00
<i>Aristida adscensionis</i>	34.33±0.00	34.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34.33±0.00	34.33±0.00	0.00
<i>Artemisia carvifolia</i>	18.50±7.50	18.50±7.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.50±7.50	18.50±7.50	0.00
<i>Arundinella bengalensis</i>	31.00±3.92	31.00±3.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.00±3.92	31.00±3.92	0.00
<i>Axonopus compressus</i>	79.75±12.93	105.08±17.82	54.42±5.92	30.17±5.58	42.58±6.52	17.75±0.34	17.63±2.61	23.08±3.36	12.17±0.87	127.54±20.71	170.75±26.75	84.33±6.37
<i>Azolla pinnata</i>	20.83±3.01	23.83±3.69	14.83±0.17	2.89±0.51	3.00±0.69	2.67±1.00	3.93±1.12	4.42±1.30	2.00±0.00	27.00±3.47	31.25±3.37	18.50±2.17
<i>Bacopa monnieri</i>	3.33±0.00	0.00	3.33±0	0.00	0.00	0.00	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00
<i>Blumea lacera</i>	1.00±0.00	0.00	1±0	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00
<i>Boerhavia diffusa</i>	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00
<i>Brachiaria distachya</i>	105.83±23.17	105.83±23.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	105.83±23.17	105.83±23.17	0.00
<i>Brachiaria reptans</i>	75.33±0.00	75.33±0.00	0.00	32.67±0.00	32.67±0.00	0.00	0.00	0.00	0.00	108.00±0.00	108.00±0.00	0.00
<i>Cajanus scarabaeoides</i>	3.33±0.00	0.00	3.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00
<i>Capillipedium assimile</i>	12.17±1.83	0.00	12.17±1.83	0.00	0.00	0.00	0.00	0.00	0.00	12.17±1.83	0.00	12.17±1.83
<i>Capsella bursa-pastoris</i>	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Cardiospermum halicacabum</i>	24.33±0.67	24.33±0.67	0.00	6.17±1.50	6.17±1.50	0.00	0.00	0.00	0.00	30.50±2.17	30.50±2.17	0.00
<i>Carex vesicaria</i>	22.33±1.80	24.50±2.56	20.17±2.34	9.92±0.97	11.00±1.72	8.83±0.82	6.54±0.68	7.75±0.94	5.33±0.56	38.79±3.26	43.25±4.91	34.33±3.51
<i>Cenchrus ciliaris</i>	23.67±2.23	27.75±2.02	19.58±2.84	10.96±1.94	14.00±2.90	7.92±1.74	6.33±0.94	8.08±1.07	4.58±0.96	40.96±4.47	49.83±4.05	32.08±4.94
<i>Centella asiatica</i>	42.71±6.20	54.92±8.77	30.50±1.85	12.71±1.16	15.33±1.15	10.75±1.00	6.81±1.41	10.44±0.87	4.08±0.89	59.79±9.01	74.25±15.20	45.33±2.87
<i>Centipeda minima</i>	69.83±3.72	74.89±3.74	64.78±5.46	18.61±4.53	27.78±3.56	9.44±2.45	9.44±1.10	11.44±1.28	7.44±0.68	97.89±7.92	114.11±5.81	81.67±4.11
<i>Centothea lappacea</i>	16.67±0.00	0.00	16.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.67±0.00	0.00	16.67±0.00
<i>Ceratopteris thalictroides</i>	12.33±0.00	12.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.33±0.00	12.33±0.00	0.00
<i>Chenopodium album</i>	5.56±1.13	6.67±0.33	3.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.56±1.13	6.67±0.33	3.33±0.00
<i>Christella parasitica</i>	122.63±16.57	160.25±10.80	85.00±14.86	45.54±5.96	59.75±4.98	31.33±2.50	26.67±3.84	32.83±5.66	20.50±3.40	194.83±25.59	252.83±21.00	136.83±19.29
<i>Chromolaena odorata</i>	3.83±0.83	3.83±0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.83±0.83	3.83±0.83	0.00
<i>Chrysopogon aciculatus</i>	33.33±4.71	41.83±3.84	24.83±6.38	14.17±2.43	18.33±3.54	10.00±1.84	9.38±1.19	11.00±1.69	7.75±1.40	56.88±7.82	71.17±7.88	42.58±9.32
<i>Cissampelos pareira</i>	1.67±0.00	0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00
<i>Colocasia esculenta</i>	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Commelina benghalensis</i>	15.00±3.68	22.33±3.67	10.11±3.28	4.27±0.88	4.83±1.17	3.89±1.39	0.00	0.00	0.00	19.27±4.39	27.17±4.83	14.00±4.67
<i>Commelina diffusa</i>	5.00±0.00	0.00	5.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00±0.00	0.00	5.00±0.00
<i>Cotula hemisphaerica</i>	64.08±8.21	80.25±10.88	47.92±4.66	13.75±1.13	16.08±1.42	11.42±0.58	0.00	0.00	0.00	77.83±9.03	96.33±11.23	59.33±5.13
<i>Crassocephalum crepidioides</i>	1.00±0.00	0.00	1.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00
<i>Cuphea carthagenensis</i>	63.46±8.89	84.83±6.61	42.08±4.57	24.88±5.29	37.58±4.59	12.17±1.44	0.00	0.00	0.00	88.33±13.17	122.42±3.29	54.25±4.88
<i>Cyathula prostrata</i>	0.00	0.00	0.00	3.00±0.00	0.00	3.00±0.00	0.00	0.00	0.00	3.00±0.00	0.00	3.00±0.00
<i>Cynodon dactylon</i>	533.13±55.21	664.42±44.02	401.83±28.24	208.29±32.72	284.25±32.93	132.33±7.97	105.67±10.72	130.83±8.40	80.50±6.59	847.08±98.02	1079.50±84.00	614.67±42.07
<i>Cyperus compactus</i>	5.00±0.00	5.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00±0.00	5.00±0.00	0.00
<i>Cyperus compressus</i>	109.33±25.17	143.50±35.17	75.17±15.17	43.50±7.86	55.83±7.83	31.17±2.17	29.25±5.33	36.50±6.83	22.00±4.33	182.08±38.15	235.83±49.83	128.33±21.67
<i>Cyperus cyperoides</i>	15.44±4.75	19.83±3.17	6.67±0.00	6.44±0.48	6.83±0.50	5.67±0.00	0.00	0.00	0.00	21.89±5.02	26.67±2.67	12.33±0.00
<i>Cyperus difformis</i>	23.11±4.62	32.33±0.00	18.50±0.50	0.00	0.00	0.00	0.00	0.00	0.00	23.11±4.62	32.33±0.00	18.50±0.50
<i>Cyperus digitatus</i>	0.00	0.00	0.00	0.00	0.00	0.00	4.00±0.33	4.00±0.33	0.00	4.00±0.33	4.00±0.33	0.00
<i>Cyperus distans</i>	29.33±5.61	44.33±6.67	21.83±3.87	12.00±1.83	16.00±2.33	10.00±1.85	0.00	0.00	0.00	41.33±7.37	60.33±9.00	31.83±5.65
<i>Cyperus eleusinoides</i>	0.00	0.00	0.00	0.67±0.00	0.67±0.00	0.00	0.00	0.00	0.00	0.67±0.00	0.67±0.00	0.00
<i>Cyperus eragrostis</i>	48.48±5.46	54.42±5.99	40.56±9.06	19.24±2.42	21.67±3.67	16.00±2.19	14.90±2.12	15.50±3.81	14.11±1.39	82.62±8.75	91.58±11.91	70.67±11.26
<i>Cyperus imbricatus</i>	19.67±3.80	27.50±3.50	15.75±4.32	11.11±1.92	14.33±1.67	9.50±2.49	0.00	0.00	0.00	30.78±5.69	41.83±5.17	25.25±6.78
<i>Cyperus iria</i>	33.13±3.79	42.08±3.11	24.17±1.95	15.50±2.03	18.50±3.21	12.50±1.73	0.00	0.00	0.00	48.63±5.49	60.58±5.86	36.67±3.34
<i>Cyperus rotundus</i>	54.50±4.07	54.50±4.07	0.00	0.00	0.00	0.00	19.58±2.06	19.58±2.06	0.00	74.08±4.76	74.08±4.76	0.00
<i>Cyperus squarrosus</i>	32.92±4.82	43.17±3.29	22.67±5.25	12.92±1.67	14.75±3.09	11.08±1.08	8.83±1.10	11.08±1.18	6.58±0.96	54.67±7.21	69.00±7.37	40.33±7.18
<i>Cyperus strigosus</i>	0.00	0.00	0.00	4.67±0.00	4.67±0.00	0.00	0.00	0.00	0.00	4.67±0.00	4.67±0.00	0.00
<i>Cyperus tenuispica</i>	0.00	0.00	0.00	0.00	0.00	0.00	6.67±0.00	6.67±0.00	0.00	6.67±0.00	6.67±0.00	0.00
<i>Cyrtococcum oxyphyllum</i>	0.00	0.00	0.00	16.67±0.00	16.67±0.00	0.00	0.00	0.00	0.00	16.67±0.00	16.67±0.00	0.00
<i>Cyrtococcum patens</i>	7.89±1.83	9.50±1.50	4.67±0.00	3.56±0.80	4.33±0.33	2.00±0.00	0.00	0.00	0.00	11.44±2.61	13.83±1.83	6.67±0.00
<i>Dactylius glomerata</i>	4.67±0.00	4.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67±0.00	4.67±0.00	0.00

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Dactyloctenium aegyptium</i>	14.19±2.25	18.11±3.86	11.25±1.87	6.33±0.98	7.00±0.84	5.83±1.68	0.00	0.00	0.00	20.52±3.00	25.11±4.53	17.08±3.45
<i>Dentella repens</i>	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00
<i>Desmodium heterophyllum</i>	10.11±2.91	13.00±0.67	4.33±0.00	0.00	0.00	0.00	5.22±1.49	6.67±0.67	2.33±0.00	15.33±4.33	19.67±0.00	6.67±0.00
<i>Dichanthium annulatum</i>	38.42±4.52	38.83±9.53	38.00±2.12	15.17±1.81	16.50±3.72	13.83±0.59	0.00	0.00	0.00	53.58±5.82	55.33±12.23	51.83±2.53
<i>Dichrocephala integrifolia</i>	22.62±4.70	35.44±2.73	13.00±1.25	7.19±1.60	9.11±2.96	5.75±1.71	0.00	0.00	0.00	29.81±5.27	44.56±0.78	18.75±1.38
<i>Dicranopteris linearis</i>	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00
<i>Digitaria ciliaris</i>	192.50±20.98	243.75±10.22	141.25±14.06	66.88±8.84	87.08±9.21	46.67±2.81	43.50±5.30	54.83±6.20	32.17±2.70	302.88±34.36	385.67±24.64	220.08±18.23
<i>Digitaria setigera</i>	41.67±0.00	41.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41.67±0.00	41.67±0.00	0.00
<i>Digitaria violascens</i>	40.17±1.50	0.00	40.17±1.50	0.00	0.00	0.00	0.00	0.00	0.00	40.17±1.50	0.00	40.17±1.50
<i>Diplazium esculentum</i>	6.89±2.42	8.83±2.50	3.00±0.00	4.22±1.13	5.33±0.33	2.00±0.00	0.00	0.00	0.00	11.11±3.30	14.17±2.17	5.00±0.00
<i>Drymaria cordata</i>	0.00	0.00	0.00	3.33±0.00	3.33±0.00	0.00	0.00	0.00	0.00	3.33±0.00	3.33±0.00	0.00
<i>Duchesnea indica</i>	41.88±5.21	54.92±2.59	28.83±2.58	16.17±1.81	18.67±2.76	13.67±1.89	9.13±1.14	11.08±1.51	7.17±1.13	67.17±7.68	84.67±6.72	49.67±5.11
<i>Dysphania ambrosioides</i>	12.67±4.67	12.67±4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.67±4.67	12.67±4.67	0.00
<i>Echinochloa colona</i>	23.33±0.00	0.00	23.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.33±0.00	0.00	23.33±0.00
<i>Echinochloa crus-galli</i>	53.04±7.04	66.58±10.30	39.50±1.65	20.42±3.25	24.25±6.14	16.58±1.40	0.00	0.00	0.00	73.46±9.36	90.83±14.35	56.08±1.23
<i>Eclipta prostrata</i>	46.46±5.21	59.58±1.86	33.33±2.91	18.46±1.87	22.33±2.25	14.58±1.09	14.17±0.95	15.33±1.19	13.00±1.37	79.08±7.33	97.25±4.50	60.92±3.24
<i>Eichhornia crassipes</i>	7.96±1.20	9.33±1.98	6.58±1.24	3.67±0.42	4.17±0.52	3.17±0.62	2.83±0.39	3.33±0.41	2.33±0.61	14.46±1.78	16.83±2.60	12.08±2.06
<i>Eleocharis acutangula</i>	0.00	0.00	0.00	9.38±0.76	11.08±0.86	7.67±0.19	0.00	0.00	0.00	9.38±0.76	11.08±0.86	7.67±0.19
<i>Eleusine indica</i>	12.42±4.12	19.50±1.17	5.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.42±4.12	19.50±1.17	5.33±0.00
<i>Emilia sonchifolia</i>	5.33±0.00	5.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.33±0.00	5.33±0.00	0.00
<i>Enhydra fluctuans</i>	3.00±0.00	3.00±0.00	0.00	2.67±0.00	2.67±0.00	0.00	0.00	0.00	0.00	5.67±0.00	5.67±0.00	0.00
<i>Equisetum debile</i>	7.83±1.00	7.08±1.77	8.58±1.08	0.00	0.00	0.00	0.00	0.00	0.00	7.83±1.00	7.08±1.77	8.58±1.08
<i>Eragrostis amabilis</i>	18.83±1.83	18.83±1.83	0.00	9.00±3.00	9.00±3.00	0.00	0.00	0.00	0.00	27.83±4.83	27.83±4.83	0.00
<i>Eragrostis riparia</i>	28.56±9.54	36.00±10.33	13.67±0.00	12.11±0.56	11.83±0.83	12.67±0.00	0.00	0.00	0.00	40.67±9.02	47.83±9.50	26.33±0.00
<i>Eragrostis unioloides</i>	16.00±1.20	18.33±0.00	14.83±0.50	0.00	0.00	0.00	9.89±1.56	12.33±0.00	8.67±1.67	25.89±2.70	30.67±0.00	23.50±2.17
<i>Erigeron bonariensis</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.33±0.00	0.00	0.33±0.00	0.33±0.00	0.00	0.33±0.00
<i>Ethulia conyzoides</i>	104.04±11.89	127.50±15.11	80.58±8.02	37.63±5.60	50.50±5.44	24.75±2.45	25.71±2.89	30.25±4.55	21.17±2.11	167.38±19.70	208.25±23.56	126.50±11.95
<i>Euphorbia heterophylla</i>	5.67±0.00	0.00	5.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.67±0.00	0.00	5.67±0.00
<i>Euphorbia hirta</i>	34.52±6.69	43.67±12.50	27.67±6.47	12.10±1.63	13.67±2.69	10.92±2.14	11.38±2.16	14.56±3.42	9.00±2.45	58.00±10.34	71.89±18.56	47.58±10.83
<i>Euphorbia hypericifolia</i>	47.42±1.75	47.42±1.75	0.00	13.75±1.51	13.75±1.51	0.00	6.33±0.36	6.33±0.36	0.00	67.50±2.42	67.50±2.42	0.00
<i>Euphorbia thymifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	5.17±0.50	0.00	5.17±0.50	5.17±0.50	0.00	5.17±0.50
<i>Evolvulus nummularius</i>	35.25±5.05	45.58±5.29	24.92±4.47	9.88±1.46	12.17±1.82	7.58±1.76	0.00	0.00	0.00	45.13±6.11	57.75±6.54	32.50±5.02
<i>Fimbristylis aestivalis</i>	148.54±14.03	182.58±9.43	114.50±7.52	61.63±7.75	80.75±5.36	42.50±2.77	38.83±4.04	48.75±2.83	28.92±1.65	249.00±25.45	312.08±15.57	185.92±11.24
<i>Fimbristylis dichotoma</i>	15.00±0.00	15.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00±0.00	15.00±0.00	0.00
<i>Fimbristylis littoralis</i>	13.33±0.00	13.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.33±0.00	13.33±0.00	0.00
<i>Flemingia lineata</i>	14.24±2.60	17.83±3.63	9.44±0.87	3.52±0.67	4.33±0.71	2.44±1.06	0.00	0.00	0.00	17.76±2.80	22.17±3.31	11.89±1.72
<i>Floscopa scandens</i>	0.00	0.00	0.00	0.33±0.00	0.00	0.33±0.00	0.00	0.00	0.00	0.33±0.00	0.00	0.33±0.00
<i>Glinus lotoides</i>	36.67±8.30	56.00±19.00	27.00±4.34	11.89±1.28	14.00±3.67	10.83±0.88	0.00	0.00	0.00	48.56±9.42	70.00±22.67	37.83±4.60
<i>Glinus oppositifolius</i>	51.17±9.30	66.83±5.17	35.50±1.17	0.00	0.00	0.00	7.58±2.14	10.00±3.67	5.17±1.50	58.75±11.10	76.83±8.83	40.67±2.67
<i>Gnaphalium pensylvanicum</i>	42.83±7.00	53.50±3.83	32.17±7.17	14.75±2.57	18.50±0.50	11.00±3.33	0.00	0.00	0.00	57.58±9.46	72.00±3.33	43.17±10.50
<i>Grangea maderaspatana</i>	149.42±10.44	167.83±9.14	131.00±14.10	56.00±5.20	67.67±3.93	44.33±4.49	34.46±2.44	36.92±3.01	32.00±3.83	239.88±17.24	272.42±15.48	207.33±21.00
<i>Heliotropium indicum</i>	41.88±3.86	49.75±2.96	34.00±4.41	17.67±1.64	21.25±1.94	14.08±0.48	15.46±1.19	17.92±0.55	13.00±1.51	75.00±6.29	88.92±4.49	61.08±5.92
<i>Heliotropium ovalifolium</i>	7.00±0.00	0.00	7.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00±0.00	0.00	7.00±0.00
<i>Heliotropium strigosum</i>	6.33±0.00	6.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33±0.00	6.33±0.00	0.00
<i>Hemarthra compressa</i>	245.25±28.54	311.67±19.28	178.83±22.12	98.67±12.45	127.33±11.05	70.00±7.30	66.46±6.51	80.67±6.89	52.25±3.94	410.38±46.86	519.67±34.97	301.08±32.54
<i>Houttuynia cordata</i>	1.00±0.00	0.00	1.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00
<i>Hydrocotyle sibthorpioides</i>	9.33±2.17	14.33±0.00	8.08±2.29	0.00	0.00	0.00	0.00	0.00	0.00	9.33±2.17	14.33±0.00	8.08±2.29
<i>Hymenachne amplexicaulis</i>	2.56±0.59	3.00±0.67	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.56±0.59	3.00±0.67	1.67±0.00
<i>Hyptis suaveolens</i>	58.71±8.45	65.67±15.54	51.75±7.70	16.57±2.23	20.33±4.14	13.75±1.64	12.67±1.41	15.89±0.68	10.25±1.47	84.29±12.91	92.83±25.16	75.75±9.80
<i>Ichnanthus pallens</i>	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Impatiens tripetala</i>	3.00±0.00	0.00	3.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00±0.00	0.00	3.00±0.00
<i>Imperata cylindrica</i>	94.58±12.14	123.42±4.37	65.75±10.72	35.88±7.53	54.33±6.01	17.42±1.07	22.75±2.99	27.58±4.69	17.92±2.02	153.21±21.48	205.33±14.23	101.08±11.83
<i>Isachne globosa</i>	12.53±3.13	17.17±7.83	9.44±0.48	9.87±2.86	15.83±4.50	5.89±0.87	0.00	0.00	0.00	22.40±5.87	33.00±12.33	15.33±1.35

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Juncus articulatus</i>	7.44±0.40	7.83±0.17	6.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.44±0.40	7.83±0.17	6.67±0.00
<i>Juncus prismatocarpus</i>	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00
<i>Kyllinga brevifolia</i>	75.00±10.64	99.83±9.40	50.17±5.36	22.96±2.55	27.33±2.69	18.58±3.21	3.42±0.71	5.00±0.71	1.83±0.40	101.38±13.37	132.17±11.50	70.58±8.37
<i>Laphangium luteoalbum</i>	73.92±9.63	98.08±3.56	49.75±5.57	24.04±2.18	28.67±1.63	19.42±2.28	17.13±2.07	20.75±2.98	13.50±1.51	115.08±12.97	147.50±4.53	82.67±7.97
<i>Leersia hexandra</i>	9.00±0.33	9.00±0.33	0.00	2.83±0.17	2.83±0.17	0.00	0.00	0.00	0.00	11.83±0.50	11.83±0.50	0.00
<i>Lepidagathis incurva</i>	0.00	0.00	0.00	5.67±1.67	7.33±0.00	4.00±0.00	6.83±1.50	8.33±0.00	5.33±0.00	12.50±3.17	15.67±0.00	9.33±0.00
<i>Leucas aspera</i>	13.08±1.14	15.17±1.61	11.00±0.72	0.00	0.00	0.00	0.00	0.00	0.00	13.08±1.14	15.17±1.61	11.00±0.72
<i>Leucostegia immersa</i>	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Limnobiium laevigatum</i>	31.56±3.98	32.25±5.94	30.17±4.83	10.67±1.80	11.92±2.56	8.17±0.17	8.06±0.69	7.92±1.07	8.33±0.33	50.28±5.53	52.08±8.36	46.67±4.33
<i>Lindernia crustacea</i>	196.00±16.65	239.25±6.21	152.75±2.85	81.33±9.65	104.33±7.45	58.33±5.14	50.04±4.81	60.75±4.93	39.33±2.71	327.38±30.60	404.33±18.03	250.42±9.79
<i>Lindernia ruelliioides</i>	26.17±1.17	26.17±1.17	0.00	14.50±1.17	14.50±1.17	0.00	0.00	0.00	0.00	40.67±2.33	40.67±2.33	0.00
<i>Ludwigia adscendens</i>	12.42±1.31	14.00±2.00	10.83±1.17	0.00	0.00	0.00	0.00	0.00	0.00	12.42±1.31	14.00±2.00	10.83±1.17
<i>Ludwigia octovalvis</i>	17.83±5.17	17.83±5.17	0.00	10.83±2.17	10.83±2.17	0.00	0.00	0.00	0.00	28.67±7.33	28.67±7.33	0.00
<i>Lygodium flexuosum</i>	34.21±5.86	45.00±7.89	23.42±4.49	12.63±2.22	17.33±2.77	7.92±0.75	6.17±1.25	8.42±1.87	3.92±0.66	53.00±8.76	70.75±10.97	35.25±5.25
<i>Lygodium microphyllum</i>	12.00±3.33	15.33±0.00	8.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00±3.33	15.33±0.00	8.67±0.00
<i>Marsilea quadrifolia</i>	26.00±4.05	28.58±5.69	20.83±3.50	7.94±1.11	9.00±1.33	5.83±1.17	8.00±0.98	8.50±1.40	7.00±1.00	41.94±5.72	46.08±7.69	33.67±5.67
<i>Mazus pumilus</i>	70.67±6.39	85.67±7.81	59.42±3.74	17.33±2.8	22.11±5.50	13.75±1.51	13.48±0.48	14.22±0.95	12.92±0.32	101.48±8.96	122.00±12.68	86.08±4.07
<i>Mecardonia procumbens</i>	72.39±12.93	85.75±15.32	45.67±5.33	19.00±2.75	21.25±3.30	14.50±4.17	14.61±2.15	15.83±3.12	12.17±1.50	106.00±17.22	122.83±20.92	72.33±11.00
<i>Melilotus albus</i>	3.17±1.50	3.17±1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.17±1.50	3.17±1.50	0.00
<i>Merremia umbellata</i>	99.54±16.56	139.17±11.20	59.92±10.35	29.38±5.26	42.00±4.44	16.75±1.74	22.29±3.38	28.67±5.04	15.92±0.91	151.21±24.35	209.83±17.69	92.58±12.80
<i>Mikania micrantha</i>	33.04±5.81	43.25±5.80	22.83±7.36	13.04±2.46	18.00±2.61	8.08±2.22	0.00	0.00	0.00	46.08±7.71	61.25±6.98	30.92±8.67
<i>Monochoria hastata</i>	3.33±0.00	3.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33±0.00	3.33±0.00	0.00
<i>Nelsonia canescens</i>	3.67±0.67	0.00	3.67±0.67	4.33±0.33	0.00	4.33±0.33	0.00	0.00	0.00	8.00±1.00	0.00	8.00±1.00
<i>Nymphoides cristata</i>	4.00±0.00	4.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00
<i>Oldenlandia lineata</i>	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00
<i>Oldenlandia tenelliflora</i>	0.00	0.00	0.00	12.00±0.00	0.00	12.00±0.00	0.00	0.00	0.00	12.00±0.00	0.00	12.00±0.00
<i>Onychium japonicum</i>	15.00±0.00	0.00	15.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00±0.00	0.00	15.00±0.00
<i>Oplismenus burmanni</i>	40.93±5.16	48.67±3.76	29.33±0.00	15.00±2.60	18.56±2.56	9.67±0.67	8.67±0.86	10.00±0.51	6.67±0.00	64.60±8.31	77.22±5.57	45.67±0.67
<i>Oplismenus compositus</i>	82.67±0.00	82.67±0.00	0.00	32.67±0.00	32.67±0.00	0.00	0.00	0.00	0.00	115.33±0.00	115.33±0.00	0.00
<i>Ottochloa nodosa</i>	0.00	0.00	0.00	1.00±0.00	1.00±0.00	0.00	0.00	0.00	0.00	1.00±0.00	1.00±0.00	0.00
<i>Oxalis corniculata</i>	220.04±20.38	271.33±9.75	168.75±9.49	82.38±10.87	106.25±10.87	58.50±7.32	53.08±4.88	63.83±4.39	42.33±3.86	355.50±35.39	441.42±22.83	269.58±20.03
<i>Oxalis debilis</i>	0.00	0.00	0.00	6.00±1.67	6.00±1.67	0.00	6.33±0.00	6.33±0.00	0.00	12.33±1.67	12.33±1.67	0.00
<i>Oxalis latifolia</i>	1.67±0.00	0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00
<i>Panicum auritum</i>	9.67±0.00	9.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.67±0.00	9.67±0.00	0.00
<i>Panicum brevifolium</i>	57.00±0.00	0.00	57.00±0.00	22.67±0.00	0.00	22.67±0.00	0.00	0.00	0.00	79.67±0.00	0.00	79.67±0.00
<i>Panicum notatum</i>	71.22±15.54	115.83±21.50	48.92±5.43	24.78±5.18	39.33±8.33	17.50±1.60	0.00	0.00	0.00	96.00±20.67	155.17±29.83	66.42±6.69
<i>Parthenium hysterophorus</i>	6.29±0.74	7.25±0.95	5.33±1.01	3.29±0.35	3.92±0.52	2.67±0.24	0.00	0.00	0.00	9.58±0.97	11.17±1.29	8.00±1.04
<i>Paspalidium flavidum</i>	24.50±5.24	24.67±11.67	24.33±5.33	0.00	0.00	0.00	0.00	0.00	0.00	24.50±5.24	24.67±11.67	24.33±5.33
<i>Paspalum conjugatum</i>	197.42±26.67	261.67±18.65	133.17±14.81	71.58±11.98	97.42±14.41	45.75±4.17	44.17±6.00	57.50±6.38	30.83±3.00	313.17±43.55	416.58±35.95	209.75±20.74
<i>Paspalum dilatatum</i>	41.17±11.58	59.17±12.50	23.17±0.50	0.00	0.00	0.00	0.00	0.00	0.00	41.17±11.58	59.17±12.50	23.17±0.50
<i>Paspalum scrobiculatum</i>	33.00±0.00	33.00±0.00	0.00	9.00±0.00	9.00±0.00	0.00	0.00	0.00	0.00	42.00±0.00	42.00±0.00	0.00
<i>Peperomia pellucida</i>	94.92±12.13	121.50±11.64	68.33±8.93	25.54±4.09	32.67±6.27	18.42±2.25	17.50±1.59	20.08±2.65	14.92±0.60	137.96±16.30	174.25±17.87	101.67±6.52
<i>Persicaria barbata</i>	9.33±0.96	8.50±0.83	11.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.33±0.96	8.50±0.83	11.00±0.00
<i>Persicaria chinensis</i>	1.33±0.00	1.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33±0.00	1.33±0.00	0.00
<i>Persicaria hydropiper</i>	28.54±3.88	38.42±2.08	18.67±0.91	14.75±1.53	17.25±1.89	12.25±1.78	12.25±1.41	13.92±2.10	10.58±1.73	55.54±5.58	69.58±1.74	41.50±3.27
<i>Persicaria orientalis</i>	7.83±1.17	7.83±1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.83±1.17	7.83±1.17	0.00
<i>Phyla nodiflora</i>	9.25±2.87	13.67±3.00	4.83±1.17	2.33±0.59	2.83±1.17	1.83±0.50	2.00±0.58	3.00±0.00	1.00±0.00	13.58±3.56	19.50±1.83	7.67±1.67
<i>Phyllanthus niruri</i>	278.75±29.98	348.25±19.25	209.25±24.56	98.71±12.82	127.50±13.18	69.92±6.40	65.71±6.46	81.08±5.51	50.33±2.58	443.17±48.62	556.83±36.25	329.50±33.22
<i>Phyllanthus virgatus</i>	0.00	0.00	0.00	4.00±0.00	0.00	4±0	0.00	0.00	0.00	4.00±0.00	0.00	4.00±0.00
<i>Physalis minima</i>	16.00±2.67	16.00±2.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.00±2.67	16.00±2.67	0.00
<i>Pistia stratiotes</i>	6.50±0.57	6.50±0.57	0.00	3.83±0.42	3.83±0.42	0.00	3.33±0.71	3.33±0.71	0.00	13.67±1.08	13.67±1.08	0.00
<i>Plantago major</i>	4.67±0.00	0.00	4.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67±0.00	0.00	4.67±0.00
<i>Plectranthus sp.</i>	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Poa annua</i>	0.00	0.00	0.00	9.33±0.67	10.00±0.00	8.67±0.00	7.17±1.83	9.00±0.00	5.33±0.00	16.50±2.50	19.00±0.00	14.00±0.00
<i>Polycarpon prostratum</i>	115.17±18.57	158.17±17.34	72.17±8.76	31.13±4.65	41.83±4.72	20.42±1.46	23.63±3.27	29.92±4.43	17.33±1.96	169.92±26.08	229.92±26.20	109.92±9.33
<i>Polygala arvensis</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00	1.67±0.00	0.00	1.67±0.00
<i>Polygonum plebeium</i>	262.00±29.41	331.25±24.80	192.75±14.94	90.83±11.81	116.92±12.66	64.75±6.08	58.13±5.84	70.75±6.57	45.50±3.12	410.96±46.81	518.92±43.30	303.00±24.06
<i>Polygonum posumbo</i>	10.17±2.83	10.17±2.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.17±2.83	10.17±2.83	0.00
<i>Portulaca oleracea</i>	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00
<i>Potentilla kleiniana</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00	1.67±0.00	0.00	1.67±0.00
<i>Pouzolzia zeylanica</i>	154.58±24.03	210.50±22.71	98.67±9.73	57.92±9.81	79.50±10.16	36.33±5.90	36.96±4.90	47.25±5.95	26.67±2.48	249.46±38.50	337.25±38.60	161.67±16.96
<i>Pycnus pumilus</i>	0.00	0.00	0.00	0.00	0.00	0.00	7.33±0.00	7.33±0.00	0.00	7.33±0.00	7.33±0.00	0.00
<i>Ranunculus cantoniensis</i>	4.67±0.00	4.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67±0.00	4.67±0.00	0.00
<i>Ranunculus sceleratus</i>	9.56±0.22	10.00±0.00	9.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.56±0.22	10.00±0.00	9.33±0.00
<i>Rorippa indica</i>	160.46±19.96	207.08±17.41	113.83±10.30	57.25±9.21	79.33±7.91	35.17±2.89	36.79±3.55	43.58±4.30	30.00±3.08	254.50±31.30	330.00±24.38	179.00±13.30
<i>Rumex dentatus</i>	2.67±0.43	0.00	2.67±0.43	0.00	0.00	0.00	0.00	0.00	0.00	2.67±0.43	0.00	2.67±0.43
<i>Rungia pectinata</i>	51.50±2.50	54.00±0.00	49.00±0.00	24.17±0.83	23.33±0.00	25.00±0.00	15.50±4.17	19.67±0.00	11.33±0.00	91.17±5.83	97.00±0.00	85.33±0.00
<i>Rungia repens</i>	26.33±7.41	32.83±15.17	19.83±3.83	0.00	0.00	0.00	0.00	0.00	0.00	26.33±7.41	32.83±15.17	19.83±3.83
<i>Saccharum spp.</i>	56.83±4.92	68.92±0.67	44.75±3.92	29.17±5.17	40.83±3.97	17.50±4.29	14.29±2.22	19.58±1.94	9.00±0.78	100.29±11.92	129.33±5.94	71.25±8.07
<i>Salvinia natans</i>	6.50±0.50	6.50±0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.50±0.50	6.50±0.50	0.00
<i>Scirpus mucronatus</i>	0.00	0.00	0.00	5.33±0.00	5.33±0.00	0.00	0.00	0.00	0.00	5.33±0.00	5.33±0.00	0.00
<i>Scleria terrestris</i>	50.79±8.38	69.92±6.67	31.67±6.25	20.17±3.40	27.08±3.86	13.25±2.68	0.00	0.00	0.00	70.96±10.72	97.00±6.51	44.92±6.46
<i>Senna tora</i>	2.11±0.40	2.33±0.00	2.00±0.67	0.00	0.00	0.00	0.00	0.00	0.00	2.11±0.40	2.33±0.00	2.00±0.67
<i>Setaria pumila</i>	133.96±17.35	173.92±16.70	94.00±7.79	54.33±8.41	71.75±9.97	36.92±5.30	33.79±4.64	43.25±5.15	24.33±3.78	222.08±30.10	288.92±31.31	155.25±16.39
<i>Setaria viridis</i>	37.33±0.00	37.33±0.00	0.00	16.00±0.00	16.00±0.00	0.00	0.00	0.00	0.00	53.33±0.00	53.33±0.00	0.00
<i>Sida acuta</i>	4.83±1.50	4.83±1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.83±1.50	4.83±1.50	0.00
<i>Solanum americanum</i>	15.46±1.78	17.42±3.10	13.50±1.62	9.42±1.00	10.17±2.05	8.67±0.33	7.79±0.88	8.58±1.47	7.00±1.01	32.67±3.40	36.17±6.42	29.17±2.15
<i>Solanum viarum</i>	11.96±1.92	13.25±3.73	10.67±1.50	6.75±1.10	8.33±1.68	5.17±1.06	0.00	0.00	0.00	18.71±2.97	21.58±5.41	15.83±2.51
<i>Sonchus oleraceus</i>	1.00±0.00	1.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	1.00±0.00	0.00
<i>Spermacoce pusilla</i>	1.75±0.66	2.83±0.50	0.67±0.00	0.83±0.32	1.33±0.33	0.33±0.00	0.00	0.00	0.00	2.58±0.98	4.17±0.83	1.00±0.00
<i>Spirodela polyrrhiza</i>	10.78±0.82	10.67±0.84	10.89±1.64	3.61±0.58	3.22±0.40	4.00±1.17	0.00	0.00	0.00	14.39±1.10	13.89±1.13	14.89±2.12
<i>Sporobolus diandrus</i>	15.11±6.85	19.33±9.33	6.89±1.68	6.89±1.68	8.50±0.83	3.67±0.00	0.00	0.00	0.00	22.00±8.28	27.83±10.17	10.33±0.00
<i>Sporobolus fertilis</i>	8.00±2.28	9.50±4.83	6.50±1.83	0.00	0.00	0.00	0.00	0.00	0.00	8.00±2.28	9.50±4.83	6.50±1.83
<i>Stellaria media</i>	18.14±3.30	24.67±4.93	13.25±2.71	10.24±2.12	13.78±4.08	7.58±1.37	0.00	0.00	0.00	28.38±5.29	38.44±8.99	20.83±3.66
<i>Synedrella nodiflora</i>	3.67±0.91	5.00±0.67	2.33±1.00	0.00	0.00	0.00	3.67±0.91	0.00	0.00	3.67±0.91	5.00±0.67	2.33±1.00
<i>Tetrastigma dubium</i>	4.00±0.00	4.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00
<i>Themeda spp.</i>	6.75±0.28	6.92±0.57	6.58±0.16	3.71±0.41	4.17±0.62	3.25±0.52	0.00	0.00	0.00	10.46±0.54	11.08±0.95	9.83±0.44
<i>Thespis divaricata</i>	17.60±4.59	25.83±5.83	12.11±4.61	7.60±2.41	10.00±5.67	6.00±2.33	0.00	0.00	0.00	25.20±6.78	35.83±11.50	18.11±6.82
<i>Tridax procumbens</i>	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Typhonium trilobatum</i>	0.67±0.00	0.00	0.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67±0.00	0.00	0.67±0.00
<i>Urochloa panicoides</i>	17.00±0.00	17.00±0.00	0.00	11.67±0.00	11.67±0.00	0.00	3.33±0.00	3.33±0.00	0.00	32.00±0.00	32.00±0.00	0.00
<i>Verbena officinalis</i>	3.00±0.00	3.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00±0.00	3.00±0.00	0.00
<i>Vicia sativa</i>	7.00±0.00	7.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00±0.00	7.00±0.00	0.00
<i>Xanthium strumarium</i>	7.05±0.97	8.89±1.54	5.67±0.78	3.95±0.84	4.89±1.94	3.25±0.46	0.00	0.00	0.00	11.00±1.63	13.78±2.98	8.92±1.24
<i>Youngia japonica</i>	1.33±0.00	1.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33±0.00	1.33±0.00	0.00
UI 1	0.00	0.00	0.00	0.00	0.00	0.00	3.67±0.00	3.67±0.00	0.00	3.67±0.00	3.67±0.00	0.00
UI 2	6.33±1.00	0.00	6.33±1.00	3.33±0.33	0.00	3.33±0.33	0.00	0.00	0.00	9.67±1.33	0.00	9.67±1.33
UI 3	2.67±0.00	2.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67±0.00	2.67±0.00	0.00
UI 4	0.00	0.00	0.00	1.33±0.00	0.00	1.33±0.00	0.00	0.00	0.00	1.33±0.00	0.00	1.33±0.00
UI 5	28.88±2.81	26.17±4.79	31.58±2.99	13.08±2.57	14.08±5.02	12.08±2.20	0.00	0.00	0.00	41.96±4.65	40.25±8.64	43.67±4.95
UI 6	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
UI 7	0.00	0.00	0.00	0.00	0.00	0.00	5.00±0.00	5.00±0.00	0.00	5.00±0.00	5.00±0.00	0.00
UI 8	18.50±3.43	25.33±2.00	11.67±2.85	5.39±1.13	7.33±1.17	3.44±1.11	3.67±0.71	5.00±0.51	2.33±0.69	27.56±4.83	37.67±2.14	17.44±3.11
UI 10	8.67±1.25	10.50±1.17	6.83±1.17	3.75±1.58	5.83±2.50	1.67±0.00	2.17±0.59	3.17±0.17	1.17±0.17	14.58±2.91	19.50±1.17	9.67±1.00
UI 11	11.83±0.17	11.83±0.17	0.00	4.17±0.17	4.17±0.17	0.00	0.00	0.00	0.00	16.00±0.00	16.00±0.00	0.00
UI 12	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
UI 13	2.33±0.00	2.33±0.00	0.00	0.67±0.00	0.67±0.00	0.00	0.00	0.00	0.00	3.00±0.00	3.00±0.00	0.00
UI 14	6.67±0.00	0.00	6.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.67±0.00	0.00	6.67±0.00
UI 16	1.00±0.00	0.00	1.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00
UI 17	10.20±1.73	12.67±1.39	6.50±1.17	0.00	0.00	0.00	5.07±0.91	5.56±1.46	4.33±1.00	15.27±2.32	18.22±2.35	10.83±2.17
UI 18	2.00±0.00	2.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00±0.00	2.00±0.00	0.00
UI 19	3.00±0.00	3.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00±0.00	3.00±0.00	0.00
UI 20	0.00	0.00	0.00	3.33±0.00	3.33±0.00	0.00	0.00	0.00	0.00	3.33±0.00	3.33±0.00	0.00
UI 21	9.50±1.50	9.50±1.50	0.00	2.83±0.83	2.83±0.83	0.00	0.00	0.00	0.00	12.33±2.33	12.33±2.33	0.00
UI 22	0.00	0.00	0.00	2.33±0.00	2.33±0.00	0.00	0.00	0.00	0.00	2.33±0.00	2.33±0.00	0.00
UI 24	8.33±0.00	0.00	8.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.33±0.00	0.00	8.33±0.00
UI 25	14.67±0.00	14.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.67±0.00	14.67±0.00	0.00
UI 26	8.00±0.00	8.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00±0.00	8.00±0.00	0.00
UI 27	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00
UI 28	2.00±0.00	0.00	2.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00±0.00	0.00	2.00±0.00
UI 29	9.80±0.65	9.33±0.33	10.11±1.11	0.00	0.00	0.00	0.00	0.00	0.00	9.80±0.65	9.33±0.33	10.11±1.11
UK (premature mortality)	278.42±36.39	367.17±24.82	189.67±17.67	90.83±17.91	134.08±14.25	47.58±6.88	27.50±5.46	39.42±6.22	15.58±2.35	396.75±59.42	540.67±44.72	252.83±25.84

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.18. Overall and seasonal plant species seed abundances and densities (m⁻²) recorded from different soil layers of riverine alluvial grasslands soil seed bank given natural treatment during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers															Total								
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D		
<i>Achyranthes aspera</i>	10	1.97	0	0.00	10	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	0.66	0	0.00	10	1.31
<i>Acmella uliginosa</i>	453	89.05	278	109.30	175	68.81	198	38.92	109	42.86	89	34.99	0	0.00	0	0.00	0	0.00	651	42.66	387	50.72	264	34.60
<i>Acroceras zizanioides</i>	792	155.70	568	223.32	224	88.07	254	49.93	199	78.24	55	21.62	157	30.86	112	44.04	45	17.69	1203	78.83	879	115.20	324	42.46
<i>Acroceras munroanum</i>	54	10.62	0	0.00	54	21.23	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	54	3.54	0	0.00	54	7.08
<i>Adiantum caudatum</i>	655	128.76	462	181.65	193	75.88	217	42.66	136	53.47	81	31.85	100	19.66	65	25.56	35	13.76	972	63.69	663	86.89	309	40.50
<i>Adiantum philippense</i>	75	14.74	75	29.49	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	75	4.91	75	9.83	0	0.00
<i>Ageratum conyzoides</i>	1016	199.73	658	258.71	358	140.76	413	81.19	253	99.47	160	62.91	240	47.18	157	61.73	83	32.63	1669	109.37	1068	139.97	601	78.77
<i>Alpinia nigra</i>	74	14.55	51	20.05	23	9.04	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	74	4.85	51	6.68	23	3.01
<i>Alternanthera philoxeroides</i>	88	17.30	88	34.60	0	0.00	0	0.00	0	0.00	0	0.00	43	8.45	43	16.91	0	0.00	131	8.58	131	17.17	0	0.00
<i>Alternanthera pungens</i>	1320	259.50	773	303.92	547	215.07	416	81.78	235	92.40	181	71.16	0	0.00	0	0.00	0	0.00	1736	113.76	1008	132.11	728	95.41
<i>Alternanthera sessilis</i>	3388	666.04	2226	875.21	1162	456.87	1136	223.32	774	304.32	362	142.33	711	139.77	455	178.89	256	100.65	5235	343.04	3455	452.81	1780	233.28
<i>Amaranthus spinosus</i>	142	27.92	73	28.70	69	27.13	85	16.71	47	18.48	38	14.94	0	0.00	0	0.00	0	0.00	227	14.88	120	15.73	107	14.02
<i>Amaranthus viridis</i>	336	66.05	206	80.99	130	51.11	145	28.51	89	34.99	56	22.02	0	0.00	0	0.00	0	0.00	481	31.52	295	38.66	186	24.38
<i>Ampelopteris prolifera</i>	409	80.40	409	160.81	0	0.00	146	28.70	146	57.40	0	0.00	0	0.00	0	0.00	0	0.00	555	36.37	555	72.74	0	0.00
<i>Anagallis arvensis</i>	7	1.38	0	0.00	7	2.75	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	7	0.46	0	0.00	7	0.92
<i>Apluda mutica</i>	1851	363.88	1266	497.76	585	230.01	573	112.64	422	165.92	151	59.37	314	61.73	213	83.75	101	39.71	2738	179.42	1901	249.14	837	109.70
<i>Aristida adscensionis</i>	76	14.94	76	29.88	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	76	4.98	76	9.96	0	0.00
<i>Artemisia carvifolia</i>	56	11.01	56	22.02	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	56	3.67	56	7.34	0	0.00
<i>Arundinella bengalensis</i>	251	49.34	251	98.69	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	251	16.45	251	32.90	0	0.00
<i>Axonopus compressus</i>	1390	273.26	934	367.22	456	179.29	556	109.30	408	160.42	148	58.19	266	52.29	181	71.16	85	33.42	2212	144.95	1523	199.60	689	90.30
<i>Bacopa monnieri</i>	10	1.97	0	0.00	10	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	0.66	0	0.00	10	1.31
<i>Blumea lacera</i>	3	0.59	0	0.00	3	1.18	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.20	0	0.00	3	0.39
<i>Brachiaria distachya</i>	635	124.83	635	249.67	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	635	41.61	635	83.22	0	0.00
<i>Brachiaria reptans</i>	143	28.11	143	56.22	0	0.00	55	10.81	55	21.62	0	0.00	0	0.00	0	0.00	0	0.00	198	12.97	198	25.95	0	0.00
<i>Cajanus scarabaeoides</i>	10	1.97	0	0.00	10	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	0.66	0	0.00	10	1.31

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Eragrostis amabilis</i>	113	22.21	113	44.43	0	0.00	54	10.62	54	21.23	0	0.00	0	0.00	0	0.00	0	0.00	167	10.94	167	21.89	0	0.00
<i>Eragrostis riparia</i>	208	40.89	183	71.95	25	9.83	72	14.15	51	20.05	21	8.26	0	0.00	0	0.00	0	0.00	280	18.35	234	30.67	46	6.03
<i>Eragrostis uniolioides</i>	89	17.50	39	15.33	50	19.66	0	0.00	0	0.00	0	0.00	51	10.03	22	8.65	29	11.40	140	9.17	61	7.99	79	10.35
<i>Erigeron bonariensis</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.20	0	0.00	1	0.39	1	0.07	0	0.00	1	0.13
<i>Ethulia conyzoides</i>	1762	346.39	1117	439.18	645	253.60	640	125.82	448	176.14	192	75.49	398	78.24	251	98.69	147	57.80	2800	183.48	1816	238.00	984	128.96
<i>Euphorbia heterophylla</i>	17	3.34	0	0.00	17	6.68	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	17	1.11	0	0.00	17	2.23
<i>Euphorbia hirta</i>	498	97.90	282	110.88	216	84.93	155	30.47	86	33.81	69	27.13	154	30.27	95	37.35	59	23.20	807	52.88	463	60.68	344	45.08
<i>Euphorbia hypericifolia</i>	438	86.11	438	172.21	0	0.00	165	32.44	165	64.87	0	0.00	76	14.94	76	29.88	0	0.00	679	44.49	679	88.99	0	0.00
<i>Euphorbia thymifolia</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	31	6.09	0	0.00	31	12.19	31	2.03	0	0.00	31	4.06
<i>Evolvulus nummularius</i>	697	137.02	474	186.36	223	87.68	186	36.57	118	46.39	68	26.74	0	0.00	0	0.00	0	0.00	883	57.86	592	77.59	291	38.14
<i>Fimbristylis aestivalis</i>	2509	493.24	1589	624.75	920	361.72	1034	203.27	711	279.55	323	127.00	571	112.25	375	147.44	196	77.06	4114	269.59	2675	350.58	1439	188.59
<i>Fimbristylis dichotoma</i>	45	8.85	45	17.69	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	45	2.95	45	5.90	0	0.00
<i>Fimbristylis littoralis</i>	21	4.13	21	8.26	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	21	1.38	21	2.75	0	0.00
<i>Flemingia lineata</i>	299	58.78	214	84.14	85	33.42	74	14.55	52	20.45	22	8.65	0	0.00	0	0.00	0	0.00	373	24.44	266	34.86	107	14.02
<i>Floscopa scandens</i>	0	0.00	0	0.00	0	0.00	1	0.20	0	0.00	1	0.39	0	0.00	0	0.00	0	0.00	1	0.07	0	0.00	1	0.13
<i>Glinus lotoides</i>	498	97.90	260	102.23	238	93.58	145	28.51	56	22.02	89	34.99	0	0.00	0	0.00	0	0.00	643	42.14	316	41.41	327	42.86
<i>Glinus oppositifolius</i>	496	97.51	331	130.14	165	64.87	0	0.00	0	0.00	0	0.00	59	11.60	40	15.73	19	7.47	555	36.37	371	48.62	184	24.11
<i>Gnaphalium pensylvanicum</i>	514	101.05	321	126.21	193	75.88	177	34.80	111	43.64	66	25.95	0	0.00	0	0.00	0	0.00	691	45.28	432	56.62	259	33.94
<i>Grangea maderaspatana</i>	2619	514.86	1497	588.58	1122	441.14	930	182.83	571	224.50	359	141.15	534	104.98	307	120.70	227	89.25	4083	267.56	2375	311.26	1708	223.85
<i>Heliotropium indicum</i>	664	130.53	403	158.45	261	102.62	279	54.85	169	66.45	110	43.25	242	47.57	144	56.62	98	38.53	1185	77.65	716	93.84	469	61.47
<i>Heliotropium ovalifolium</i>	42	8.26	0	0.00	42	16.51	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	42	2.75	0	0.00	42	5.50
<i>Heliotropium strigosum</i>	19	3.74	19	7.47	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	19	1.25	19	2.49	0	0.00
<i>Hemarthra compressa</i>	4090	804.04	2706	1063.93	1384	544.15	1548	304.32	1038	408.12	510	200.52	911	179.09	580	228.04	331	130.14	6549	429.15	4324	566.70	2225	291.60
<i>Houttuynia cordata</i>	3	0.59	0	0.00	3	1.18	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.20	0	0.00	3	0.39
<i>Hydrocotyle sibthorpioides</i>	140	27.52	43	16.91	97	38.14	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	140	9.17	43	5.64	97	12.71
<i>Hymenachne amplexicaulis</i>	23	4.52	18	7.08	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	23	1.51	18	2.36	5	0.66
<i>Hyptis suaveolens</i>	1163	228.63	671	263.82	492	193.44	266	52.29	147	57.80	119	46.79	178	34.99	102	40.10	76	29.88	1607	105.31	920	120.57	687	90.04
<i>Impatiens tripetala</i>	9	1.77	0	0.00	9	3.54	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	9	0.59	0	0.00	9	1.18
<i>Imperata cylindrica</i>	1538	302.35	1001	393.57	537	211.13	586	115.20	470	184.79	116	45.61	324	63.69	210	82.57	114	44.82	2448	160.42	1681	220.31	767	100.52
<i>Isachne globosa</i>	116	22.80	70	27.52	46	18.09	109	21.43	75	29.49	34	13.37	0	0.00	0	0.00	0	0.00	225	14.74	145	19.00	80	10.48
<i>Juncus articulatus</i>	36	7.08	26	10.22	10	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	36	2.36	26	3.41	10	1.31
<i>Kyllinga brevifolia</i>	1246	244.95	847	333.02	399	156.88	379	74.51	236	92.79	143	56.22	82	16.12	60	23.59	22	8.65	1707	111.86	1143	149.80	564	73.92
<i>Laphangium luteoalbum</i>	1473	289.57	980	385.31	493	193.84	441	86.69	261	102.62	180	70.77	275	54.06	173	68.02	102	40.10	2189	143.44	1414	185.32	775	101.57
<i>Lepidagathis incurva</i>	0	0.00	0	0.00	0	0.00	34	6.68	22	8.65	12	4.72	41	8.06	25	9.83	16	6.29	75	4.91	47	6.16	28	3.67
<i>Leucas aspera</i>	239	46.98	141	55.44	98	38.53	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	239	15.66	141	18.48	98	12.84
<i>Leucostegia immersa</i>	5	0.98	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.33	5	0.66	0	0.00
<i>Lindernia crustacea</i>	3413	670.95	2110	829.60	1303	512.31	1357	266.77	894	351.50	463	182.04	797	156.68	503	197.77	294	115.59	5567	364.80	3507	459.62	2060	269.98
<i>Lindernia ruelliioides</i>	157	30.86	157	61.73	0	0.00	87	17.10	87	34.21	0	0.00	0	0.00	0	0.00	0	0.00	244	15.99	244	31.98	0	0.00
<i>Ludwigia adscendens</i>	79	15.53	50	19.66	29	11.40	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	79	5.18	50	6.55	29	3.80
<i>Ludwigia octovalvis</i>	107	21.03	107	42.07	0	0.00	65	12.78	65	25.56	0	0.00	0	0.00	0	0.00	0	0.00	172	11.27	172	22.54	0	0.00
<i>Lygodium flexuosum</i>	517	101.64	341	134.07	176	69.20	207	40.69	143	56.22	64	25.16	98	19.27	69	27.13	29	11.40	822	53.86	553	72.48	269	35.25
<i>Lygodium microphyllum</i>	72	14.15	46	18.09	26	10.22	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	72	4.72	46	6.03	26	3.41
<i>Mazus pumilus</i>	1232	242.20	677	266.18	555	218.21	280	55.04	157	61.73	123	48.36	175	34.40	85	33.42	90	35.39	1687	110.55	919	120.44	768	100.65
<i>Mecardonia procumbens</i>	1093	214.87	890	349.93	203	79.81	283	55.63	216	84.93	67	26.34	168	33.03	127	49.93	41	16.12	1544	101.18	1233	161.59	311	40.76
<i>Melilotus albus</i>	19	3.74	19	7.47	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	19	1.25	19	2.49	0	0.00
<i>Merremia umbellata</i>	1725	339.11	1208	474.95	517	203.27	514	101.05	390	153.34	124	48.75	322	63.30	209	82.17	113	44.43	2561	167.82	1807	236.82	754	98.82
<i>Mikania micrantha</i>	560	110.09	361	141.94	199	78.24	246	48.36	168	66.05	78	30.67	0	0.00	0	0.00								

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Vicia sativa</i>	21	4.13	21	8.26	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	21	1.38	21	2.75	0	0.00
<i>Xanthium strumarium</i>	148	29.09	80	31.45	68	26.74	83	16.32	44	17.30	39	15.33	0	0.00	0	0.00	0	0.00	231	15.14	124	16.25	107	14.02
<i>Youngia japonica</i>	4	0.79	4	1.57	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	4	0.26	4	0.52	0	0.00
UI 1	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	11	2.16	11	4.32	0	0.00	11	0.72	11	1.44	0	0.00
UI 2	18	3.54	0	0.00	18	7.08	20	3.93	0	0.00	20	7.86	0	0.00	0	0.00	0	0.00	38	2.49	0	0.00	38	4.98
UI 3	8	1.57	8	3.15	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	8	0.52	8	1.05	0	0.00
UI 4	0	0.00	0	0.00	0	0.00	4	0.79	0	0.00	4	1.57	0	0.00	0	0.00	0	0.00	4	0.26	0	0.00	4	0.52
UI 5	476	93.58	224	88.07	252	99.08	245	48.16	131	51.51	114	44.82	0	0.00	0	0.00	0	0.00	721	47.25	355	46.53	366	47.97
UI 6	0	0.00	0	0.00	0	0.00	5	0.98	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	5	0.33	5	0.66	0	0.00
UI 7	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	15	2.95	15	5.90	0	0.00	15	0.98	15	1.97	0	0.00
UI 8	258	50.72	180	70.77	78	30.67	67	13.17	48	18.87	19	7.47	48	9.44	33	12.97	15	5.90	373	24.44	261	34.21	112	14.68
UI 10	104	20.45	63	24.77	41	16.12	45	8.85	35	13.76	10	3.93	26	5.11	19	7.47	7	2.75	175	11.47	117	15.33	58	7.60
UI 11	71	13.96	71	27.92	0	0.00	25	4.91	25	9.83	0	0.00	0	0.00	0	0.00	0	0.00	96	6.29	96	12.58	0	0.00
UI 12	0	0.00	0	0.00	0	0.00	10	1.97	0	0.00	10	3.93	0	0.00	0	0.00	0	0.00	10	0.66	0	0.00	10	1.31
UI 14	20	3.93	0	0.00	20	7.86	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	20	1.31	0	0.00	20	2.62
UI 16	3	0.59	0	0.00	3	1.18	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.20	0	0.00	3	0.39
UI 17	153	30.08	114	44.82	39	15.33	0	0.00	0	0.00	0	0.00	76	14.94	50	19.66	26	10.22	229	15.01	164	21.49	65	8.52
UI 18	6	1.18	6	2.36	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	6	0.39	6	0.79	0	0.00
UI 19	9	1.77	9	3.54	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	9	0.59	9	1.18	0	0.00
UI 20	0	0.00	0	0.00	0	0.00	10	1.97	10	3.93	0	0.00	0	0.00	0	0.00	0	0.00	10	0.66	10	1.31	0	0.00
UI 21	42	8.26	42	16.51	0	0.00	12	2.36	12	4.72	0	0.00	0	0.00	0	0.00	0	0.00	54	3.54	54	7.08	0	0.00
UI 22	0	0.00	0	0.00	0	0.00	7	1.38	7	2.75	0	0.00	0	0.00	0	0.00	0	0.00	7	0.46	7	0.92	0	0.00
UI 25	44	8.65	44	17.30	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	44	2.88	44	5.77	0	0.00
UI 26	24	4.72	24	9.44	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	24	1.57	24	3.15	0	0.00
UI 27	0	0.00	0	0.00	0	0.00	12	2.36	12	4.72	0	0.00	0	0.00	0	0.00	0	0.00	12	0.79	12	1.57	0	0.00
UI 28	6	1.18	0	0.00	6	2.36	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	6	0.39	0	0.00	6	0.79
UI 29	147	28.90	56	22.02	91	35.78	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	147	9.63	56	7.34	91	11.93
UI (premature mortality)	5021	987.06	3418	1343.87	1603	630.26	1774	348.75	1317	517.81	457	179.68	475	93.38	351	138.00	124	48.75	7270	476.40	5086	666.56	2184	286.23

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.19. Overall and seasonal plant species total seed abundances recorded from different soil layers of riverine alluvial grasslands soil seed bank given natural treatment during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Achyranthes aspera</i>	3.33	0.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	3.33	0.00	3.33
<i>Acmella uliginosa</i>	151.00	92.67	58.33	66.00	36.33	29.67	0.00	0.00	0.00	217.00	129.00	88.00
<i>Acroceras zizanioides</i>	264.00	189.33	74.67	84.67	66.33	18.33	52.33	37.33	15.00	401.00	293.00	108.00
<i>Acroceras munroanum</i>	18.00	0.00	18.00	0.00	0.00	0.00	0.00	0.00	0.00	18.00	0.00	18.00
<i>Adiantum caudatum</i>	218.33	154.00	64.33	72.33	45.33	27.00	33.33	21.67	11.67	324.00	221.00	103.00
<i>Adiantum philippense</i>	25.00	25.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00	25.00	0.00
<i>Ageratum conyzoides</i>	338.67	219.33	119.33	137.67	84.33	53.33	80.00	52.33	27.67	556.33	356.00	200.33
<i>Alpinia nigra</i>	24.67	17.00	7.67	0.00	0.00	0.00	0.00	0.00	0.00	24.67	17.00	7.67
<i>Alternanthera philoxeroides</i>	29.33	29.33	0.00	0.00	0.00	0.00	14.33	14.33	0.00	43.67	43.67	0.00
<i>Alternanthera pungens</i>	440.00	257.67	182.33	138.67	78.33	60.33	0.00	0.00	0.00	578.67	336.00	242.67
<i>Alternanthera sessilis</i>	1129.33	742.00	387.33	378.67	258.00	120.67	237.00	151.67	85.33	1745.00	1151.67	593.33
<i>Amaranthus spinosus</i>	47.33	24.33	23.00	28.33	15.67	12.67	0.00	0.00	0.00	75.67	40.00	35.67
<i>Amaranthus viridis</i>	112.00	68.67	43.33	48.33	29.67	18.67	0.00	0.00	0.00	160.33	98.33	62.00

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Ampelopteris prolifera</i>	136.33	136.33	0.00	48.67	48.67	0.00	0.00	0.00	0.00	185.00	185.00	0.00
<i>Anagallis arvensis</i>	2.33	0.00	2.33	0.00	0.00	0.00	0.00	0.00	0.00	2.33	0.00	2.33
<i>Apluda mutica</i>	617.00	422.00	195.00	191.00	140.67	50.33	104.67	71.00	33.67	912.67	633.67	279.00
<i>Aristida adscensionis</i>	25.33	25.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.33	25.33	0.00
<i>Artemisia carvifolia</i>	18.67	18.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.67	18.67	0.00
<i>Arundinella bengalensis</i>	83.67	83.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	83.67	83.67	0.00
<i>Axonopus compressus</i>	463.33	311.33	152.00	185.33	136.00	49.33	88.67	60.33	28.33	737.33	507.67	229.67
<i>Bacopa monnieri</i>	3.33	0.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	3.33	0.00	3.33
<i>Blumea lacera</i>	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
<i>Brachiaria distachya</i>	211.67	211.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	211.67	211.67	0.00
<i>Brachiaria reptans</i>	47.67	47.67	0.00	18.33	18.33	0.00	0.00	0.00	0.00	66.00	66.00	0.00
<i>Cajanus scarabaeoides</i>	3.33	0.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	3.33	0.00	3.33
<i>Capillipedium assimile</i>	18.00	0.00	18.00	0.00	0.00	0.00	0.00	0.00	0.00	18.00	0.00	18.00
<i>Cardiospermum halicacabum</i>	36.67	36.67	0.00	12.33	12.33	0.00	0.00	0.00	0.00	49.00	49.00	0.00
<i>Carex vesicaria</i>	110.67	61.67	49.00	48.67	28.00	20.67	34.33	21.67	12.67	193.67	111.33	82.33
<i>Cenchrus ciliaris</i>	134.67	79.33	55.33	61.33	40.67	20.67	31.33	21.33	10.00	227.33	141.33	86.00
<i>Centella asiatica</i>	243.33	165.67	77.67	61.67	33.67	28.00	47.67	31.33	16.33	352.67	230.67	122.00
<i>Centipeda minima</i>	419.00	224.67	194.33	111.67	83.33	28.33	56.67	34.33	22.33	587.33	342.33	245.00
<i>Centotheca lappacea</i>	12.33	0.00	12.33	0.00	0.00	0.00	0.00	0.00	0.00	12.33	0.00	12.33
<i>Chenopodium album</i>	16.67	13.33	3.33	0.00	0.00	0.00	0.00	0.00	0.00	16.67	13.33	3.33
<i>Christella parasitica</i>	655.00	427.00	228.00	235.00	161.00	74.00	119.33	74.00	45.33	1009.33	662.00	347.33
<i>Chromolaena odorata</i>	7.67	7.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.67	7.67	0.00
<i>Chrysopogon aciculatus</i>	188.33	119.67	68.67	79.67	51.33	28.33	41.67	26.33	15.33	309.67	197.33	112.33
<i>Cissampelos pareira</i>	1.67	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	1.67
<i>Colocasia esculenta</i>	1.67	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Commelina benghalensis</i>	44.67	28.00	16.67	21.33	9.67	11.67	0.00	0.00	0.00	66.00	37.67	28.33
<i>Commelina diffusa</i>	5.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	5.00
<i>Cotula hemisphaerica</i>	408.67	272.00	136.67	110.00	64.33	45.67	0.00	0.00	0.00	518.67	336.33	182.33
<i>Crassocephalum crepidioides</i>	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
<i>Cuphea carthagenensis</i>	338.33	225.33	113.00	152.67	116.67	36.00	0.00	0.00	0.00	491.00	342.00	149.00
<i>Cyathula prostrata</i>	0.00	0.00	0.00	3.00	0.00	3.00	0.00	0.00	0.00	3.00	0.00	3.00
<i>Cynodon dactylon</i>	2998.00	1854.67	1143.33	1144.67	828.33	316.33	518.00	335.00	183.00	4660.67	3018.00	1642.67
<i>Cyperus compressus</i>	292.00	195.67	96.33	117.33	78.00	39.33	71.00	45.33	25.67	480.33	319.00	161.33
<i>Cyperus cyperoides</i>	23.00	19.33	3.67	10.00	7.33	2.67	0.00	0.00	0.00	33.00	26.67	6.33
<i>Cyperus difformis</i>	69.33	32.33	37.00	0.00	0.00	0.00	0.00	0.00	0.00	69.33	32.33	37.00
<i>Cyperus digitatus</i>	0.00	0.00	0.00	0.00	0.00	0.00	4.67	4.67	0.00	4.67	4.67	0.00
<i>Cyperus distans</i>	104.00	57.00	47.00	43.00	18.00	25.00	0.00	0.00	0.00	147.00	75.00	72.00
<i>Cyperus eragrostis</i>	215.67	155.00	60.67	89.33	60.33	29.00	61.67	43.00	18.67	366.67	258.33	108.33
<i>Cyperus imbricatus</i>	48.00	25.67	22.33	31.67	12.67	19.00	0.00	0.00	0.00	79.67	38.33	41.33
<i>Cyperus iria</i>	175.33	117.67	57.67	81.67	47.67	34.00	0.00	0.00	0.00	257.00	165.33	91.67
<i>Cyperus rotundus</i>	175.67	175.67	0.00	0.00	0.00	0.00	49.33	49.33	0.00	225.00	225.00	0.00
<i>Cyperus squarrosus</i>	263.33	172.67	90.67	103.33	59.00	44.33	70.67	44.33	26.33	437.33	276.00	161.33
<i>Cyperus strigosus</i>	0.00	0.00	0.00	2.67	2.67	0.00	0.00	0.00	0.00	2.67	2.67	0.00
<i>Cyperus tenuispica</i>	0.00	0.00	0.00	0.00	0.00	0.00	6.00	6.00	0.00	6.00	6.00	0.00
<i>Cyrtococcum oxyphyllum</i>	0.00	0.00	0.00	16.67	16.67	0.00	0.00	0.00	0.00	16.67	16.67	0.00
<i>Dactylis glomerata</i>	4.67	4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67	4.67	0.00
<i>Dactyloctenium aegyptium</i>	66.67	36.33	30.33	29.33	13.00	16.33	0.00	0.00	0.00	96.00	49.33	46.67
<i>Dentella repens</i>	0.00	0.00	0.00	2.33	0.00	2.33	0.00	0.00	0.00	2.33	0.00	2.33
<i>Desmodium heterophyllum</i>	30.33	26.00	4.33	0.00	0.00	0.00	15.67	13.33	2.33	46.00	39.33	6.67
<i>Dichanthium annulatum</i>	220.33	112.67	107.67	89.67	48.67	41.00	0.00	0.00	0.00	310.00	161.33	148.67
<i>Dichrocephala integrifolia</i>	158.33	106.33	52.00	50.33	27.33	23.00	0.00	0.00	0.00	208.67	133.67	75.00
<i>Dicranopteris linearis</i>	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00	1.00
<i>Digitaria ciliaris</i>	1150.33	741.33	409.00	382.67	264.33	118.33	225.00	149.00	76.00	1758.00	1154.67	603.33

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Digitaria setigera</i>	41.67	41.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41.67	41.67	0.00
<i>Digitaria violascens</i>	80.33	0.00	80.33	0.00	0.00	0.00	0.00	0.00	0.00	80.33	0.00	80.33
<i>Diplazium esculentum</i>	20.67	17.67	3.00	12.67	10.67	2.00	0.00	0.00	0.00	33.33	28.33	5.00
<i>Duchesnea indica</i>	242.33	168.33	74.00	102.00	62.67	39.33	73.00	44.33	28.67	417.33	275.33	142.00
<i>Dysphania ambrosioides</i>	25.33	25.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.33	25.33	0.00
<i>Echinochloa colona</i>	15.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	15.00
<i>Echinochloa crus-galli</i>	294.00	192.00	102.00	115.00	74.67	40.33	0.00	0.00	0.00	409.00	266.67	142.33
<i>Eclipta prostrata</i>	265.00	179.67	85.33	109.00	67.00	42.00	79.00	43.33	35.67	453.00	290.00	163.00
<i>Eleocharis acutangula</i>	0.00	0.00	0.00	41.67	23.67	18.00	0.00	0.00	0.00	41.67	23.67	18.00
<i>Eleusine indica</i>	49.67	39.00	10.67	0.00	0.00	0.00	0.00	0.00	0.00	49.67	39.00	10.67
<i>Emilia sonchifolia</i>	5.33	5.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.33	5.33	0.00
<i>Eragrostis amabilis</i>	37.67	37.67	0.00	18.00	18.00	0.00	0.00	0.00	0.00	55.67	55.67	0.00
<i>Eragrostis riparia</i>	69.33	61.00	8.33	24.00	17.00	7.00	0.00	0.00	0.00	93.33	78.00	15.33
<i>Eragrostis unioloides</i>	29.67	13.00	16.67	0.00	0.00	0.00	17.00	7.33	9.67	46.67	20.33	26.33
<i>Erigeron bonariensis</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.33	0.33	0.00	0.33
<i>Ethulia conyzoides</i>	587.33	372.33	215.00	213.33	149.33	64.00	132.67	83.67	49.00	933.33	605.33	328.00
<i>Euphorbia heterophylla</i>	5.67	0.00	5.67	0.00	0.00	0.00	0.00	0.00	0.00	5.67	0.00	5.67
<i>Euphorbia hirta</i>	166.00	94.00	72.00	51.67	28.67	23.00	51.33	31.67	19.67	269.00	154.33	114.67
<i>Euphorbia hypericifolia</i>	146.00	146.00	0.00	55.00	55.00	0.00	25.33	25.33	0.00	226.33	226.33	0.00
<i>Euphorbia thymifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	10.33	0.00	10.33	10.33	0.00	10.33
<i>Evolvulus nummularius</i>	232.33	158.00	74.33	62.00	39.33	22.67	0.00	0.00	0.00	294.33	197.33	97.00
<i>Fimbristylis aestivalis</i>	836.33	529.67	306.67	344.67	237.00	107.67	190.33	125.00	65.33	1371.33	891.67	479.67
<i>Fimbristylis dichotoma</i>	15.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	15.00	0.00
<i>Fimbristylis littoralis</i>	7.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00	7.00	0.00
<i>Flemingia lineata</i>	99.67	71.33	28.33	24.67	17.33	7.33	0.00	0.00	0.00	124.33	88.67	35.67
<i>Floscopa scandens</i>	0.00	0.00	0.00	0.33	0.00	0.33	0.00	0.00	0.00	0.33	0.00	0.33
<i>Glinus lotoides</i>	166.00	86.67	79.33	48.33	18.67	29.67	0.00	0.00	0.00	214.33	105.33	109.00
<i>Glinus oppositifolius</i>	165.33	110.33	55.00	0.00	0.00	0.00	19.67	13.33	6.33	185.00	123.67	61.33
<i>Gnaphalium pensylvanicum</i>	171.33	107.00	64.33	59.00	37.00	22.00	0.00	0.00	0.00	230.33	144.00	86.33
<i>Grangea maderaspatana</i>	873.00	499.00	374.00	310.00	190.33	119.67	178.00	102.33	75.67	1361.00	791.67	569.33
<i>Heliotropium indicum</i>	221.33	134.33	87.00	93.00	56.33	36.67	80.67	48.00	32.67	395.00	238.67	156.33
<i>Heliotropium ovalifolium</i>	14.00	0.00	14.00	0.00	0.00	0.00	0.00	0.00	0.00	14.00	0.00	14.00
<i>Heliotropium strigosum</i>	6.33	6.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33	6.33	0.00
<i>Hemarthria compressa</i>	1363.33	902.00	461.33	516.00	346.00	170.00	303.67	193.33	110.33	2183.00	1441.33	741.67
<i>Houttuynia cordata</i>	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
<i>Hydrocotyle sibthorpioides</i>	46.67	14.33	32.33	0.00	0.00	0.00	0.00	0.00	0.00	46.67	14.33	32.33
<i>Hymenachne amplexicaulis</i>	7.67	6.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	7.67	6.00	1.67
<i>Hyptis suaveolens</i>	387.67	223.67	164.00	88.67	49.00	39.67	59.33	34.00	25.33	535.67	306.67	229.00
<i>Impatiens tripetala</i>	3.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	3.00
<i>Imperata cylindrica</i>	512.67	333.67	179.00	195.33	156.67	38.67	108.00	70.00	38.00	816.00	560.33	255.67
<i>Isachne globosa</i>	38.67	23.33	15.33	36.33	25.00	11.33	0.00	0.00	0.00	75.00	48.33	26.67
<i>Juncus articulatus</i>	12.00	8.67	3.33	0.00	0.00	0.00	0.00	0.00	0.00	12.00	8.67	3.33
<i>Kyllinga brevifolia</i>	415.33	282.33	133.00	126.33	78.67	47.67	27.33	20.00	7.33	569.00	381.00	188.00
<i>Laphangium luteoalbum</i>	491.00	326.67	164.33	147.00	87.00	60.00	91.67	57.67	34.00	729.67	471.33	258.33
<i>Lepidagathis incurva</i>	0.00	0.00	0.00	11.33	7.33	4.00	13.67	8.33	5.33	25.00	15.67	9.33
<i>Leucas aspera</i>	79.67	47.00	32.67	0.00	0.00	0.00	0.00	0.00	0.00	79.67	47.00	32.67
<i>Leucostegia immersa</i>	1.67	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Lindernia crustacea</i>	1137.67	703.33	434.33	452.33	298.00	154.33	265.67	167.67	98.00	1855.67	1169.00	686.67
<i>Lindernia ruelliioides</i>	52.33	52.33	0.00	29.00	29.00	0.00	0.00	0.00	0.00	81.33	81.33	0.00
<i>Ludwigia adscendens</i>	26.33	16.67	9.67	0.00	0.00	0.00	0.00	0.00	0.00	26.33	16.67	9.67
<i>Ludwigia octovalvis</i>	35.67	35.67	0.00	21.67	21.67	0.00	0.00	0.00	0.00	57.33	57.33	0.00
<i>Lygodium flexuosum</i>	172.33	113.67	58.67	69.00	47.67	21.33	32.67	23.00	9.67	274.00	184.33	89.67
<i>Lygodium microphyllum</i>	24.00	15.33	8.67	0.00	0.00	0.00	0.00	0.00	0.00	24.00	15.33	8.67

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
Mazus pumilus	410.67	225.67	185.00	93.33	52.33	41.00	58.33	28.33	30.00	562.33	306.33	256.00
Mecardonia procumbens	364.33	296.67	67.67	94.33	72.00	22.33	56.00	42.33	13.67	514.67	411.00	103.67
Melilotus albus	6.33	6.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33	6.33	0.00
Merremia umbellata	575.00	402.67	172.33	171.33	130.00	41.33	107.33	69.67	37.67	853.67	602.33	251.33
Mikania micrantha	186.67	120.33	66.33	82.00	56.00	26.00	0.00	0.00	0.00	268.67	176.33	92.33
Nelsonia canescens	7.33	0.00	7.33	8.67	0.00	8.67	0.00	0.00	0.00	16.00	0.00	16.00
Oldenlandia lineata	0.00	0.00	0.00	3.33	0.00	3.33	0.00	0.00	0.00	3.33	0.00	3.33
Oldenlandia tenelliflora	0.00	0.00	0.00	7.33	0.00	7.33	0.00	0.00	0.00	7.33	0.00	7.33
Onychium japonicum	15.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	15.00
Oplismenus burmanni	142.00	102.67	39.33	51.33	39.33	12.00	31.00	21.00	10.00	224.33	163.00	61.33
Oplismenus compositus	60.67	60.67	0.00	22.00	22.00	0.00	0.00	0.00	0.00	82.67	82.67	0.00
Oxalis corniculata	1265.33	788.33	477.00	461.00	310.67	150.33	269.00	166.67	102.33	1995.33	1265.67	729.67
Oxalis debilis	0.00	0.00	0.00	12.00	12.00	0.00	12.67	12.67	0.00	24.67	24.67	0.00
Oxalis latifolia	1.67	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	1.67
Panicum auritum	9.67	9.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.67	9.67	0.00
Panicum brevifolium	39.67	0.00	39.67	16.33	0.00	16.33	0.00	0.00	0.00	56.00	0.00	56.00
Panicum notatum	326.67	185.00	141.67	97.00	55.33	41.67	0.00	0.00	0.00	423.67	240.33	183.33
Parthenium hysterophorus	50.33	29.00	21.33	26.33	15.67	10.67	0.00	0.00	0.00	76.67	44.67	32.00
Paspalidium flavidum	98.00	49.33	48.67	0.00	0.00	0.00	0.00	0.00	0.00	98.00	49.33	48.67
Paspalum conjugatum	1191.33	801.67	389.67	394.67	278.67	116.00	225.67	154.33	71.33	1811.67	1234.67	577.00
Paspalum dilatatum	164.67	118.33	46.33	0.00	0.00	0.00	0.00	0.00	0.00	164.67	118.33	46.33
Paspalum scrobiculatum	33.00	33.00	0.00	9.00	9.00	0.00	0.00	0.00	0.00	42.00	42.00	0.00
Peperomia pellucida	634.33	423.67	210.67	154.33	105.67	48.67	85.33	54.67	30.67	874.00	584.00	290.00
Persicaria barbata	9.33	5.67	3.67	0.00	0.00	0.00	0.00	0.00	0.00	9.33	5.67	3.67
Persicaria hydropiper	139.00	97.33	41.67	75.33	43.00	32.33	60.67	35.33	25.33	275.00	175.67	99.33
Persicaria orientalis	6.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	6.00	0.00
Phyla nodiflora	27.67	21.00	6.67	9.33	5.67	3.67	8.00	6.00	2.00	45.00	32.67	12.33
Phyllanthus niruri	1572.67	1002.33	570.33	542.33	366.33	176.00	331.00	206.33	124.67	2446.00	1575.00	871.00
Phyllanthus virgatus	0.00	0.00	0.00	4.00	0.00	4.00	0.00	0.00	0.00	4.00	0.00	4.00
Physalis minima	20.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	20.00	0.00
Plectranthus sp.	1.67	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	1.67	0.00
Poa annua	0.00	0.00	0.00	18.67	10.00	8.67	14.33	9.00	5.33	33.00	19.00	14.00
Polycarpon prostratum	713.00	510.00	203.00	172.67	121.33	51.33	133.33	86.33	47.00	1019.00	717.67	301.33
Polygala arvensis	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	1.67	1.67	0.00	1.67
Polygonum plebeium	1481.00	953.00	528.00	485.00	321.67	163.33	284.00	177.33	106.67	2250.00	1452.00	798.00
Portulaca oleracea	0.00	0.00	0.00	2.33	0.00	2.33	0.00	0.00	0.00	2.33	0.00	2.33
Pouzolzia zeylanica	855.33	607.67	247.67	334.33	233.67	100.67	200.67	134.00	66.67	1390.33	975.33	415.00
Pycnus pumilus	0.00	0.00	0.00	0.00	0.00	0.00	7.33	7.33	0.00	7.33	7.33	0.00
Ranunculus sceleratus	13.67	5.00	8.67	0.00	0.00	0.00	0.00	0.00	0.00	13.67	5.00	8.67
Rorippa indica	906.67	591.00	315.67	327.67	231.33	96.33	186.67	114.00	72.67	1421.00	936.33	484.67
Rumex dentatus	10.67	0.00	10.67	0.00	0.00	0.00	0.00	0.00	0.00	10.67	0.00	10.67
Rungia pectinata	66.00	32.33	33.67	32.33	14.33	18.00	28.00	17.67	10.33	126.33	64.33	62.00
Rungia repens	105.33	65.67	39.67	0.00	0.00	0.00	0.00	0.00	0.00	105.33	65.67	39.67
Saccharum spp.	296.00	171.67	124.33	170.33	119.67	50.67	65.33	45.33	20.00	531.67	336.67	195.00
Scleria terrestris	247.67	181.00	66.67	112.33	76.33	36.00	0.00	0.00	0.00	360.00	257.33	102.67
Senna tora	6.33	2.33	4.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33	2.33	4.00
Setaria pumila	745.00	489.33	255.67	301.33	207.00	94.33	175.67	117.00	58.67	1222.00	813.33	408.67
Setaria viridis	26.00	26.00	0.00	16.00	16.00	0.00	0.00	0.00	0.00	42.00	42.00	0.00
Sida acuta	9.67	9.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.67	9.67	0.00
Solanum americanum	72.00	42.00	30.00	52.00	27.67	24.33	42.00	22.33	19.67	166.00	92.00	74.00
Solanum viarum	95.67	53.00	42.67	54.00	33.33	20.67	0.00	0.00	0.00	149.67	86.33	63.33
Sonchus oleraceus	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00
Sporobolus diandrus	45.33	38.67	6.67	20.67	17.00	3.67	0.00	0.00	0.00	66.00	55.67	10.33

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Sporobolus fertilis</i>	32.00	19.00	13.00	0.00	0.00	0.00	0.00	0.00	0.00	32.00	19.00	13.00
<i>Stellaria media</i>	127.00	74.00	53.00	71.67	41.33	30.33	0.00	0.00	0.00	198.67	115.33	83.33
<i>Synedrella nodiflora</i>	14.67	10.00	4.67	0.00	0.00	0.00	0.00	0.00	0.00	14.67	10.00	4.67
<i>Tetrastigma dubium</i>	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00
<i>Themeda spp.</i>	54.00	27.67	26.33	29.67	16.67	13.00	0.00	0.00	0.00	83.67	44.33	39.33
<i>Thespis divaricata</i>	88.00	51.67	36.33	38.00	20.00	18.00	0.00	0.00	0.00	126.00	71.67	54.33
<i>Tridax procumbens</i>	0.00	0.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Urochloa panicoides</i>	6.67	6.67	0.00	3.67	3.67	0.00	3.33	3.33	0.00	13.67	13.67	0.00
<i>Verbena officinalis</i>	3.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.00	0.00
<i>Vicia sativa</i>	7.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00	7.00	0.00
<i>Xanthium strumarium</i>	49.33	26.67	22.67	27.67	14.67	13.00	0.00	0.00	0.00	77.00	41.33	35.67
<i>Youngia japonica</i>	1.33	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33	1.33	0.00
UI 1	0.00	0.00	0.00	0.00	0.00	0.00	3.67	3.67	0.00	3.67	3.67	0.00
UI 2	6.00	0.00	6.00	6.67	0.00	6.67	0.00	0.00	0.00	12.67	0.00	12.67
UI 3	2.67	2.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67	2.67	0.00
UI 4	0.00	0.00	0.00	1.33	0.00	1.33	0.00	0.00	0.00	1.33	0.00	1.33
UI 5	158.67	74.67	84.00	81.67	43.67	38.00	0.00	0.00	0.00	240.33	118.33	122.00
UI 6	0.00	0.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	1.67	1.67	0.00
UI 7	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00	5.00	5.00	0.00
UI 8	86.00	60.00	26.00	22.33	16.00	6.33	16.00	11.00	5.00	124.33	87.00	37.33
UI 10	34.67	21.00	13.67	15.00	11.67	3.33	8.67	6.33	2.33	58.33	39.00	19.33
UI 11	23.67	23.67	0.00	8.33	8.33	0.00	0.00	0.00	0.00	32.00	32.00	0.00
UI 12	0.00	0.00	0.00	3.33	0.00	3.33	0.00	0.00	0.00	3.33	0.00	3.33
UI 14	6.67	0.00	6.67	0.00	0.00	0.00	0.00	0.00	0.00	6.67	0.00	6.67
UI 16	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
UI 17	51.00	38.00	13.00	0.00	0.00	0.00	25.33	16.67	8.67	76.33	54.67	21.67
UI 18	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	0.00
UI 19	3.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.00	0.00
UI 20	0.00	0.00	0.00	3.33	3.33	0.00	0.00	0.00	0.00	3.33	3.33	0.00
UI 21	14.00	14.00	0.00	4.00	4.00	0.00	0.00	0.00	0.00	18.00	18.00	0.00
UI 22	0.00	0.00	0.00	2.33	2.33	0.00	0.00	0.00	0.00	2.33	2.33	0.00
UI 25	14.67	14.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.67	14.67	0.00
UI 26	8.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00	0.00
UI 27	0.00	0.00	0.00	4.00	4.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00
UI 28	2.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00
UI 29	49.00	18.67	30.33	0.00	0.00	0.00	0.00	0.00	0.00	49.00	18.67	30.33
UK (premature mortality)	1673.67	1139.33	534.33	591.33	439.00	152.33	158.33	117.00	41.33	2423.33	1695.33	728.00

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.20. Overall and seasonal plant species mean seed abundances recorded from different soil layers of riverine alluvial grasslands soil seed bank given natural treatment during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Achyranthes aspera</i>	3.33±0.00	0.00	3.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00
<i>Acmella uliginosa</i>	18.88±2.99	23.17±4.99	14.58±2.14	8.25±1.45	9.08±2.83	7.42±1.17	0.00	0.00	0.00	27.13±4.07	32.25±7.03	22.00±3.20
<i>Acroceras zizanioides</i>	33.00±5.84	47.33±2.51	18.67±3.97	10.58±2.57	16.58±2.01	4.58±1.66	6.54±1.35	9.33±1.19	3.75±1.36	50.13±9.39	73.25±2.78	27.00±6.85
<i>Acroceras munroanum</i>	18.00±0.00	0.00	18.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.00±0.00	0.00	18.00±0.00
<i>Adiantum caudatum</i>	27.29±4.62	38.50±3.00	16.08±2.58	9.04±1.43	11.33±2.22	6.75±1.04	4.17±0.71	5.42±0.89	2.92±0.71	40.50±6.06	55.25±4.43	25.75±2.55

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Adiantum philippense</i>	25.00±0.00	25.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.00±0.00	25.00±0.00	0.00
<i>Ageratum conyzoides</i>	42.33±6.48	54.83±9.26	29.83±2.47	17.21±1.98	21.08±2.39	13.33±1.60	10.00±1.49	13.08±1.86	6.92±0.72	69.54±9.62	89.00±12.82	50.08±3.85
<i>Alpinia nigra</i>	3.08±0.64	4.25±0.64	1.92±0.77	0.00	0.00	0.00	0.00	0.00	0.00	3.08±0.64	4.25±0.64	1.92±0.77
<i>Alternanthera philoxeroides</i>	14.67±2.67	14.67±2.67	0.00	0.00	0.00	0.00	7.17±1.17	7.17±1.17	0.00	21.83±3.83	21.83±3.83	0.00
<i>Alternanthera pungens</i>	55.00±7.85	64.42±13.68	45.58±6.41	17.33±3.47	19.58±6.80	15.08±2.55	0.00	0.00	0.00	72.33±10.58	84.00±18.98	60.67±8.45
<i>Alternanthera sessilis</i>	141.17±18.52	185.50±11.88	96.83±12.22	47.33±7.99	64.50±9.88	30.17±1.88	29.63±3.75	37.92±3.68	21.33±2.53	218.13±29.75	287.92±25.15	148.33±15.80
<i>Amaranthus spinosus</i>	5.92±0.50	6.08±0.70	5.75±0.81	3.54±0.34	3.92±0.28	3.17±0.62	0.00	0.00	0.00	9.46±0.60	10.00±0.97	8.92±0.74
<i>Amaranthus viridis</i>	14.00±1.84	17.17±2.49	10.83±1.73	6.04±0.92	7.42±1.48	4.67±0.72	0.00	0.00	0.00	20.04±2.67	24.58±3.93	15.50±2.04
<i>Ampelopteris prolifera</i>	34.08±13.42	34.08±13.42	0.00	12.17±5.49	12.17±5.49	0.00	0.00	0.00	0.00	46.25±18.75	46.25±18.75	0.00
<i>Anagallis arvensis</i>	2.33±0.00	0.00	2.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00
<i>Apluda mutica</i>	77.13±12.04	105.50±9.17	48.75±7.47	23.88±4.58	35.17±3.15	12.58±1.72	13.08±2.03	17.75±1.05	8.42±1.89	114.08±18.05	158.42±11.62	69.75±8.64
<i>Aristida adscensionis</i>	25.33±0.00	25.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.33±0.00	25.33±0.00	0.00
<i>Artemisia carvifolia</i>	9.33±4.67	9.33±4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.33±4.67	9.33±4.67	0.00
<i>Arundinella bengalensis</i>	20.92±3.20	20.92±3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.92±3.20	20.92±3.20	0.00
<i>Axonopus compressus</i>	57.92±10.24	77.83±14.01	38.00±5.35	23.17±4.88	34.00±5.67	12.33±0.87	11.08±1.93	15.08±2.52	7.08±0.58	92.17±16.60	126.92±21.09	57.42±5.95
<i>Bacopa monnieri</i>	3.33±0.00	0.00	3.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00
<i>Blumea lacera</i>	1.00±0.00	0.00	1.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00
<i>Brachiaria distachya</i>	105.83±23.17	105.83±23.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	105.83±23.17	105.83±23.17	0.00
<i>Brachiaria reptans</i>	47.67±0.00	47.67±0.00	0.00	18.33±0.00	18.33±0.00	0.00	0.00	0.00	0.00	66.00±0.00	66.00±0.00	0.00
<i>Cajanus scarabaeoides</i>	3.33±0.00	0.00	3.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00
<i>Capillipedium assimile</i>	9.00±1.00	0.00	9.00±1.00	0.00	0.00	0.00	0.00	0.00	0.00	9.00±1.00	0.00	9.00±1.00
<i>Cardiospermum halicacabum</i>	18.33±1.00	18.33±1.00	0.00	6.17±1.50	6.17±1.50	0.00	0.00	0.00	0.00	24.50±2.50	24.50±2.50	0.00
<i>Carex vesicaria</i>	13.83±1.36	15.42±2.15	12.25±1.55	6.08±0.74	7.00±1.08	5.17±0.92	4.29±0.64	5.42±0.97	3.17±0.40	24.21±2.59	27.83±4.12	20.58±2.38
<i>Cenchrus ciliaris</i>	16.83±1.69	19.83±2.17	13.83±1.65	7.67±1.60	10.17±2.47	5.17±1.29	3.92±0.81	5.33±1.13	2.50±0.65	28.42±3.30	35.33±3.37	21.50±2.74
<i>Centella asiatica</i>	30.42±4.80	41.42±5.07	19.42±1.15	8.81±1.17	11.22±1.09	7.00±1.28	6.81±1.41	10.44±0.87	4.08±0.89	44.08±7.12	57.67±10.50	30.50±1.72
<i>Centipeda minima</i>	69.83±3.72	74.89±3.74	64.78±5.46	18.61±4.53	27.78±3.56	9.44±2.45	9.44±1.10	11.44±1.28	7.44±0.68	97.89±7.92	114.11±5.81	81.67±4.11
<i>Cenotheca lappacea</i>	12.33±0.00	0.00	12.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.33±0.00	0.00	12.33±0.00
<i>Chenopodium album</i>	5.56±1.13	6.67±0.33	3.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.56±1.13	6.67±0.33	3.33±0.00
<i>Christella parasitica</i>	81.88±11.33	106.75±8.56	57.00±10.65	29.38±4.77	40.25±4.97	18.50±1.66	14.92±2.69	18.50±4.27	11.33±2.64	126.17±18.08	165.50±17.37	86.83±13.89
<i>Chromolaena odorata</i>	3.83±0.83	3.83±0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.83±0.83	3.83±0.83	0.00
<i>Chrysopogon aciculatus</i>	23.54±3.75	29.92±2.80	17.17±5.55	9.96±1.97	12.83±3.18	7.08±1.58	5.21±0.98	6.58±1.61	3.83±0.80	38.71±6.09	49.33±6.17	28.08±7.71
<i>Cissampelos pareira</i>	1.67±0.00	0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00
<i>Colocasia esculenta</i>	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Commelina benghalensis</i>	8.93±2.61	14.00±2.33	5.56±2.56	4.27±0.88	4.83±1.17	3.89±1.39	0.00	0.00	0.00	13.20±3.34	18.83±3.50	9.44±3.95
<i>Commelina diffusa</i>	5.00±0.00	0.00	5.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00±0.00	0.00	5.00±0.00
<i>Cotula hemisphaerica</i>	51.08±7.90	68.00±9.35	34.17±3.57	13.75±1.13	16.08±1.42	11.42±0.58	0.00	0.00	0.00	64.83±8.75	84.08±9.70	45.58±4.04
<i>Crassocephalum crepidioides</i>	1.00±0.00	0.00	1.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00
<i>Cuphea carthagenensis</i>	42.29±6.16	56.33±5.96	28.25±3.23	19.08±4.15	29.17±3.15	9.00±1.64	0.00	0.00	0.00	61.38±9.41	85.5±3.98	37.25±3.05
<i>Cyathula prostrata</i>	0.00	0.00	0.00	3.00±0.00	0.00	3.00±0.00	0.00	0.00	0.00	3.00±0.00	0.00	3.00±0.00
<i>Cynodon dactylon</i>	374.75±36.16	463.67±24.01	285.83±16.01	143.08±27.30	207.08±26.71	79.08±5.75	64.75±8.08	83.75±6.61	45.75±4.50	582.58±71.03	754.50±56.39	410.67±25.65
<i>Cyperus compressus</i>	73.00±17.52	97.83±23.50	48.17±7.50	29.33±6.10	39.00±6.00	19.67±0.33	17.75±3.18	22.67±3.00	12.83±1.83	120.08±26.64	159.50±32.50	80.67±9.67
<i>Cyperus cyperoides</i>	7.67±3.20	9.67±4.33	3.67±0.00	3.33±0.38	3.67±0.33	2.67±0.00	0.00	0.00	0.00	11.00±3.56	13.33±4.67	6.33±0.00
<i>Cyperus difformis</i>	23.11±4.62	32.33±0.00	18.50±0.50	0.00	0.00	0.00	0.00	0.00	0.00	23.11±4.62	32.33±0.00	18.50±0.50
<i>Cyperus digitatus</i>	0.00	0.00	0.00	0.00	0.00	0.00	2.33±0.00	2.33±0.00	0.00	2.33±0.00	2.33±0.00	0.00
<i>Cyperus distans</i>	17.33±3.87	28.50±2.83	11.75±2.21	7.17±1.07	9.00±1.33	6.25±1.31	0.00	0.00	0.00	24.50±4.76	37.50±4.17	18.00±3.39
<i>Cyperus eragrostis</i>	30.81±4.45	38.75±3.72	20.22±3.61	12.76±2.38	15.08±3.78	9.67±1.58	8.81±1.74	10.75±2.68	6.22±0.99	52.38±7.58	64.58±8.46	36.11±5.25
<i>Cyperus imbricatus</i>	9.60±2.13	12.83±2.17	7.44±2.78	6.33±1.10	6.33±1.00	6.33±1.00	0.00	0.00	0.00	15.93±2.79	19.17±5.17	13.78±3.35
<i>Cyperus iria</i>	21.92±3.12	29.42±2.66	14.42±0.86	10.21±1.34	11.92±2.19	8.50±1.29	0.00	0.00	0.00	32.13±4.15	41.33±4.53	22.92±1.86
<i>Cyperus rotundus</i>	43.92±2.48	43.92±2.48	0.00	0.00	0.00	0.00	12.33±1.34	12.33±1.34	0.00	56.25±3.35	56.25±3.35	0.00
<i>Cyperus squarrosus</i>	32.92±4.82	43.17±3.29	22.67±5.25	12.92±1.67	14.75±3.09	11.08±1.08	8.83±1.10	11.08±1.18	6.58±0.96	54.67±7.21	69.00±7.37	40.33±7.18
<i>Cyperus strigosus</i>	0.00	0.00	0.00	2.67±0.00	2.67±0.00	0.00	0.00	0.00	0.00	2.67±0.00	2.67±0.00	0.00
<i>Cyperus tenuispica</i>	0.00	0.00	0.00	0.00	0.00	0.00	6.00±0.00	6±0	0.00	6.00±0.00	6.00±0.00	0.00
<i>Cyrtococcum oxyphyllum</i>	0.00	0.00	0.00	16.67±0.00	16.67±0.00	0.00	0.00	0.00	0.00	16.67±0.00	16.67±0.00	0.00

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Dactylis glomerata</i>	4.67±0.00	4.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67±0.00	4.67±0.00	0.00
<i>Dactyloctenium aegyptium</i>	9.52±1.72	12.11±3.29	7.58±1.44	4.19±0.82	4.33±0.96	4.08±1.36	0.00	0.00	0.00	13.71±2.20	16.44±3.51	11.67±2.74
<i>Dentella repens</i>	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00
<i>Desmodium heterophyllum</i>	10.11±2.91	13.00±0.67	4.33±0.00	0.00	0.00	0.00	5.22±1.49	6.67±0.67	2.33±0.00	15.33±4.33	19.67±0.00	6.67±0.00
<i>Dichanthium annulatum</i>	27.54±3.28	28.17±7.00	26.92±1.07	11.21±1.54	12.17±3.10	10.25±0.90	0.00	0.00	0.00	38.75±4.14	40.33±8.72	37.17±1.51
<i>Dichrocephala integrifolia</i>	22.62±4.70	35.44±2.73	13.00±1.25	7.19±1.60	9.11±2.96	5.75±1.71	0.00	0.00	0.00	29.81±5.27	44.56±0.78	18.75±1.38
<i>Dicranopteris linearis</i>	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00
<i>Digitaria ciliaris</i>	143.79±16.87	185.33±8.00	102.25±10.69	47.83±8.24	66.08±9.38	29.58±2.57	28.13±3.96	37.25±3.82	19.00±1.80	219.75±27.82	288.67±16.96	150.83±12.59
<i>Digitaria setigera</i>	41.67±0.00	41.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41.67±0.00	41.67±0.00	0.00
<i>Digitaria violascens</i>	40.17±1.50	0.00	40.17±1.50	0.00	0.00	0.00	0.00	0.00	0.00	40.17±1.50	0.00	40.17±1.50
<i>Diplazium esculentum</i>	6.89±2.42	8.83±2.50	3.00±0.00	4.22±1.13	5.33±0.33	2.00±0.00	0.00	0.00	0.00	11.11±3.30	14.17±2.17	5.00±0.00
<i>Duchesnea indica</i>	30.29±4.55	42.08±1.29	18.50±1.52	12.75±1.74	15.67±2.63	9.83±1.25	9.13±1.14	11.08±1.51	7.17±1.13	52.17±6.88	68.83±4.60	35.50±3.85
<i>Dysphania ambrosioides</i>	12.67±4.67	12.67±4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.67±4.67	12.67±4.67	0.00
<i>Echinochloa colona</i>	15.00±0.00	0.00	15.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00±0.00	0.00	15.00±0.00
<i>Echinochloa crus-galli</i>	36.75±5.80	48.00±8.37	25.50±1.65	14.38±3.48	18.67±6.47	10.08±1.49	0.00	0.00	0.00	51.13±8.37	66.67±12.82	35.58±1.21
<i>Eclipta prostrata</i>	33.13±4.66	44.92±1.54	21.33±2.51	13.63±1.51	16.75±1.70	10.50±1.10	9.88±0.54	10.83±0.48	8.92±0.71	56.63±6.27	72.50±3.11	40.75±2.41
<i>Eleocharis acutangula</i>	0.00	0.00	0.00	5.21±0.48	5.92±0.69	4.50±0.50	0.00	0.00	0.00	5.21±0.48	5.92±0.69	4.50±0.50
<i>Eleusine indica</i>	12.42±4.12	19.50±1.17	5.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.42±4.12	19.50±1.17	5.33±0.00
<i>Emilia sonchifolia</i>	5.33±0.00	5.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.33±0.00	5.33±0.00	0.00
<i>Eragrostis amabilis</i>	18.83±1.83	18.83±1.83	0.00	9.00±3.00	9.00±3.00	0.00	0.00	0.00	0.00	27.83±4.83	27.83±4.83	0.00
<i>Eragrostis riparia</i>	23.11±9.56	30.50±10.50	8.33±0.00	8.00±0.69	8.50±0.83	7.00±0.00	0.00	0.00	0.00	31.11±9.66	39.00±9.67	15.33±0.00
<i>Eragrostis unioloides</i>	9.89±1.94	13.00±0.00	8.33±2.00	0.00	0.00	0.00	5.67±1.07	7.33±0.00	4.83±1.17	15.56±3.01	20.33±0.00	13.17±3.17
<i>Erigeron bonariensis</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.33±0.00	0.00	0.33±0.00	0.33±0.00	0.00	0.33±0.00
<i>Ethulia conyzoides</i>	73.42±9.03	93.08±9.88	53.75±4.99	26.67±4.46	37.33±3.74	16.00±1.74	16.58±2.38	20.92±3.44	12.25±1.46	116.67±15.53	151.33±16.46	82.00±7.30
<i>Euphorbia heterophylla</i>	5.67±0.00	0.00	5.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.67±0.00	0.00	5.67±0.00
<i>Euphorbia hirta</i>	23.71±4.52	31.33±7.73	18.00±4.04	7.38±1.44	9.56±2.08	5.75±1.74	7.33±1.66	10.56±2.62	4.92±1.28	38.43±7.38	51.44±12.41	28.67±6.28
<i>Euphorbia hypericifolia</i>	36.50±2.64	36.50±2.64	0.00	13.75±1.51	13.75±1.51	0.00	6.33±0.36	6.33±0.36	0.00	56.58±3.40	56.58±3.40	0.00
<i>Euphorbia thymifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	5.17±0.50	0.00	5.17±0.50	5.17±0.50	0.00	5.17±0.50
<i>Evolvulus nummularius</i>	29.04±4.85	39.50±5.02	18.58±3.42	7.75±1.39	9.83±1.69	5.67±1.80	0.00	0.00	0.00	36.79±5.80	49.33±5.89	24.25±4.20
<i>Fimbristylis aestivalis</i>	104.54±11.51	132.42±8.79	76.67±4.78	43.08±6.43	59.25±3.57	26.92±2.41	23.79±3.04	31.25±2.24	16.33±1.01	171.42±20.67	222.92±12.89	119.92±7.67
<i>Fimbristylis dichotoma</i>	15.00±0.00	15.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00±0.00	15.00±0.00	0.00
<i>Fimbristylis littoralis</i>	7.00±0.00	7.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00±0.00	7.00±0.00	0.00
<i>Flemingia lineata</i>	14.24±2.60	17.83±3.63	9.44±0.87	3.52±0.67	4.33±0.71	2.44±1.06	0.00	0.00	0.00	17.76±2.80	22.17±3.31	11.89±1.72
<i>Floscopa scandens</i>	0.00	0.00	0.00	0.33±0.00	0.00	0.33±0.00	0.00	0.00	0.00	0.33±0.00	0.00	0.33±0.00
<i>Glinus lotoides</i>	27.67±6.28	43.33±11.00	19.83±4.12	8.06±0.67	9.33±1.33	7.42±0.64	0.00	0.00	0.00	35.72±6.78	52.67±12.33	27.25±4.22
<i>Glinus oppositifolius</i>	41.33±8.11	55.17±3.50	27.50±0.17	0.00	0.00	0.00	4.92±1.56	6.67±2.67	3.17±1.17	46.25±9.36	61.83±6.17	30.67±1.33
<i>Gnaphalium pensylvanicum</i>	42.83±7.00	53.50±3.83	32.17±7.17	14.75±2.57	18.50±0.50	11.00±3.33	0.00	0.00	0.00	57.58±9.46	72.00±3.33	43.17±10.5
<i>Grangea maderaspatana</i>	109.13±7.97	124.75±6.02	93.50±9.89	38.75±3.82	47.58±2.37	29.92±3.22	22.25±2.17	25.58±3.00	18.92±2.37	170.13±13.48	197.92±11.03	142.33±14.54
<i>Heliotropium indicum</i>	27.67±2.87	33.58±2.83	21.75±2.65	11.63±1.24	14.08±1.22	9.17±1.27	10.08±0.94	12.00±0.83	8.17±1	49.38±4.58	59.67±4.13	39.08±3.23
<i>Heliotropium ovalifolium</i>	7.00±0.00	0.00	7.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00±0.00	0.00	7.00±0.00
<i>Heliotropium strigosum</i>	6.33±0.00	6.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33±0.00	6.33±0.00	0.00
<i>Hemarthria compressa</i>	170.42±23.47	225.50±16.03	115.33±17.07	64.50±9.62	86.50±8.58	42.50±5.93	37.96±4.64	48.33±4.71	27.58±2.55	272.88±37.15	360.33±26.83	185.42±24.91
<i>Houttuynia cordata</i>	1.00±0.00	0.00	1.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00
<i>Hydrocotyle sibthorpioides</i>	9.33±2.17	14.33±0.00	8.08±2.29	0.00	0.00	0.00	0.00	0.00	0.00	9.33±2.17	14.33±0.00	8.08±2.29
<i>Hymenachne amplexicaulis</i>	2.56±0.59	3.00±0.67	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.56±0.59	3.00±0.67	1.67±0.00
<i>Hyptis suaveolens</i>	48.46±7.30	55.92±12.07	41.00±8.10	12.67±1.66	16.33±2.59	9.92±0.67	8.48±1.20	11.33±0.96	6.33±0.99	66.96±10.53	76.67±19.27	57.25±9.11
<i>Impatiens tripetala</i>	3.00±0.00	0.00	3.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00±0.00	0.00	3.00±0.00
<i>Imperata cylindrica</i>	64.08±8.35	83.42±4.30	44.75±7.59	24.42±5.95	39.17±4.43	9.67±0.79	13.50±2.22	17.50±3.24	9.50±1.36	102.00±15.76	140.08±11.61	63.92±7.57
<i>Isachne globosa</i>	7.73±2.41	11.67±5.67	5.11±0.22	7.27±2.59	12.50±4.50	3.78±0.59	0.00	0.00	0.00	15.00±4.94	24.17±10.17	8.89±0.59
<i>Juncus articulatus</i>	4.00±0.67	4.33±1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00±0.67	4.33±1.00	3.33±0.00
<i>Kyllinga brevifolia</i>	51.92±7.94	70.58±7.31	33.25±2.89	15.79±2.08	19.67±2.24	11.92±2.27	3.42±0.71	5.00±0.71	1.83±0.40	71.13±10.35	95.25±9.38	47.00±4.87
<i>Laphangium luteoalbum</i>	61.38±8.24	81.67±3.08	41.08±5.76	18.38±1.76	21.75±1.94	15.00±1.76	11.46±1.61	14.42±2.11	8.50±1.32	91.21±10.88	117.83±3.98	64.58±8.00
<i>Lepidagathis incurva</i>	0.00	0.00	0.00	5.67±1.67	7.33±0.00	4.00±0.00	6.83±1.50	8.33±0.00	5.33±0.00	12.50±3.17	15.67±0.00	9.33±0.00

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Leucas aspera</i>	9.96±0.96	11.75±1.44	8.17±0.32	0.00	0.00	0.00	0.00	0.00	0.00	9.96±0.96	11.75±1.44	8.17±0.32
<i>Leucostegia immersa</i>	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Lindernia crustacea</i>	142.21±13.31	175.83±5.76	108.58±6.34	56.54±7.51	74.50±5.22	38.58±4.61	33.21±3.79	41.92±3.68	24.50±1.72	231.96±24.27	292.25±13.27	171.67±12.19
<i>Lindernia ruelliioides</i>	26.17±1.17	26.17±1.17	0.00	14.50±1.17	14.50±1.17	0.00	0.00	0.00	0.00	40.67±2.33	40.67±2.33	0.00
<i>Ludwigia adscendens</i>	6.58±1.02	8.33±0.33	4.83±0.17	0.00	0.00	0.00	0.00	0.00	0.00	6.58±1.02	8.33±0.33	4.83±0.17
<i>Ludwigia octovalvis</i>	17.83±5.17	17.83±5.17	0.00	10.83±2.17	10.83±2.17	0.00	0.00	0.00	0.00	28.67±7.33	28.67±7.33	0.00
<i>Lygodium flexuosum</i>	21.54±4.00	28.42±5.63	14.67±3.39	8.63±1.61	11.92±2.01	5.33±0.95	4.08±0.96	5.75±1.51	2.42±0.37	34.25±5.77	46.08±6.80	22.42±3.94
<i>Lygodium microphyllum</i>	12.00±3.33	15.33±0.00	8.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00±3.33	15.33±0.00	8.67±0.00
<i>Mazus pumilus</i>	58.67±6.98	75.22±9.62	46.25±2.14	13.33±2.35	17.44±4.59	10.25±1.17	8.33±0.73	9.44±1.31	7.50±0.70	80.33±9.44	102.11±14.11	64.00±2.13
<i>Mecardonia procumbens</i>	60.72±12.52	74.17±14.46	33.83±3.17	15.72±2.95	18.00±3.80	11.17±3.50	9.33±1.34	10.58±1.64	6.83±1.17	85.78±16.28	102.75±19.09	51.83±7.83
<i>Melilotus albus</i>	3.17±1.50	3.17±1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.17±1.50	3.17±1.50	0.00
<i>Merremia umbellata</i>	71.88±12.53	100.67±10.15	43.08±8.80	21.42±4.73	32.50±4.40	10.33±1.81	13.42±2.29	17.42±3.57	9.42±1.08	106.71±18.80	150.58±15.60	62.83±11.11
<i>Mikania micrantha</i>	23.33±4.39	30.08±4.89	16.58±5.97	10.25±2.03	14.00±2.29	6.50±2.17	0.00	0.00	0.00	33.58±5.99	44.08±6.34	23.08±7.34
<i>Nelsonia canescens</i>	3.67±0.67	0.00	3.67±0.67	4.33±0.33	0.00	4.33±0.33	0.00	0.00	0.00	8.00±1.00	0.00	8.00±1.00
<i>Oldenlandia lineata</i>	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00
<i>Oldenlandia tenelliflora</i>	0.00	0.00	0.00	7.33±0.00	0.00	7.33±0.00	0.00	0.00	0.00	7.33±0.00	0.00	7.33±0.00
<i>Onychium japonicum</i>	15.00±0.00	0.00	15.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00±0.00	0.00	15.00±0.00
<i>Opismenus burmanni</i>	28.40±3.88	34.22±2.79	19.67±0.33	10.27±2.23	13.11±2.54	6.00±0.33	6.20±0.58	7.00±0.58	5.00±0.00	44.87±6.38	54.33±4.86	30.67±0.00
<i>Opismenus compositus</i>	60.67±0.00	60.67±0.00	0.00	22.00±0.00	22.00±0.00	0.00	0.00	0.00	0.00	82.67±0.00	82.67±0.00	0.00
<i>Oxalis corniculata</i>	158.17±15.90	197.08±10.28	119.25±8.06	57.63±9.01	77.67±8.79	37.58±5.83	33.63±3.44	41.67±2.38	25.58±2.55	249.42±27.94	316.42±19.83	182.42±16.04
<i>Oxalis debilis</i>	0.00	0.00	0.00	6.00±1.67	6.00±1.67	0.00	6.33±0.00	6.33±0.00	0.00	12.33±1.67	12.33±1.67	0.00
<i>Oxalis latifolia</i>	1.67±0.00	0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00
<i>Panicum auritum</i>	9.67±0.00	9.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.67±0.00	9.67±0.00	0.00
<i>Panicum brevifolium</i>	39.67±0.00	0.00	39.67±0.00	16.33±0.00	0.00	16.33±0.00	0.00	0.00	0.00	56.00±0.00	0.00	56.00±0.00
<i>Panicum notatum</i>	54.44±13.14	92.50±17.17	35.42±4.51	16.17±3.95	27.67±5.00	10.42±1.36	0.00	0.00	0.00	70.61±17.08	120.17±22.17	45.83±5.81
<i>Parthenium hysterophorus</i>	6.29±0.74	7.25±0.95	5.33±1.01	3.29±0.35	3.92±0.52	2.67±0.24	0.00	0.00	0.00	9.58±0.97	11.17±1.29	8.00±1.04
<i>Paspalidium flavidum</i>	24.50±5.24	24.67±11.67	24.33±5.33	0.00	0.00	0.00	0.00	0.00	0.00	24.50±5.24	24.67±11.67	24.33±5.33
<i>Paspalum conjugatum</i>	148.92±21.84	200.42±16.72	97.42±13.37	49.33±9.89	69.67±12.70	29.00±4.46	28.21±4.52	38.58±4.25	17.83±2.38	226.46±35.18	308.67±30.33	144.25±18.75
<i>Paspalum dilatatum</i>	41.17±11.58	59.17±12.50	23.17±0.50	0.00	0.00	0.00	0.00	0.00	0.00	41.17±11.58	59.17±12.50	23.17±0.50
<i>Paspalum scrobiculatum</i>	33.00±0.00	33.00±0.00	0.00	9.00±0.00	9.00±0.00	0.00	0.00	0.00	0.00	42.00±0.00	42.00±0.00	0.00
<i>Peperomia pellucida</i>	79.29±11.68	105.92±9.84	52.67±8.21	19.29±3.86	26.42±5.63	12.17±1.95	10.67±1.47	13.67±2.02	7.67±0.19	109.25±15.72	146±14.56	72.50±6.37
<i>Persicaria barbata</i>	3.11±0.40	2.83±0.50	3.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.11±0.40	2.83±0.50	3.67±0.00
<i>Persicaria hydropiper</i>	17.38±2.67	24.33±0.84	10.42±0.55	9.42±0.95	10.75±1.09	8.08±1.36	7.58±0.85	8.83±1.17	6.33±0.98	34.38±3.82	43.92±1.2	24.83±2.44
<i>Persicaria orientalis</i>	3.00±0.33	3.00±0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00±0.33	3.00±0.33	0.00
<i>Phyla nodiflora</i>	6.92±2.69	10.50±4.17	3.33±0.67	2.33±0.59	2.83±1.17	1.83±0.50	2.00±0.58	3.00±0.00	1.00±0.00	11.25±3.22	16.33±3.00	6.17±1.17
<i>Phyllanthus niruri</i>	196.58±23.49	250.58±18.29	142.58±17.19	67.79±10.48	91.58±10.25	44.00±5.51	41.38±4.25	51.58±3.24	31.17±2.03	305.75±37.72	393.75±29.70	217.75±24.4
<i>Phyllanthus virgatus</i>	0.00	0.00	0.00	4.00±0.00	0.00	4.00±0.00	0.00	0.00	0.00	4.00±0.00	0.00	4.00±0.00
<i>Physalis minima</i>	10.00±1.67	10.00±1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00±1.67	10.00±1.67	0.00
<i>Plectranthus sp.</i>	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Poa annua</i>	0.00	0.00	0.00	9.33±0.67	10.00±0.00	8.67±0.00	7.17±1.83	9±0	5.33±0.00	16.50±2.50	19.00±0.00	14.00±0.00
<i>Polycarpon prostratum</i>	89.13±16.48	127.50±14.72	50.75±8.28	21.58±4.27	30.33±5.77	12.83±0.83	16.67±2.52	21.58±3.44	11.75±1.30	127.38±22.85	179.42±23.59	75.33±8.64
<i>Polygala arvensis</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00	1.67±0.00	0.00	1.67±0.00
<i>Polygonum plebeium</i>	185.13±23.25	238.25±23.11	132.00±10.34	60.63±9.06	80.42±9.46	40.83±5.68	35.50±3.93	44.33±4.15	26.67±1.73	281.25±36.08	363.00±36.43	199.50±17.06
<i>Portulaca oleracea</i>	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00
<i>Pouzolzia zeylanica</i>	106.92±19.18	151.92±16.82	61.92±9.10	41.79±7.61	58.42±7.95	25.17±4.79	25.08±3.80	33.50±4.02	16.67±2.01	173.79±30.37	243.83±28.31	103.75±15.24
<i>Pycneus pumilus</i>	0.00	0.00	0.00	0.00	0.00	0.00	7.33±0.00	7.33±0.00	0.00	7.33±0.00	7.33±0.00	0.00
<i>Ranunculus scleratus</i>	4.56±0.44	5.00±0.00	4.33±0.67	0.00	0.00	0.00	0.00	0.00	0.00	4.56±0.44	5.00±0.00	4.33±0.67
<i>Rorippa indica</i>	113.33±14.96	147.75±12.84	78.92±9.46	40.96±7.12	57.83±6.55	24.08±1.89	23.33±2.49	28.50±2.53	18.17±2.18	177.63±23.35	234.08±17.56	121.17±10.51
<i>Rumex dentatus</i>	2.67±0.43	0.00	2.67±0.43	0.00	0.00	0.00	0.00	0.00	0.00	2.67±0.43	0.00	2.67±0.43
<i>Rungia pectinata</i>	33.00±0.67	32.33±0.00	33.67±0.00	16.17±1.83	14.33±0.00	18.00±0.00	14.00±3.67	17.67±0.00	10.33±0.00	63.17±1.17	64.33±0.00	62.00±0.00
<i>Rungia repens</i>	26.33±7.41	32.83±15.17	19.83±3.83	0.00	0.00	0.00	0.00	0.00	0.00	26.33±7.41	32.83±15.17	19.83±3.83
<i>Saccharum spp.</i>	37.00±2.48	42.92±1.44	31.08±1.80	21.29±3.87	29.92±2.82	12.67±3.53	8.17±1.39	11.33±1.43	5.00±0.49	66.46±7.39	84.17±4.52	48.75±5.06
<i>Scleria terrestris</i>	30.96±6.46	45.25±5.80	16.67±5.00	14.04±2.59	19.08±3.31	9.00±1.82	0.00	0.00	0.00	45.00±8.16	64.33±6.44	25.67±4.49

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Senna tora</i>	2.11±0.40	2.33±0.00	2.00±0.67	0.00	0.00	0.00	0.00	0.00	0.00	2.11±0.40	2.33±0.00	2.00±0.67
<i>Setaria pumila</i>	93.13±13.03	122.33±13.36	63.92±6.71	37.67±7.00	51.75±8.93	23.58±4.07	21.96±3.70	29.25±4.57	14.67±2.74	152.75±23.50	203.33±26.37	102.17±13.24
<i>Setaria viridis</i>	26.00±0.00	26.00±0.00	0.00	16.00±0.00	16.00±0.00	0.00	0.00	0.00	0.00	42.00±0.00	42.00±0.00	0.00
<i>Sida acuta</i>	4.83±1.50	4.83±1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.83±1.50	4.83±1.50	0.00
<i>Solanum americanum</i>	9.00±1.26	10.50±1.78	7.50±1.65	6.50±0.89	6.92±1.87	6.08±0.21	5.25±0.56	5.58±1.05	4.92±0.52	20.75±2.41	23.00±4.56	18.50±1.73
<i>Solanum viarum</i>	11.96±1.92	13.25±3.73	10.67±1.50	6.75±1.10	8.33±1.68	5.17±1.06	0.00	0.00	0.00	18.71±2.97	21.58±5.41	15.83±2.51
<i>Sonchus oleraceus</i>	1.00±0.00	1.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	1.00±0.00	0.00
<i>Sporobolus diandrus</i>	15.11±6.85	19.33±9.33	6.67±0.00	6.89±1.68	8.50±0.83	3.67±0.00	0.00	0.00	0.00	22.00±8.28	27.83±10.17	10.33±0.00
<i>Sporobolus fertilis</i>	8.00±2.28	9.50±4.83	6.50±1.83	0.00	0.00	0.00	0.00	0.00	0.00	8.00±2.28	9.50±4.83	6.50±1.83
<i>Stellaria media</i>	18.14±3.30	24.67±4.93	13.25±2.71	10.24±2.12	13.78±4.08	7.58±1.37	0.00	0.00	0.00	28.38±5.29	38.44±8.99	20.83±3.66
<i>Synedrella nodiflora</i>	3.67±0.91	5.00±0.67	2.33±1.00	0.00	0.00	0.00	0.00	0.00	0.00	3.67±0.91	5.00±0.67	2.33±1.00
<i>Tetragstigma dubium</i>	4.00±0.00	4.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00
<i>Themeda spp.</i>	6.75±0.28	6.92±0.57	6.58±0.16	3.71±0.41	4.17±0.62	3.25±0.52	0.00	0.00	0.00	10.46±0.54	11.08±0.95	9.83±0.44
<i>Thespis divaricata</i>	17.60±4.59	25.83±5.83	12.11±4.61	7.60±2.41	10.00±5.67	6.00±2.33	0.00	0.00	0.00	25.20±6.78	35.83±11.50	18.11±6.82
<i>Tridax procumbens</i>	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Urochloa panicoides</i>	6.67±0.00	6.67±0.00	0.00	3.67±0.00	3.67±0.00	0.00	3.33±0.00	3.33±0.00	0.00	13.67±0.00	13.67±0.00	0.00
<i>Verbena officinalis</i>	3.00±0.00	3.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00±0.00	3.00±0.00	0.00
<i>Vicia sativa</i>	7.00±0.00	7.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00±0.00	7.00±0.00	0.00
<i>Xanthium strumarium</i>	7.05±0.97	8.89±1.54	5.67±0.78	3.95±0.84	4.89±1.94	3.25±0.46	0.00	0.00	0.00	11.00±1.63	13.78±2.98	8.92±1.24
<i>Youngia japonica</i>	1.33±0.00	1.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33±0.00	1.33±0.00	0.00
UI 1	0.00	0.00	0.00	0.00	0.00	0.00	3.67±0.00	3.67±0.00	0.00	3.67±0.00	3.67±0.00	0.00
UI 2	3.00±1.33	0.00	3.00±1.33	3.33±0.33	0.00	3.33±0.33	0.00	0.00	0.00	6.33±1.67	0.00	6.33±1.67
UI 3	2.67±0.00	2.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67±0.00	2.67±0.00	0.00
UI 4	0.00	0.00	0.00	1.33±0.00	0.00	1.33±0.00	0.00	0.00	0.00	1.33±0.00	0.00	1.33±0.00
UI 5	19.83±1.68	18.67±3.23	21.00±1.37	10.21±2.33	10.92±4.59	9.05±1.98	0.00	0.00	0.00	30.04±3.34	29.58±6.65	30.50±2.79
UI 6	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
UI 7	0.00	0.00	0.00	0.00	0.00	0.00	5±0	5.00±0.00	0.00	5.00±0.00	5.00±0.00	0.00
UI 8	14.33±2.81	20.00±1.86	8.67±2.01	3.72±1.00	5.33±1.35	2.11±0.78	2.67±0.51	3.67±0.19	1.67±0.51	20.72±3.87	29.00±1.45	12.44±2.02
UI 10	8.67±1.25	10.50±1.17	6.83±1.17	3.75±1.58	5.83±2.50	1.67±0.00	2.17±0.59	3.17±0.17	1.17±0.17	14.58±2.91	19.50±1.17	9.67±1.00
UI 11	11.83±0.17	11.83±0.17	0.00	4.17±0.17	4.17±0.17	0.00	0.00	0.00	0.00	16.00±0.00	16.00±0.00	0.00
UI 12	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00
UI 14	6.67±0.00	0.00	6.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.67±0.00	0.00	6.67±0.00
UI 16	1.00±0.00	0.00	1.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00
UI 17	10.20±1.73	12.67±1.39	6.50±1.17	0.00	0.00	0.00	5.07±0.91	5.56±1.46	4.33±1.00	15.27±2.32	18.22±2.35	10.83±2.17
UI 18	2.00±0.00	2.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00±0.00	2.00±0.00	0.00
UI 19	3.00±0.00	3.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00±0.00	3.00±0.00	0.00
UI 20	0.00	0.00	0.00	3.33±0.00	3.33±0.00	0.00	0.00	0.00	0.00	3.33±0.00	3.33±0.00	0.00
UI 21	7.00±0.33	7.00±0.33	0.00	2.00±0.67	2.00±0.67	0.00	0.00	0.00	0.00	9.00±1.00	9.00±1.00	0.00
UI 22	0.00	0.00	0.00	2.33±0.00	2.33±0.00	0.00	0.00	0.00	0.00	2.33±0.00	2.33±0.00	0.00
UI 25	14.67±0.00	14.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.67±0.00	14.67±0.00	0.00
UI 26	8.00±0.00	8.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00±0.00	8.00±0.00	0.00
UI 27	0.00	0.00	0.00	4.00±0.00	4±0	0.00	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00
UI 28	2.00±0.00	0.00	2.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00±0.00	0.00	2.00±0.00
UI 29	9.80±0.65	9.33±0.33	10.11±1.11	0.00	0.00	0.00	0.00	0.00	0.00	9.80±0.65	9.33±0.33	10.11±1.11
UK (premature mortality)	209.21±30.78	284.83±20.30	133.58±13.99	73.92±14.67	109.75±11.22	38.08±4.76	19.79±4.19	29.25±4.21	10.33±2.17	302.92±49.40	423.83±35.39	182.00±19.67

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.21. Overall and seasonal plant species seed abundances and densities (m⁻²) recorded from different soil layers of riverine alluvial grasslands soil seed bank given flooding treatment during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Acmeila uliginosa</i>	151	29.68	58	22.80	93	36.57	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	151	9.89	58	7.60	93	12.19
<i>Acroceras zizanioides</i>	343	67.43	253	99.47	90	35.39	121	23.79	89	34.99	32	12.58	91	17.89	62	24.38	29	11.40	555	36.37	404	52.95	151	19.79
<i>Adenostemma lavenia</i>	0	0.00	0	0.00	0	0.00	5	0.98	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	5	0.33	5	0.66	0	0.00
<i>Adiantum caudatum</i>	215	42.27	123	48.36	92	36.17	81	15.92	52	20.45	29	11.40	40	7.86	23	9.04	17	6.68	336	22.02	198	25.95	138	18.09
<i>Adiantum capillus-veneris</i>	5	0.98	0	0.00	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.33	0	0.00	5	0.66
<i>Aeschynomene aspera</i>	55	10.81	55	21.62	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	55	3.60	55	7.21	0	0.00
<i>Ageratum conyzoides</i>	305	59.96	161	63.30	144	56.62	128	25.16	72	28.31	56	22.02	130	25.56	67	26.34	63	24.77	563	36.89	300	39.32	263	34.47
<i>Alternanthera philoxeroides</i>	58	11.40	58	22.80	0	0.00	0	0.00	0	0.00	0	0.00	27	5.31	27	10.62	0	0.00	85	5.57	85	11.14	0	0.00
<i>Alternanthera pungens</i>	452	88.86	226	88.86	226	88.86	100	19.66	52	20.45	48	18.87	0	0.00	0	0.00	0	0.00	552	36.17	278	36.43	274	35.91
<i>Alternanthera sessilis</i>	1464	287.80	828	325.55	636	250.06	624	122.67	371	145.87	253	99.47	381	74.90	221	86.89	160	62.91	2469	161.79	1420	186.10	1049	137.48
<i>Amaranthus spinosus</i>	86	16.91	41	16.12	45	17.69	40	7.86	25	9.83	15	5.90	0	0.00	0	0.00	0	0.00	126	8.26	66	8.65	60	7.86
<i>Amaranthus viridis</i>	155	30.47	78	30.67	77	30.27	58	11.40	32	12.58	26	10.22	0	0.00	0	0.00	0	0.00	213	13.96	110	14.42	103	13.50
<i>Ammannia multiflora</i>	40	7.86	40	15.73	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	40	2.62	40	5.24	0	0.00
<i>Ampelopteris prolifera</i>	189	37.15	189	74.31	0	0.00	48	9.44	48	18.87	0	0.00	0	0.00	0	0.00	0	0.00	237	15.53	237	31.06	0	0.00
<i>Apluda mutica</i>	949	186.56	637	250.45	312	122.67	328	64.48	197	77.46	131	51.51	257	50.52	151	59.37	106	41.68	1534	100.52	985	129.09	549	71.95
<i>Arenaria serpyllifolia</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	8	1.57	8	3.15	0	0.00	8	0.52	8	1.05	0	0.00
<i>Aristida adscensionis</i>	27	5.31	27	10.62	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	27	1.77	27	3.54	0	0.00
<i>Artemisia carvifolia</i>	55	10.81	55	21.62	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	55	3.60	55	7.21	0	0.00
<i>Arundinella bengalensis</i>	121	23.79	121	47.57	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	121	7.93	121	15.86	0	0.00
<i>Axonopus compressus</i>	524	103.01	327	128.57	197	77.46	168	33.03	103	40.50	65	25.56	157	30.86	96	37.74	61	23.98	849	55.63	526	68.94	323	42.33
<i>Azolla pinnata</i>	375	73.72	286	112.45	89	34.99	52	10.22	36	14.15	16	6.29	59	11.60	53	20.84	6	2.36	486	31.85	375	49.15	111	14.55
<i>Boerhavia diffusa</i>	0	0.00	0	0.00	0	0.00	5	0.98	0	0.00	5	1.97	0	0.00	0	0.00	0	0.00	5	0.33	0	0.00	5	0.66
<i>Brachiaria reptans</i>	83	16.32	83	32.63	0	0.00	43	8.45	43	16.91	0	0.00	0	0.00	0	0.00	0	0.00	126	8.26	126	16.51	0	0.00
<i>Capillipedium assimile</i>	19	3.74	0	0.00	19	7.47	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	19	1.25	0	0.00	19	2.49
<i>Capsella bursa-pastoris</i>	5	0.98	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.33	5	0.66	0	0.00
<i>Cardiospermum halicacabum</i>	36	7.08	36	14.15	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	36	2.36	36	4.72	0	0.00
<i>Carex vesicaria</i>	204	40.10	109	42.86	95	37.35	92	18.09	48	18.87	44	17.30	54	10.62	28	11.01	26	10.22	350	22.94	185	24.25	165	21.62
<i>Cenchrus ciliaris</i>	164	32.24	95	37.35	69	27.13	79	15.53	46	18.09	33	12.97	58	11.40	33	12.97	25	9.83	301	19.72	174	22.80	127	16.64
<i>Centella asiatica</i>	295	57.99	162	63.69	133	52.29	82	16.12	37	14.55	45	17.69	0	0.00	0	0.00	0	0.00	377	24.70	199	26.08	178	23.33
<i>Centothea lappacea</i>	13	2.56	0	0.00	13	5.11	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	13	0.85	0	0.00	13	1.70
<i>Ceratopteris thalictroides</i>	37	7.27	37	14.55	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	37	2.42	37	4.85	0	0.00
<i>Christella parasitica</i>	978	192.26	642	252.42	336	132.11	388	76.28	234	92.00	154	60.55	282	55.44	172	67.63	110	43.25	1648	107.99	1048	137.35	600	78.63
<i>Chrysopogon aciculatus</i>	235	46.20	143	56.22	92	36.17	101	19.86	66	25.95	35	13.76	100	19.66	53	20.84	47	18.48	436	28.57	262	34.34	174	22.80
<i>Commelina benghalensis</i>	91	17.89	50	19.66	41	16.12	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	91	5.96	50	6.55	41	5.37
<i>Cotula hemisphaerica</i>	312	61.34	147	57.80	165	64.87	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	312	20.45	147	19.27	165	21.62
<i>Cuphea carthagenensis</i>	508	99.87	342	134.47	166	65.27	139	27.33	101	39.71	38	14.94	0	0.00	0	0.00	0	0.00	647	42.40	443	58.06	204	26.74
<i>Cynodon dactylon</i>	3801	747.23	2409	947.16	1392	547.30	1565	307.66	926	364.08	639	251.24	982	193.05	565	222.14	417	163.95	6348	415.98	3900	511.13	2448	320.83
<i>Cyperus compactus</i>	15	2.95	15	5.90	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	15	0.98	15	1.97	0	0.00
<i>Cyperus compressus</i>	436	85.71	274	107.73	162	63.69	170	33.42	101	39.71	69	27.13	138	27.13	83	32.63	55	21.62	744	48.75	458	60.02	286	37.48
<i>Cyperus cyperoides</i>	70	13.76	61	23.98	9	3.54	28	5.50	19	7.47	9	3.54	0	0.00	0	0.00	0	0.00	98	6.42	80	10.48	18	2.36
<i>Cyperus digitatus</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	1.97	10	3.93	0	0.00	10	0.66	10	1.31	0	0.00
<i>Cyperus distans</i>	216	42.46	95	37.35	121	47.57	87	17.10	42	16.51	45	17.69	0	0.00	0	0.00	0	0.00	303	19.86	137	17.95	166	21.76
<i>Cyperus eleusinoides</i>	0	0.00	0	0.00	0	0.00	2	0.39	2	0.79	0	0.00	0	0.00	0	0.00	0	0.00	2	0.13	2	0.26	0	0.00
<i>Cyperus eragrostis</i>	371	72.93	188	73.92	183	71.95	136	26.74	79	31.06	57	22.41	128	25.16	57	22.41	71	27.92	635	41.61	324	42.46	311	40.76
<i>Cyperus imbricatus</i>	210	41.28	88	34.60	122	47.97	105	20.64	48	18.87	57	22.41	0	0.00	0	0.00	0	0.00	315	20.64	136	17.82	179	23.46
<i>Cyperus iria</i>	269	52.88	152	59.76	117	46.00	127	24.97	79	31.06	48	18.87	0	0.00	0	0.00	0	0.00	396	25.95	231	30.27	165	21.62
<i>Cyperus rotundus</i>	127	24.97	127	49.93	0	0.00	0	0.00	0	0.00	0	0.00	87	17.10	87	34.21	0	0.00	214	14.02	214	28.05	0	0.00
<i>Cyperus strigosus</i>	0	0.00	0	0.00	0	0.00	6	1.18	6	2.36	0	0.00	0	0.00	0	0.00	0	0.00	6	0.39	6	0.79	0	0.00
<i>Cyperus tenuispica</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	0.39	2	0.79	0	0.00	2					

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Digitaria ciliaris</i>	1169	229.81	701	275.62	468	184.01	457	89.84	252	99.08	205	80.60	369	72.54	211	82.96	158	62.12	1995	130.73	1164	152.55	831	108.91
<i>Drymaria cordata</i>	0	0.00	0	0.00	0	0.00	10	1.97	10	3.93	0	0.00	0	0.00	0	0.00	0	0.00	10	0.66	10	1.31	0	0.00
<i>Duchesnea indica</i>	278	54.65	154	60.55	124	48.75	82	16.12	36	14.15	46	18.09	0	0.00	0	0.00	0	0.00	360	23.59	190	24.90	170	22.28
<i>Echinochloa colona</i>	25	4.91	0	0.00	25	9.83	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	25	1.64	0	0.00	25	3.28
<i>Echinochloa crus-galli</i>	391	76.87	223	87.68	168	66.05	145	28.51	67	26.34	78	30.67	0	0.00	0	0.00	0	0.00	536	35.12	290	38.01	246	32.24
<i>Eclipta prostrata</i>	320	62.91	176	69.20	144	56.62	116	22.80	67	26.34	49	19.27	103	20.25	54	21.23	49	19.27	539	35.32	297	38.92	242	31.72
<i>Eichhornia crassipes</i>	191	37.55	112	44.04	79	31.06	88	17.30	50	19.66	38	14.94	68	13.37	40	15.73	28	11.01	347	22.74	202	26.47	145	19.00
<i>Eleocharis acutangula</i>	0	0.00	0	0.00	0	0.00	100	19.66	62	24.38	38	14.94	0	0.00	0	0.00	0	0.00	100	6.55	62	8.13	38	4.98
<i>Enhydra fluctuans</i>	9	1.77	9	3.54	0	0.00	8	1.57	8	3.15	0	0.00	0	0.00	0	0.00	0	0.00	17	1.11	17	2.23	0	0.00
<i>Equisetum debile</i>	188	36.96	85	33.42	103	40.50	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	188	12.32	85	11.14	103	13.50
<i>Eragrostis riparia</i>	49	9.63	33	12.97	16	6.29	37	7.27	20	7.86	17	6.68	0	0.00	0	0.00	0	0.00	86	5.64	53	6.95	33	4.32
<i>Eragrostis unioides</i>	55	10.81	16	6.29	39	15.33	0	0.00	0	0.00	0	0.00	38	7.47	15	5.90	23	9.04	93	6.09	31	4.06	62	8.13
<i>Ethulia conyzoides</i>	735	144.49	413	162.38	322	126.60	263	51.70	158	62.12	105	41.28	219	43.05	112	44.04	107	42.07	1217	79.75	683	89.51	534	69.99
<i>Euphorbia hirta</i>	227	44.63	111	43.64	116	45.61	99	19.46	37	14.55	62	24.38	85	16.71	36	14.15	49	19.27	411	26.93	184	24.11	227	29.75
<i>Euphorbia hypericifolia</i>	131	25.75	131	51.51	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	131	8.58	131	17.17	0	0.00
<i>Evolvulus nummularius</i>	149	29.29	73	28.70	76	29.88	51	10.03	28	11.01	23	9.04	0	0.00	0	0.00	0	0.00	200	13.11	101	13.24	99	12.97
<i>Fimbristylis aestivalis</i>	1056	207.60	602	236.69	454	178.50	445	87.48	258	101.44	187	73.52	361	70.97	210	82.57	151	59.37	1862	122.02	1070	140.23	792	103.80
<i>Fimbristylis littoralis</i>	19	3.74	19	7.47	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	19	1.25	19	2.49	0	0.00
<i>Glinus lotoides</i>	162	31.85	76	29.88	86	33.81	69	13.56	28	11.01	41	16.12	0	0.00	0	0.00	0	0.00	231	15.14	104	13.63	127	16.64
<i>Glinus oppositifolius</i>	118	23.20	70	27.52	48	18.87	0	0.00	0	0.00	0	0.00	32	6.29	20	7.86	12	4.72	150	9.83	90	11.80	60	7.86
<i>Grangea maderaspatana</i>	967	190.10	517	203.27	450	176.93	414	81.39	241	94.76	173	68.02	293	57.60	136	53.47	157	61.73	1674	109.70	894	117.17	780	102.23
<i>Heliotropium indicum</i>	341	67.04	194	76.28	147	57.80	145	28.51	86	33.81	59	23.20	129	25.36	71	27.92	58	22.80	615	40.30	351	46.00	264	34.60
<i>Hemarthra compressa</i>	1796	353.07	1034	406.54	762	299.60	820	161.20	490	192.66	330	129.75	684	134.47	388	152.55	296	116.38	3300	216.25	1912	250.58	1388	181.91
<i>Hypis suaveolens</i>	246	48.36	117	46.00	129	50.72	82	16.12	36	14.15	46	18.09	88	17.30	41	16.12	47	18.48	416	27.26	194	25.43	222	29.09
<i>Ichnanthus pallens</i>	0	0.00	0	0.00	0	0.00	5	0.98	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	5	0.33	5	0.66	0	0.00
<i>Imperata cylindrica</i>	732	143.90	480	188.72	252	99.08	275	54.06	182	71.56	93	36.57	222	43.64	121	47.57	101	39.71	1229	80.54	783	102.62	446	58.45
<i>Isachne globosa</i>	72	14.15	33	12.97	39	15.33	39	7.67	20	7.86	19	7.47	0	0.00	0	0.00	0	0.00	111	7.27	53	6.95	58	7.60
<i>Juncus articulatus</i>	31	6.09	21	8.26	10	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	31	2.03	21	2.75	10	1.31
<i>Juncus prismatocarpus</i>	0	0.00	0	0.00	0	0.00	12	2.36	12	4.72	0	0.00	0	0.00	0	0.00	0	0.00	12	0.79	12	1.57	0	0.00
<i>Kyllinga brevifolia</i>	554	108.91	351	138.00	203	79.81	172	33.81	92	36.17	80	31.45	0	0.00	0	0.00	0	0.00	726	47.57	443	58.06	283	37.09
<i>Laphangium luteoalbum</i>	301	59.17	197	77.46	104	40.89	136	26.74	83	32.63	53	20.84	136	26.74	76	29.88	60	23.59	573	37.55	356	46.66	217	28.44
<i>Leersia hexandra</i>	54	10.62	54	21.23	0	0.00	17	3.34	17	6.68	0	0.00	0	0.00	0	0.00	0	0.00	71	4.65	71	9.31	0	0.00
<i>Leucas aspera</i>	75	14.74	41	16.12	34	13.37	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	75	4.91	41	5.37	34	4.46
<i>Limnobiium laevigatum</i>	568	111.66	387	152.16	181	71.16	192	37.74	143	56.22	49	19.27	145	28.51	95	37.35	50	19.66	905	59.30	625	81.91	280	36.70
<i>Lindernia crustacea</i>	1291	253.79	761	299.21	530	208.38	595	116.97	358	140.76	237	93.18	404	79.42	226	88.86	178	69.99	2290	150.06	1345	176.27	945	123.85
<i>Ludwigia adscendens</i>	70	13.76	34	13.37	36	14.15	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	70	4.59	34	4.46	36	4.72
<i>Lygodium flexuosum</i>	304	59.76	199	78.24	105	41.28	96	18.87	65	25.56	31	12.19	50	9.83	32	12.58	18	7.08	450	29.49	296	38.79	154	20.18
<i>Marsilea quadrifolia</i>	468	92.00	343	134.86	125	49.15	143	28.11	108	42.46	35	13.76	144	28.31	102	40.10	42	16.51	755	49.47	553	72.48	202	26.47
<i>Mazus pumilus</i>	252	49.54	94	36.96	158	62.12	84	16.51	42	16.51	42	16.51	108	21.23	43	16.91	65	25.56	444	29.09	179	23.46	265	34.73
<i>Mecardonia procumbens</i>	210	41.28	139	54.65	71	27.92	59	11.60	39	15.33	20	7.86	95	18.68	63	24.77	32	12.58	364	23.85	241	31.59	123	16.12
<i>Merremia umbellata</i>	664	130.53	462	181.65	202	79.42	191	37.55	114	44.82	77	30.27	213	41.87	135	53.08	78	30.67	1068	69.99	711	93.18	357	46.79
<i>Mikania micrantha</i>	233	45.80	158	62.12	75	29.49	67	13.17	48	18.87	19	7.47	0	0.00	0	0.00	0	0.00	300	19.66	206	27.00	94	12.32
<i>Monochoria hastata</i>	10	1.97	10	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	0.66	10	1.31	0	0.00
<i>Nymphoides cristata</i>	12	2.36	12	4.72	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	12	0.79	12	1.57	0	0.00
<i>Oldenlandia lineata</i>	0	0.00	0	0.00	0	0.00	4	0.79	0	0.00	4	1.57	0	0.00	0	0.00	0	0.00	4	0.26	0	0.00	4	0.52
<i>Oldenlandia tenelliflora</i>	0	0.00	0	0.00	0	0.00	14	2.75	0	0.00	14	5.50	0	0.00	0	0.00	0	0.00	14	0.92	0	0.00	14	1.83
<i>Oplismenus burmanni</i>	188	36.96	130	51.11	58	22.80	71	13.96	49	19.27	22	8.65	37	7.27	27	10.62	10	3.93	296	19.40	206	27.00	90	11.80
<																								

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Paspalum conjugatum</i>	1164	228.83	735	288.98	429	168.67	534	104.98	333	130.93	201	79.03	383	75.29	227	89.25	156	61.34	2081	136.37	1295	169.72	786	103.01
<i>Peperomia pellucida</i>	375	73.72	187	73.52	188	73.92	150	29.49	75	29.49	75	29.49	164	32.24	77	30.27	87	34.21	689	45.15	339	44.43	350	45.87
<i>Persicaria barbata</i>	56	11.01	34	13.37	22	8.65	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	56	3.67	34	4.46	22	2.88
<i>Persicaria chinensis</i>	4	0.79	4	1.57	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	4	0.26	4	0.52	0	0.00
<i>Persicaria hydropiper</i>	268	52.69	169	66.45	99	38.92	128	25.16	78	30.67	50	19.66	112	22.02	61	23.98	51	20.05	508	33.29	308	40.37	200	26.21
<i>Persicaria orientalis</i>	29	5.70	29	11.40	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	29	1.90	29	3.80	0	0.00
<i>Phyla nodiflora</i>	28	5.50	19	7.47	9	3.54	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	28	1.83	19	2.49	9	1.18
<i>Phyllanthus niruri</i>	1972	387.67	1172	460.80	800	314.54	742	145.87	431	169.46	311	122.28	584	114.81	354	139.18	230	90.43	3298	216.11	1957	256.48	1341	175.75
<i>Physalis minima</i>	36	7.08	36	14.15	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	36	2.36	36	4.72	0	0.00
<i>Pistia stratiotes</i>	78	15.33	78	30.67	0	0.00	46	9.04	46	18.09	0	0.00	40	7.86	40	15.73	0	0.00	164	10.75	164	21.49	0	0.00
<i>Plantago major</i>	14	2.75	0	0.00	14	5.50	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	14	0.92	0	0.00	14	1.83
<i>Polycarpon prostratum</i>	625	122.87	368	144.69	257	101.05	229	45.02	138	54.26	91	35.78	167	32.83	100	39.32	67	26.34	1021	66.91	606	79.42	415	54.39
<i>Polygonum plebeium</i>	1845	362.70	1116	438.78	729	286.62	725	142.53	438	172.21	287	112.84	543	106.75	317	124.64	226	88.86	3113	203.99	1871	245.21	1242	162.77
<i>Polygonum posumbo</i>	61	11.99	61	23.98	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	61	4.00	61	7.99	0	0.00
<i>Potentilla kleiniana</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.98	0	0.00	5	1.97	5	0.33	0	0.00	5	0.66
<i>Pouzolzia zeylanica</i>	1144	224.90	703	276.40	441	173.39	387	76.08	253	99.47	134	52.69	285	56.03	165	64.87	120	47.18	1816	119.00	1121	146.92	695	91.09
<i>Ranunculus cantoniensis</i>	14	2.75	14	5.50	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	14	0.92	14	1.83	0	0.00
<i>Ranunculus sceleratus</i>	45	8.85	15	5.90	30	11.80	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	45	2.95	15	1.97	30	3.93
<i>Rorippa indica</i>	1131	222.34	712	279.94	419	164.74	391	76.87	258	101.44	133	52.29	323	63.50	181	71.16	142	55.83	1845	120.90	1151	150.85	694	90.95
<i>Rungia pectinata</i>	111	21.82	65	25.56	46	18.09	48	9.44	27	10.62	21	8.26	9	1.77	6	2.36	3	1.18	168	11.01	98	12.84	70	9.17
<i>Saccharum spp.</i>	476	93.58	312	122.67	164	64.48	189	37.15	131	51.51	58	22.80	147	28.90	99	38.92	48	18.87	812	53.21	542	71.03	270	35.39
<i>Salvinia natans</i>	39	7.67	39	15.33	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	39	2.56	39	5.11	0	0.00
<i>Scirpus mucronatus</i>	0	0.00	0	0.00	0	0.00	16	3.15	16	6.29	0	0.00	0	0.00	0	0.00	0	0.00	16	1.05	16	2.10	0	0.00
<i>Scleria terrestris</i>	476	93.58	296	116.38	180	70.77	147	28.90	96	37.74	51	20.05	0	0.00	0	0.00	0	0.00	623	40.82	392	51.37	231	30.27
<i>Setaria pumila</i>	980	192.66	619	243.38	361	141.94	400	78.63	240	94.36	160	62.91	284	55.83	168	66.05	116	45.61	1664	109.04	1027	134.60	637	83.48
<i>Setaria viridis</i>	34	6.68	34	13.37	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	34	2.23	34	4.46	0	0.00
<i>Solanum americanum</i>	155	30.47	83	32.63	72	28.31	70	13.76	39	15.33	31	12.19	61	11.99	36	14.15	25	9.83	286	18.74	158	20.71	128	16.78
<i>Spermacoce pusilla</i>	21	4.13	17	6.68	4	1.57	10	1.97	8	3.15	2	0.79	0	0.00	0	0.00	0	0.00	31	2.03	25	3.28	6	0.79
<i>Spirodela polyrrhiza</i>	194	38.14	96	37.74	98	38.53	65	12.78	29	11.40	36	14.15	0	0.00	0	0.00	0	0.00	259	16.97	125	16.38	134	17.56
<i>Typhonium trilobatum</i>	2	0.39	0	0.00	2	0.79	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	0.13	0	0.00	2	0.26
<i>Urochloa panicoides</i>	31	6.09	31	12.19	0	0.00	24	4.72	24	9.44	0	0.00	0	0.00	0	0.00	0	0.00	55	3.60	55	7.21	0	0.00
UI 2	20	3.93	0	0.00	20	7.86	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	20	1.31	0	0.00	20	2.62
UI 5	217	42.66	90	35.39	127	49.93	69	13.56	38	14.94	31	12.19	0	0.00	0	0.00	0	0.00	286	18.74	128	16.78	158	20.71
UI 8	75	14.74	48	18.87	27	10.62	30	5.90	18	7.08	12	4.72	18	3.54	12	4.72	6	2.36	123	8.06	78	10.22	45	5.90
UI 13	7	1.38	7	2.75	0	0.00	2	0.39	2	0.79	0	0.00	0	0.00	0	0.00	0	0.00	9	0.59	9	1.18	0	0.00
UI 21	15	2.95	15	5.90	0	0.00	5	0.98	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	20	1.31	20	2.62	0	0.00
UI 24	25	4.91	0	0.00	25	9.83	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	25	1.64	0	0.00	25	3.28
UI (premature mortality)	1661	326.53	988	388.46	673	264.61	406	79.81	292	114.81	114	44.82	185	36.37	122	47.97	63	24.77	2252	147.57	1402	183.74	850	111.40

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.22. Overall and seasonal plant species total seed abundances recorded from different soil layers of riverine alluvial grasslands soil seed bank given flooding treatment during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Acmella uliginosa</i>	50.33	19.33	31.00	0.00	0.00	0.00	0.00	0.00	0.00	50.33	19.33	31.00
<i>Acroceras zizanioides</i>	114.33	84.33	30.00	40.33	29.67	10.67	30.33	20.67	9.67	185.00	134.67	50.33
<i>Adenostemma lavenia</i>	0.00	0.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	1.67	1.67	0.00

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Adiantum caudatum</i>	71.67	41.00	30.67	27.00	17.33	9.67	13.33	7.67	5.67	112.00	66.00	46.00
<i>Adiantum capillus-veneris</i>	1.67	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	1.67
<i>Aeschynomene aspera</i>	18.33	18.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.33	18.33	0.00
<i>Ageratum conyzoides</i>	101.67	53.67	48.00	42.67	24.00	18.67	43.33	22.33	21.00	187.67	100.00	87.67
<i>Alternanthera philoxeroides</i>	19.33	19.33	0.00	0.00	0.00	0.00	9.00	9.00	0.00	28.33	28.33	0.00
<i>Alternanthera pungens</i>	150.67	75.33	75.33	33.33	17.33	16.00	0.00	0.00	0.00	184.00	92.67	91.33
<i>Alternanthera sessilis</i>	488.00	276.00	212.00	208.00	123.67	84.33	127.00	73.67	53.33	823.00	473.33	349.67
<i>Amaranthus spinosus</i>	28.67	13.67	15.00	13.33	8.33	5.00	0.00	0.00	0.00	42.00	22.00	20.00
<i>Amaranthus viridis</i>	51.67	26.00	25.67	19.33	10.67	8.67	0.00	0.00	0.00	71.00	36.67	34.33
<i>Ammannia multiflora</i>	13.33	13.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.33	13.33	0.00
<i>Ampelopteris prolifera</i>	63.00	63.00	0.00	16.00	16.00	0.00	0.00	0.00	0.00	79.00	79.00	0.00
<i>Apluda mutica</i>	316.33	212.33	104.00	109.33	65.67	43.67	85.67	50.33	35.33	511.33	328.33	183.00
<i>Arenaria serpyllifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	2.67	2.67	0.00	2.67	2.67	0.00
<i>Aristida adscensionis</i>	9.00	9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.00	9.00	0.00
<i>Artemisia carvifolia</i>	18.33	18.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.33	18.33	0.00
<i>Arundinella bengalensis</i>	40.33	40.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.33	40.33	0.00
<i>Axonopus compressus</i>	174.67	109.00	65.67	56.00	34.33	21.67	52.33	32.00	20.33	283.00	175.33	107.67
<i>Azolla pinnata</i>	125.00	95.33	29.67	17.33	12.00	5.33	19.67	17.67	2.00	162.00	125.00	37.00
<i>Boerhavia diffusa</i>	0.00	0.00	0.00	1.67	0.00	1.67	0.00	0.00	0.00	1.67	0.00	1.67
<i>Brachiaria reptans</i>	27.67	27.67	0.00	14.33	14.33	0.00	0.00	0.00	0.00	42.00	42.00	0.00
<i>Capillipedium assimile</i>	6.33	0.00	6.33	0.00	0.00	0.00	0.00	0.00	0.00	6.33	0.00	6.33
<i>Capsella bursa-pastoris</i>	1.67	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Cardiospermum halicacabum</i>	12.00	12.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	12.00	0.00
<i>Carex vesicaria</i>	68.00	36.33	31.67	30.67	16.00	14.67	18.00	9.33	8.67	116.67	61.67	55.00
<i>Cenchrus ciliaris</i>	54.67	31.67	23.00	26.33	15.33	11.00	19.33	11.00	8.33	100.33	58.00	42.33
<i>Centella asiatica</i>	98.33	54.00	44.33	27.33	12.33	15.00	0.00	0.00	0.00	125.67	66.33	59.33
<i>Centotheca lappacea</i>	4.33	0.00	4.33	0.00	0.00	0.00	0.00	0.00	0.00	4.33	0.00	4.33
<i>Ceratopteris thalictroides</i>	12.33	12.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.33	12.33	0.00
<i>Christella parasitica</i>	326.00	214.00	112.00	129.33	78.00	51.33	94.00	57.33	36.67	549.33	349.33	200.00
<i>Chrysopogon aciculatus</i>	78.33	47.67	30.67	33.67	22.00	11.67	33.33	17.67	15.67	145.33	87.33	58.00
<i>Commelina benghalensis</i>	30.33	16.67	13.67	0.00	0.00	0.00	0.00	0.00	0.00	30.33	16.67	13.67
<i>Cotula hemisphaerica</i>	104.00	49.00	55.00	0.00	0.00	0.00	0.00	0.00	0.00	104.00	49.00	55.00
<i>Cuphea carthagenensis</i>	169.33	114.00	55.33	46.33	33.67	12.67	0.00	0.00	0.00	215.67	147.67	68.00
<i>Cynodon dactylon</i>	1267.00	803.00	464.00	521.67	308.67	213.00	327.33	188.33	139.00	2116.00	1300.00	816.00
<i>Cyperus compactus</i>	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00
<i>Cyperus compressus</i>	145.33	91.33	54.00	56.67	33.67	23.00	46.00	27.67	18.33	248.00	152.67	95.33
<i>Cyperus cyperoides</i>	23.33	20.33	3.00	9.33	6.33	3.00	0.00	0.00	0.00	32.67	26.67	6.00
<i>Cyperus digitatus</i>	0.00	0.00	0.00	0.00	0.00	0.00	3.33	3.33	0.00	3.33	3.33	0.00
<i>Cyperus distans</i>	72.00	31.67	40.33	29.00	14.00	15.00	0.00	0.00	0.00	101.00	45.67	55.33
<i>Cyperus eleusinoides</i>	0.00	0.00	0.00	0.67	0.67	0.00	0.00	0.00	0.00	0.67	0.67	0.00
<i>Cyperus eragrostis</i>	123.67	62.67	61.00	45.33	26.33	19.00	42.67	19.00	23.67	211.67	108.00	103.67
<i>Cyperus imbricatus</i>	70.00	29.33	40.67	35.00	16.00	19.00	0.00	0.00	0.00	105.00	45.33	59.67
<i>Cyperus iria</i>	89.67	50.67	39.00	42.33	26.33	16.00	0.00	0.00	0.00	132.00	77.00	55.00
<i>Cyperus rotundus</i>	42.33	42.33	0.00	0.00	0.00	0.00	29.00	29.00	0.00	71.33	71.33	0.00
<i>Cyperus strigosus</i>	0.00	0.00	0.00	2.00	2.00	0.00	0.00	0.00	0.00	2.00	2.00	0.00
<i>Cyperus tenuispica</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.67	0.00	0.67	0.67	0.00
<i>Cyrtococcum patens</i>	23.67	19.00	4.67	10.67	8.67	2.00	0.00	0.00	0.00	34.33	27.67	6.67
<i>Dactyloctenium aegyptium</i>	32.67	18.00	14.67	15.00	8.00	7.00	0.00	0.00	0.00	47.67	26.00	21.67
<i>Dichanthium annulatum</i>	87.00	42.67	44.33	31.67	17.33	14.33	0.00	0.00	0.00	118.67	60.00	58.67
<i>Digitaria ciliaris</i>	389.67	233.67	156.00	152.33	84.00	68.33	123.00	70.33	52.67	665.00	388.00	277.00
<i>Drymaria cordata</i>	0.00	0.00	0.00	3.33	3.33	0.00	0.00	0.00	0.00	3.33	3.33	0.00
<i>Duchesnea indica</i>	92.67	51.33	41.33	27.33	12.00	15.33	0.00	0.00	0.00	120.00	63.33	56.67
<i>Echinochloa colona</i>	8.33	0.00	8.33	0.00	0.00	0.00	0.00	0.00	0.00	8.33	0.00	8.33

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Echinochloa crus-galli</i>	130.33	74.33	56.00	48.33	22.33	26.00	0.00	0.00	0.00	178.67	96.67	82.00
<i>Eclipta prostrata</i>	106.67	58.67	48.00	38.67	22.33	16.33	34.33	18.00	16.33	179.67	99.00	80.67
<i>Eichhornia crassipes</i>	63.67	37.33	26.33	29.33	16.67	12.67	22.67	13.33	9.33	115.67	67.33	48.33
<i>Eleocharis acutangula</i>	0.00	0.00	0.00	33.33	20.67	12.67	0.00	0.00	0.00	33.33	20.67	12.67
<i>Enhydra fluctuans</i>	3.00	3.00	0.00	2.67	2.67	0.00	0.00	0.00	0.00	5.67	5.67	0.00
<i>Equisetum debile</i>	62.67	28.33	34.33	0.00	0.00	0.00	0.00	0.00	0.00	62.67	28.33	34.33
<i>Eragrostis riparia</i>	16.33	11.00	5.33	12.33	6.67	5.67	0.00	0.00	0.00	28.67	17.67	11.00
<i>Eragrostis unioloides</i>	18.33	5.33	13.00	0.00	0.00	0.00	12.67	5.00	7.67	31.00	10.33	20.67
<i>Ethulia conyzoides</i>	245.00	137.67	107.33	87.67	52.67	35.00	73.00	37.33	35.67	405.67	227.67	178.00
<i>Euphorbia hirta</i>	75.67	37.00	38.67	33.00	12.33	20.67	28.33	12.00	16.33	137.00	61.33	75.67
<i>Euphorbia hypericifolia</i>	43.67	43.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43.67	43.67	0.00
<i>Evolvulus nummularius</i>	49.67	24.33	25.33	17.00	9.33	7.67	0.00	0.00	0.00	66.67	33.67	33.00
<i>Fimbristylis aestivalis</i>	352.00	200.67	151.33	148.33	86.00	62.33	120.33	70.00	50.33	620.67	356.67	264.00
<i>Fimbristylis littoralis</i>	6.33	6.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33	6.33	0.00
<i>Glinus lotoides</i>	54.00	25.33	28.67	23.00	9.33	13.67	0.00	0.00	0.00	77.00	34.67	42.33
<i>Glinus oppositifolius</i>	39.33	23.33	16.00	0.00	0.00	0.00	10.67	6.67	4.00	50.00	30.00	20.00
<i>Grangea maderaspatana</i>	322.33	172.33	150.00	138.00	80.33	57.67	97.67	45.33	52.33	558.00	298.00	260.00
<i>Heliotropium indicum</i>	113.67	64.67	49.00	48.33	28.67	19.67	43.00	23.67	19.33	205.00	117.00	88.00
<i>Hemarthria compressa</i>	598.67	344.67	254.00	273.33	163.33	110.00	228.00	129.33	98.67	1100.00	637.33	462.67
<i>Hypitis suaveolens</i>	82.00	39.00	43.00	27.33	12.00	15.33	29.33	13.67	15.67	138.67	64.67	74.00
<i>Ichnanthus pallens</i>	0.00	0.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Imperata cylindrica</i>	244.00	160.00	84.00	91.67	60.67	31.00	74.00	40.33	33.67	409.67	261.00	148.67
<i>Isachne globosa</i>	24.00	11.00	13.00	13.00	6.67	6.33	0.00	0.00	0.00	37.00	17.67	19.33
<i>Juncus articulatus</i>	10.33	7.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	10.33	7.00	3.33
<i>Juncus prismatocarpus</i>	0.00	0.00	0.00	4.00	4.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00
<i>Kyllinga brevifolia</i>	184.67	117.00	67.67	57.33	30.67	26.67	0.00	0.00	0.00	242.00	147.67	94.33
<i>Lophanthium luteoalbum</i>	100.33	65.67	34.67	45.33	27.67	17.67	45.33	25.33	20.00	191.00	118.67	72.33
<i>Leersia hexandra</i>	18.00	18.00	0.00	5.67	5.67	0.00	0.00	0.00	0.00	23.67	23.67	0.00
<i>Leucas aspera</i>	25.00	13.67	11.33	0.00	0.00	0.00	0.00	0.00	0.00	25.00	13.67	11.33
<i>Limnobium laevigatum</i>	189.33	129.00	60.33	64.00	47.67	16.33	48.33	31.67	16.67	301.67	208.33	93.33
<i>Lindernia crustacea</i>	430.33	253.67	176.67	198.33	119.33	79.00	134.67	75.33	59.33	763.33	448.33	315.00
<i>Ludwigia adscendens</i>	23.33	11.33	12.00	0.00	0.00	0.00	0.00	0.00	0.00	23.33	11.33	12.00
<i>Lygodium flexuosum</i>	101.33	66.33	35.00	32.00	21.67	10.33	16.67	10.67	6.00	150.00	98.67	51.33
<i>Marsilea quadrifolia</i>	156.00	114.33	41.67	47.67	36.00	11.67	48.00	34.00	14.00	251.67	184.33	67.33
<i>Mazus pumilus</i>	84.00	31.33	52.67	28.00	14.00	14.00	36.00	14.33	21.67	148.00	59.67	88.33
<i>Mecardonia procumbens</i>	70.00	46.33	23.67	19.67	13.00	6.67	31.67	21.00	10.67	121.33	80.33	41.00
<i>Merremia umbellata</i>	221.33	154.00	67.33	63.67	38.00	25.67	71.00	45.00	26.00	356.00	237.00	119.00
<i>Mikania micrantha</i>	77.67	52.67	25.00	22.33	16.00	6.33	0.00	0.00	0.00	100.00	68.67	31.33
<i>Monochoria hastata</i>	3.33	3.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33	3.33	0.00
<i>Nymphoides cristata</i>	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00
<i>Oldenlandia lineata</i>	0.00	0.00	0.00	1.33	0.00	1.33	0.00	0.00	0.00	1.33	0.00	1.33
<i>Oldenlandia tenelliflora</i>	0.00	0.00	0.00	4.67	0.00	4.67	0.00	0.00	0.00	4.67	0.00	4.67
<i>Opismenus burmanni</i>	62.67	43.33	19.33	23.67	16.33	7.33	12.33	9.00	3.33	98.67	68.67	30.00
<i>Opismenus compositus</i>	22.00	22.00	0.00	10.67	10.67	0.00	0.00	0.00	0.00	32.67	32.67	0.00
<i>Ottochloa nodosa</i>	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00
<i>Oxalis corniculata</i>	495.00	297.00	198.00	198.00	114.33	83.67	155.67	88.67	67.00	848.67	500.00	348.67
<i>Panicum brevifolium</i>	17.33	0.00	17.33	6.33	0.00	6.33	0.00	0.00	0.00	23.67	0.00	23.67
<i>Panicum notatum</i>	100.67	46.67	54.00	51.67	23.33	28.33	0.00	0.00	0.00	152.33	70.00	82.33
<i>Paspalum conjugatum</i>	388.00	245.00	143.00	178.00	111.00	67.00	127.67	75.67	52.00	693.67	431.67	262.00
<i>Peperomia pellucida</i>	125.00	62.33	62.67	50.00	25.00	25.00	54.67	25.67	29.00	229.67	113.00	116.67
<i>Persicaria barbata</i>	18.67	11.33	7.33	0.00	0.00	0.00	0.00	0.00	0.00	18.67	11.33	7.33
<i>Persicaria chinensis</i>	1.33	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33	1.33	0.00
<i>Persicaria hydropiper</i>	89.33	56.33	33.00	42.67	26.00	16.67	37.33	20.33	17.00	169.33	102.67	66.67

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Persicaria orientalis</i>	9.67	9.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.67	9.67	0.00
<i>Phyla nodiflora</i>	9.33	6.33	3.00	0.00	0.00	0.00	0.00	0.00	0.00	9.33	6.33	3.00
<i>Phyllanthus niruri</i>	657.33	390.67	266.67	247.33	143.67	103.67	194.67	118.00	76.67	1099.33	652.33	447.00
<i>Physalis minima</i>	12.00	12.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	12.00	0.00
<i>Pistia stratiotes</i>	26.00	26.00	0.00	15.33	15.33	0.00	13.33	13.33	0.00	54.67	54.67	0.00
<i>Plantago major</i>	4.67	0.00	4.67	0.00	0.00	0.00	0.00	0.00	0.00	4.67	0.00	4.67
<i>Polycarpon prostratum</i>	208.33	122.67	85.67	76.33	46.00	30.33	55.67	33.33	22.33	340.33	202.00	138.33
<i>Polygonum plebeium</i>	615.00	372.00	243.00	241.67	146.00	95.67	181.00	105.67	75.33	1037.67	623.67	414.00
<i>Polygonum posumbo</i>	20.33	20.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.33	20.33	0.00
<i>Potentilla kleiniana</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	1.67	1.67	0.00	1.67
<i>Pouzolzia zeylanica</i>	381.33	234.33	147.00	129.00	84.33	44.67	95.00	55.00	40.00	605.33	373.67	231.67
<i>Ranunculus cantoniensis</i>	4.67	4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67	4.67	0.00
<i>Ranunculus sceleratus</i>	15.00	5.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	5.00	10.00
<i>Rorippa indica</i>	377.00	237.33	139.67	130.33	86.00	44.33	107.67	60.33	47.33	615.00	383.67	231.33
<i>Rungia pectinata</i>	37.00	21.67	15.33	16.00	9.00	7.00	3.00	2.00	1.00	56.00	32.67	23.33
<i>Saccharum spp.</i>	158.67	104.00	54.67	63.00	43.67	19.33	49.00	33.00	16.00	270.67	180.67	90.00
<i>Salvinia natans</i>	13.00	13.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.00	13.00	0.00
<i>Scirpus mucronatus</i>	0.00	0.00	0.00	5.33	5.33	0.00	0.00	0.00	0.00	5.33	5.33	0.00
<i>Scleria terrestris</i>	158.67	98.67	60.00	49.00	32.00	17.00	0.00	0.00	0.00	207.67	130.67	77.00
<i>Setaria pumila</i>	326.67	206.33	120.33	133.33	80.00	53.33	94.67	56.00	38.67	554.67	342.33	212.33
<i>Setaria viridis</i>	11.33	11.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.33	11.33	0.00
<i>Solanum americanum</i>	51.67	27.67	24.00	23.33	13.00	10.33	20.33	12.00	8.33	95.33	52.67	42.67
<i>Spermacoce pusilla</i>	7.00	5.67	1.33	3.33	2.67	0.67	0.00	0.00	0.00	10.33	8.33	2.00
<i>Spirodela polyrrhiza</i>	64.67	32.00	32.67	21.67	9.67	12.00	0.00	0.00	0.00	86.33	41.67	44.67
<i>Typhonium trilobatum</i>	0.67	0.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.00	0.67
<i>Urochloa panicoides</i>	10.33	10.33	0.00	8.00	8.00	0.00	0.00	0.00	0.00	18.33	18.33	0.00
UI 2	6.67	0.00	6.67	0.00	0.00	0.00	0.00	0.00	0.00	6.67	0.00	6.67
UI 5	72.33	30.00	42.33	23.00	12.67	10.33	0.00	0.00	0.00	95.33	42.67	52.67
UI 8	25.00	16.00	9.00	10.00	6.00	4.00	6.00	4.00	2.00	41.00	26.00	15.00
UI 13	2.33	2.33	0.00	0.67	0.67	0.00	0.00	0.00	0.00	3.00	3.00	0.00
UI 21	5.00	5.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	6.67	6.67	0.00
UI 24	8.33	0.00	8.33	0.00	0.00	0.00	0.00	0.00	0.00	8.33	0.00	8.33
UK (premature mortality)	553.67	329.33	224.33	135.33	97.33	38.00	61.67	40.67	21.00	750.67	467.33	283.33

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.23. Overall and seasonal plant species mean seed abundances recorded from different soil layers of riverine alluvial grasslands soil seed bank given flooding treatment during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Acmella uliginosa</i>	6.29±0.84	4.83±0.32	7.75±1.34	0.00	0.00	0.00	0.00	0.00	0.00	6.29±0.84	4.83±0.32	7.75±1.34
<i>Acroceras zizanioides</i>	14.29±2.78	21.08±0.55	7.50±2.23	5.04±0.95	7.42±0.63	2.67±0.30	3.79±0.62	5.17±0.10	2.42±0.74	23.13±4.26	33.67±0.90	12.58±3.13
<i>Adenostemma lavenia</i>	0.00	0.00	0.00	0.83±0.17	0.83±0.17	0.00	0.00	0.00	0.00	0.83±0.17	0.83±0.17	0.00
<i>Adiantum caudatum</i>	8.96±0.80	10.25±1.28	7.67±0.45	3.38±0.59	4.33±0.85	2.42±0.55	1.67±0.24	1.92±0.46	1.42±0.08	14.00±1.20	16.50±1.42	11.50±0.70
<i>Adiantum capillus-veneris</i>	1.67±0.00	0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00
<i>Aeschynomene aspera</i>	4.58±0.28	4.58±0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.58±0.28	4.58±0.28	0.00
<i>Ageratum conyzoides</i>	12.71±1.19	13.42±2.22	12.00±1.18	5.33±0.46	6.00±0.68	4.67±0.49	5.42±0.60	5.58±1.04	5.25±0.76	23.46±1.92	25.00±3.92	21.92±0.58
<i>Alternanthera philoxeroides</i>	9.67±0.33	9.67±0.33	0.00	0.00	0.00	0.00	4.50±0.50	4.50±0.50	0.00	14.17±0.83	14.17±0.83	0.00
<i>Alternanthera pungens</i>	18.83±1.49	18.83±1.18	18.83±0.52	4.17±0.82	4.33±1.11	4.00±1.37	0.00	0.00	0.00	23.00±2.05	23.17±4.29	22.83±1.04

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Alternanthera sessilis</i>	61.00±5.11	69.00±6.08	53.00±6.52	26.00±2.56	30.92±2.83	21.08±2.54	15.88±1.20	18.42±1.16	13.33±1.04	102.88±8.61	118.33±9.70	87.42±9.62
<i>Amaranthus spinosus</i>	3.58±0.45	3.42±0.80	3.75±0.53	1.67±0.20	2.08±0.21	1.25±0.16	0.00	0.00	0.00	5.25±0.48	5.50±0.83	5.00±0.59
<i>Amaranthus viridis</i>	6.46±0.36	6.50±0.65	6.42±0.44	2.42±0.47	2.67±0.86	2.17±0.52	0.00	0.00	0.00	8.88±0.77	9.17±1.43	8.58±0.83
<i>Ammannia multiflora</i>	13.33±0.00	13.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.33±0.00	13.33±0.00	0.00
<i>Ampelopteris prolifera</i>	15.75±7.19	15.75±7.19	0.00	4.00±1.97	4.00±1.97	0.00	0.00	0.00	0.00	19.75±8.88	19.75±8.88	0.00
<i>Apluda mutica</i>	39.54±5.45	53.08±0.95	26.00±3.94	13.67±1.32	16.42±1.62	10.92±0.71	10.71±1.10	12.58±1.46	8.83±1.09	63.92±7.41	82.08±2.64	45.75±5.39
<i>Arenaria serpyllifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	2.67±0.00	2.67±0.00	0.00	2.67±0.00	2.67±0.00	0.00
<i>Aristida adscensionis</i>	9.00±0.00	9.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.00±0.00	9.00±0.00	0.00
<i>Artemisia carvifolia</i>	9.17±2.83	9.17±2.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.17±2.83	9.17±2.83	0.00
<i>Arundinella bengalensis</i>	10.08±0.80	10.08±0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.08±0.80	10.08±0.80	0.00
<i>Axonopus compressus</i>	21.83±2.82	27.25±4.10	16.42±0.94	7.00±0.82	8.58±1.02	5.42±0.63	6.54±0.88	8.00±1.45	5.08±0.34	35.38±4.32	43.83±6.20	26.92±0.93
<i>Azolla pinnata</i>	20.83±3.01	23.83±3.69	14.83±0.17	2.89±0.51	3.00±0.69	2.67±1.00	3.93±1.12	4.42±1.30	2±0	27.00±3.47	31.25±3.37	18.50±2.17
<i>Boerhavia diffusa</i>	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00
<i>Brachiaria reptans</i>	27.67±0.00	27.67±0.00	0.00	14.33±0.00	14.33±0.00	0.00	0.00	0.00	0.00	42.00±0.00	42.00±0.00	0.00
<i>Capillipedium assimile</i>	3.17±0.83	0.00	3.17±0.83	0.00	0.00	0.00	0.00	0.00	0.00	3.17±0.83	0.00	3.17±0.83
<i>Capsella bursa-pastoris</i>	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Cardiospermum halicacabum</i>	6.00±0.33	6.00±0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00±0.33	6.00±0.33	0.00
<i>Carex vesicaria</i>	8.50±0.65	9.08±1.05	7.92±0.80	3.83±0.38	4.00±0.73	3.67±0.36	2.25±0.25	2.33±0.36	2.17±0.40	14.58±0.83	15.42±1.10	13.75±1.24
<i>Cenchrus ciliaris</i>	6.83±0.91	7.92±0.95	5.75±1.47	3.29±0.4	3.83±0.55	2.75±0.50	2.42±0.27	2.75±0.25	2.08±0.44	12.54±1.44	14.50±1.43	10.58±2.25
<i>Centella asiatica</i>	12.29±1.95	13.50±3.82	11.08±1.47	3.90±0.23	4.11±0.29	3.75±0.34	0.00	0.00	0.00	15.71±2.36	16.58±4.87	14.83±1.32
<i>Cenotheca lappacea</i>	4.33±0.00	0.00	4.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.33±0.00	0.00	4.33±0.00
<i>Ceratopteris thalictroides</i>	12.33±0.00	12.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.33±0.00	12.33±0.00	0.00
<i>Christella parasitica</i>	40.75±5.42	53.50±2.49	28.00±4.75	16.17±1.46	19.50±1.17	12.83±1.07	11.75±1.30	14.33±1.66	9.17±0.87	68.67±7.93	87.33±4.73	50.00±6.23
<i>Chrysopogon aciculatus</i>	9.79±1.16	11.92±1.51	7.67±1.01	4.21±0.58	5.50±0.63	2.92±0.28	4.17±0.37	4.42±0.44	3.92±0.64	18.17±1.85	21.83±2.04	14.50±1.69
<i>Commelina benghalensis</i>	6.07±1.09	8.33±1.33	4.56±0.73	0.00	0.00	0.00	0.00	0.00	0.00	6.07±1.09	8.33±1.33	4.56±0.73
<i>Cotula hemisphaerica</i>	13.00±1.09	12.25±1.99	13.75±1.09	0.00	0.00	0.00	0.00	0.00	0.00	13.00±1.09	12.25±1.99	13.75±1.09
<i>Cuphea carthagenensis</i>	21.17±3.08	28.50±2.20	13.83±1.93	5.79±1.21	8.42±1.47	3.17±0.35	0.00	0.00	0.00	26.96±3.92	36.92±1.38	17.00±1.91
<i>Cynodon dactylon</i>	158.38±20.08	200.75±21.70	116.00±14.64	65.21±6.01	77.17±8.18	53.25±2.52	40.92±2.86	47.08±2.10	34.75±2.92	264.50±28.19	325±30.11	204.00±18.99
<i>Cyperus compactus</i>	5.00±0.00	5.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00±0.00	5.00±0.00	0.00
<i>Cyperus compressus</i>	36.33±7.84	45.67±11.67	27.00±7.67	14.17±1.87	16.83±1.83	11.50±1.83	11.50±2.30	13.83±3.83	9.17±2.50	62±11.94	76.33±17.33	47.67±12.00
<i>Cyperus cyperoides</i>	7.78±2.48	10.17±1.17	3.00±0.00	3.11±0.48	3.17±0.83	3.00±0.00	0.00	0.00	0.00	10.89±2.70	13.33±2.00	6.00±0.00
<i>Cyperus digitatus</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.33	1.67±0.33	0.00	1.67±0.33	1.67±0.33	0.00
<i>Cyperus distans</i>	12.00±1.90	15.83±3.83	10.08±1.69	4.83±0.93	7.00±1.00	3.75±0.9	0.00	0.00	0.00	16.83±2.71	22.83±4.83	13.83±2.33
<i>Cyperus eleusinoides</i>	0.00	0.00	0.00	0.67±0.00	0.67±0.00	0.00	0.00	0.00	0.00	0.67±0.00	0.67±0.00	0.00
<i>Cyperus eragrostis</i>	17.67±2.76	15.67±2.51	20.33±5.89	6.48±0.46	6.58±0.46	6.33±1.02	6.10±0.93	4.75±1.21	7.89±0.48	30.24±3.62	27.00±3.53	34.56±7.12
<i>Cyperus imbricatus</i>	11.67±1.54	14.67±1.33	10.17±1.83	5.83±0.96	8.00±1.33	4.75±0.92	0.00	0.00	0.00	17.50±2.33	22.67±0.00	14.92±2.62
<i>Cyperus iria</i>	11.21±0.79	12.67±0.54	9.75±1.11	5.29±0.75	6.58±1.14	4.00±0.47	0.00	0.00	0.00	16.50±1.41	19.25±1.40	13.75±1.51
<i>Cyperus rotundus</i>	10.58±2.02	10.58±2.02	0.00	0.00	0.00	0.00	7.25±1.38	7.25±1.38	0.00	17.83±1.44	17.83±1.44	0.00
<i>Cyperus strigosus</i>	0.00	0.00	0.00	2.00±0.00	2.00±0.00	0.00	0.00	0.00	0.00	2.00±0.00	2.00±0.00	0.00
<i>Cyperus tenuispica</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.67±0.00	0.67±0.00	0.00	0.67±0.00	0.67±0.00	0.00
<i>Cyrtococcum patens</i>	7.89±1.83	9.50±1.50	4.67±0.00	3.56±0.8	4.33±0.33	2.00±0.00	0.00	0.00	0.00	11.44±2.61	13.83±1.83	6.67±0.00
<i>Dactyloctenium aegyptium</i>	4.67±0.89	6.00±1.45	3.67±0.97	2.14±0.32	2.67±0.38	1.75±0.39	0.00	0.00	0.00	6.81±1.05	8.67±1.35	5.42±1.21
<i>Dichanthium annulatum</i>	10.88±1.56	10.67±3.09	11.08±1.32	3.96±0.49	4.33±0.95	3.58±0.37	0.00	0.00	0.00	14.83±1.84	15.00±3.83	14.67±1.04
<i>Digitaria ciliaris</i>	48.71±5.35	58.42±7.38	39.00±4.01	19.04±1.74	21.00±3.05	17.08±1.50	15.38±1.61	17.58±2.66	13.17±1.32	83.13±7.25	97.00±8.86	69.25±6.23
<i>Drymaria cordata</i>	0.00	0.00	0.00	3.33±0.00	3.33±0.00	0.00	0.00	0.00	0.00	3.33±0.00	3.33±0.00	0.00
<i>Duchesnea indica</i>	11.58±1.45	12.83±2.36	10.33±1.77	3.42±0.57	3.00±0.68	3.83±0.97	0.00	0.00	0.00	15.00±1.78	15.83±2.78	14.17±2.57
<i>Echinochloa colona</i>	8.33±0.00	0.00	8.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.33±0.00	0.00	8.33±0.00
<i>Echinochloa crus-galli</i>	16.29±1.58	18.58±2.51	14.00±1.38	6.04±0.57	5.58±1.16	6.50±0.17	0.00	0.00	0.00	22.33±1.95	24.17±3.64	20.50±1.48
<i>Eclipta prostrata</i>	13.33±0.89	14.67±1.19	12.00±1.05	4.83±0.43	5.58±0.69	4.08±0.16	4.29±0.53	4.50±0.84	4.08±0.75	22.46±1.42	24.75±2.25	20.17±0.91
<i>Eichhornia crassipes</i>	7.96±1.20	9.33±1.98	6.58±1.24	3.67±0.42	4.17±0.62	3.17±0.62	2.83±0.39	3.33±0.41	2.33±0.61	14.46±1.78	16.83±2.60	12.08±2.06
<i>Eleocharis acutangula</i>	0.00	0.00	0.00	4.17±0.58	5.17±0.87	3.17±0.42	0.00	0.00	0.00	4.17±0.58	5.17±0.87	3.17±0.42
<i>Enhydra fluctuans</i>	3.00±0.00	3.00±0.00	0.00	2.67±0.00	2.67±0.00	0.00	0.00	0.00	0.00	5.67±0.00	5.67±0.00	0.00
<i>Equisetum debile</i>	7.83±1.00	7.08±1.77	8.58±1.08	0.00	0.00	0.00	0.00	0.00	0.00	7.83±1.00	7.08±1.77	8.58±1.08

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Eragrostis riparia</i>	5.44±0.11	5.50±0.17	5.33±0.00	4.11±0.78	3.33±0.00	5.67±0.00	0.00	0.00	0.00	9.56±0.73	8.83±0.17	11.00±0.00
<i>Eragrostis unioloides</i>	6.11±0.95	5.33±0.00	6.50±1.50	0.00	0.00	0.00	4.22±0.48	5.00±0.00	3.83±0.50	10.33±0.58	10.33±0.00	10.33±1.00
<i>Ethulia conyzoides</i>	30.63±3.44	34.42±5.27	26.83±4.21	10.96±1.30	13.17±1.71	8.75±1.32	9.13±0.83	9.33±1.57	8.92±0.86	50.71±4.98	56.92±7.11	44.50±6.27
<i>Euphorbia hirta</i>	10.81±2.42	12.33±4.99	9.67±2.65	4.71±0.63	4.11±0.91	5.17±0.91	4.05±0.73	4.00±0.84	4.08±1.24	19.57±3.5	20.44±6.59	18.92±4.57
<i>Euphorbia hypericifolia</i>	10.92±1.02	10.92±1.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.92±1.02	10.92±1.02	0.00
<i>Evolvulus nummularius</i>	6.21±0.76	6.08±0.63	6.33±1.51	2.13±0.35	2.33±0.38	1.92±0.63	0.00	0.00	0.00	8.33±0.99	8.42±0.71	8.25±2.02
<i>Fimbristylis aestivalis</i>	44.00±3.56	50.17±3.74	37.83±4.44	18.54±1.72	21.50±2.77	15.58±0.52	15.04±1.09	17.50±0.69	12.58±1.04	77.58±5.32	89.17±3.04	66.00±5.79
<i>Fimbristylis littoralis</i>	6.33±0.00	6.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33±0.00	6.33±0.00	0.00
<i>Glinus lotoides</i>	9.00±2.47	12.67±8.00	7.17±1.09	3.83±0.70	4.67±2.33	3.42±0.37	0.00	0.00	0.00	12.83±3.13	17.33±10.33	10.58±1.26
<i>Glinus oppositifolius</i>	9.83±1.32	11.67±1.67	8.00±1.00	0.00	0.00	0.00	2.67±0.58	3.33±1.00	2.00±0.33	12.50±1.89	15.00±2.67	10.00±1.33
<i>Grangea maderaspatana</i>	40.29±2.88	43.08±3.85	37.50±4.33	17.25±1.62	20.08±1.92	14.42±1.78	12.21±0.82	11.33±0.65	13.08±1.47	69.75±4.34	74.50±5.02	65.00±6.89
<i>Heliotropium indicum</i>	14.21±1.24	16.17±0.96	12.25±1.92	6.04±0.69	7.17±0.74	4.92±0.90	5.38±0.41	5.92±0.37	4.83±0.67	25.63±2.16	29.25±1.51	22.00±3.29
<i>Hemarthria compressa</i>	74.83±5.15	86.17±3.48	63.50±5.13	34.17±2.95	40.83±3.01	27.50±1.39	28.50±1.93	32.33±2.31	24.67±1.48	137.5±9.83	159.33±8.60	115.67±7.67
<i>Hypitis suaveolens</i>	11.71±1.32	13.00±2.52	10.75±1.50	3.90±0.91	4.00±1.71	3.83±1.19	4.19±0.48	4.56±0.91	3.92±0.58	19.81±1.89	21.56±4.01	18.50±1.77
<i>Ichnanthus pallens</i>	0.00	0.00	0.00	1.67±0	1.67±0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Imperata cylindrica</i>	30.50±3.97	40.00±1.35	21.00±3.37	11.46±1.71	15.17±1.97	7.75±0.71	9.25±0.94	10.08±1.48	8.42±1.20	51.21±5.9	65.25±3.50	37.17±4.33
<i>Isachne globosa</i>	4.80±0.79	5.50±2.17	4.33±0.51	2.60±0.34	3.33±0.00	2.11±0.29	0.00	0.00	0.00	7.40±1.00	8.83±2.17	6.44±0.78
<i>Juncus articulatus</i>	3.44±0.68	3.50±1.17	3.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.44±0.68	3.50±1.17	3.33±0.00
<i>Juncus prismatocarpus</i>	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00
<i>Kyllinga brevifolia</i>	23.08±2.82	29.25±2.40	16.92±2.47	7.17±0.71	7.67±0.86	6.67±1.19	0.00	0.00	0.00	30.25±3.25	36.92±2.53	23.58±3.65
<i>Laphangium luteoalbum</i>	12.54±1.69	16.42±0.90	8.67±1.56	5.67±0.71	6.92±0.98	4.42±0.58	5.67±0.56	6.33±0.95	5.00±0.49	23.88±2.51	29.67±1.98	18.08±1.74
<i>Leersia hexandra</i>	9.00±0.33	9.00±0.33	0.00	2.83±0.17	2.83±0.17	0.00	0.00	0.00	0.00	11.83±0.50	11.83±0.50	0.00
<i>Leucas aspera</i>	3.13±0.46	3.42±0.63	2.83±0.74	0.00	0.00	0.00	0.00	0.00	0.00	3.13±0.46	3.42±0.63	2.83±0.74
<i>Limnolobium laevigatum</i>	31.56±3.98	32.25±5.94	30.17±4.83	10.67±1.80	11.92±2.56	8.17±0.17	8.06±0.69	7.92±1.07	8.33±0.33	50.28±5.53	52.08±8.36	46.67±4.33
<i>Lindernia crustacea</i>	53.79±4.17	63.42±2.64	44.17±3.53	24.79±2.19	29.83±2.25	19.75±0.64	16.83±1.21	18.83±1.54	14.83±1.34	95.42±6.94	112.08±5.13	78.75±3.65
<i>Ludwigia adscendens</i>	5.83±0.80	5.67±1.67	6.00±1.00	0.00	0.00	0.00	0.00	0.00	0.00	5.83±0.80	5.67±1.67	6.00±1.00
<i>Lygodium flexuosum</i>	12.67±2.22	16.58±3.20	8.75±1.62	4.00±0.79	5.42±1.18	2.58±0.42	2.08±0.34	2.67±0.45	1.50±0.35	18.75±3.22	24.67±4.54	12.83±2.13
<i>Marsilea quadrifolia</i>	26.00±4.05	28.58±5.69	20.83±3.50	7.94±1.11	9.00±1.33	5.83±1.17	8.00±0.98	8.50±1.40	7.00±1.00	41.94±5.72	46.08±7.69	33.67±5.67
<i>Mazus pumilus</i>	12.00±1.26	10.44±1.82	13.17±1.68	4.00±0.96	4.67±2.40	3.50±0.40	5.14±0.43	4.78±0.87	5.42±0.46	21.14±1.69	19.89±2.98	22.08±2.19
<i>Mecardonia procumbens</i>	11.67±1.97	11.58±2.99	11.83±2.17	3.28±0.53	3.25±0.79	3.33±0.67	5.28±0.95	5.25±1.49	5.33±0.33	20.22±2.62	20.08±3.94	20.50±3.17
<i>Merremia umbellata</i>	27.67±4.51	38.50±2.91	16.83±2.84	7.96±0.87	9.50±1.31	6.42±0.46	8.88±1.24	11.25±1.55	6.50±0.99	44.50±6.07	59.25±3.96	29.75±3.31
<i>Mikania micrantha</i>	9.71±1.65	13.17±1.55	6.25±1.51	2.79±0.50	4.00±0.33	1.58±0.32	0.00	0.00	0.00	12.50±2.03	17.17±1.40	7.83±1.65
<i>Monochoria hastata</i>	3.33±0.00	3.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33±0.00	3.33±0.00	0.00
<i>Nymphoides cristata</i>	4.00±0.00	4.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00
<i>Oldenlandia lineata</i>	0.00	0.00	0.00	0.67±0.00	0.00	0.67±0.00	0.00	0.00	0.00	0.67±0.00	0.00	0.67±0.00
<i>Oldenlandia tenelliflora</i>	0.00	0.00	0.00	4.67±0.00	0.00	4.67±0.00	0.00	0.00	0.00	4.67±0.00	0.00	4.67±0.00
<i>Oplismenus burmanni</i>	12.53±1.29	14.44±0.99	9.67±0.33	4.73±0.45	5.44±0.11	3.67±0.33	2.47±0.34	3.00±0.19	1.67±0.00	19.73±1.98	22.89±0.73	15.00±0.67
<i>Oplismenus compositus</i>	22.00±0.00	22.00±0.00	0.00	10.67±0.00	10.67±0.00	0.00	0.00	0.00	0.00	32.67±0.00	32.67±0.00	0.00
<i>Ottocloa nodosa</i>	0.00	0.00	0.00	1.00±0.00	1.00±0.00	0.00	0.00	0.00	0.00	1.00±0.00	1.00±0.00	0.00
<i>Oxalis corniculata</i>	61.88±4.87	74.25±1.29	49.50±2.64	24.75±1.97	28.58±2.29	20.92±1.78	19.46±1.58	22.17±2.04	16.75±1.60	106.08±7.69	125±3.86	87.17±4.75
<i>Panicum brevifolium</i>	17.33±0.00	0.00	17.33±0.00	6.33±0.00	0.00	6.33±0.00	0.00	0.00	0.00	23.67±0.00	0.00	23.67±0.00
<i>Panicum notatum</i>	16.78±2.51	23.33±4.33	13.50±1.35	8.61±1.42	11.67±3.33	7.08±0.93	0.00	0.00	0.00	25.39±3.84	35.00±7.67	20.58±1.99
<i>Paspalum conjugatum</i>	48.50±5.13	61.25±2.18	35.75±3.09	22.25±2.34	27.75±2.05	16.75±1.06	15.96±1.90	18.92±3.08	13.00±1.25	86.71±8.67	107.92±6.48	65.50±2.94
<i>Peperomia pellucida</i>	15.63±1.31	15.58±2.51	15.67±1.29	6.25±0.70	6.25±1.38	6.25±0.64	6.83±0.52	6.42±0.93	7.25±0.55	28.71±1.84	28.25±3.57	29.17±1.71
<i>Persicaria barbata</i>	6.22±0.59	5.67±0.33	7.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.22±0.59	5.67±0.33	7.33±0.00
<i>Persicaria chinensis</i>	1.33±0.00	1.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33±0.00	1.33±0.00	0.00
<i>Persicaria hydropiper</i>	11.17±1.32	14.08±1.35	8.25±0.76	5.33±0.72	6.5±1.14	4.17±0.48	4.67±0.61	5.08±1.02	4.25±0.77	21.17±1.82	25.67±0.86	16.67±1.08
<i>Persicaria orientalis</i>	4.83±0.83	4.83±0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.83±0.83	4.83±0.83	0.00
<i>Phyla nodiflora</i>	2.33±0.71	3.17±1.17	1.50±0.50	0.00	0.00	0.00	0.00	0.00	0.00	2.33±0.71	3.17±1.17	1.50±0.50
<i>Phyllanthus niruri</i>	82.17±6.98	97.67±2.14	66.67±7.90	30.92±2.81	35.92±4.33	25.92±1.26	24.33±2.29	29.50±2.50	19.17±0.67	137.42±11.13	163.08±7.53	111.75±9.05
<i>Physalis minima</i>	6.00±1.00	6.00±1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00±1.00	6.00±1.00	0.00
<i>Pistia stratiotes</i>	6.50±0.57	6.50±0.57	0.00	3.83±0.42	3.83±0.42	0.00	3.33±0.71	3.33±0.71	0.00	13.67±1.08	13.67±1.08	0.00
<i>Plantago major</i>	4.67±0.00	0.00	4.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67±0.00	0.00	4.67±0.00

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Polycarpon prostratum</i>	26.04±2.42	30.67±3.32	21.42±1.40	9.54±1.00	11.50±1.17	7.58±0.88	6.96±0.90	8.33±1.39	5.58±0.77	42.54±3.79	50.50±4.23	34.58±2.64
<i>Polygonum plebeium</i>	76.88±7.42	93.00±7.67	60.75±5.00	30.21±3.02	36.50±3.76	23.92±1.42	22.63±2.16	26.42±2.98	18.83±1.88	129.71±11.83	155.92±12.06	103.50±7.08
<i>Polygonum posumbo</i>	10.17±2.83	10.17±2.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.17±2.83	10.17±2.83	0.00
<i>Potentilla kleiniana</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00	1.67±0.00	0.00	1.67±0.00
<i>Pouzolzia zeylanica</i>	47.67±5.04	58.58±6.13	36.75±1.30	16.13±2.47	21.08±3.21	11.17±1.31	11.88±1.45	13.75±2.44	10.00±1.25	75.67±8.50	93.42±11.05	57.92±2.30
<i>Ranunculus cantoniensis</i>	4.67±0.00	4.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67±0.00	4.67±0.00	0.00
<i>Ranunculus sceleratus</i>	5.00±0.38	5.00±0.00	5.00±0.67	0.00	0.00	0.00	0.00	0.00	0.00	5.00±0.38	5.00±0.00	5.00±0.67
<i>Rorippa indica</i>	47.13±5.26	59.33±4.78	34.92±2.61	16.29±2.26	21.50±2.14	11.08±1.10	13.46±1.31	15.08±2.29	11.83±0.97	76.88±8.19	95.92±7.08	57.83±4.60
<i>Rungia pectinata</i>	18.50±3.17	21.67±0.00	15.33±0.00	8.00±1.00	9.00±0.00	7.00±0.00	1.50±0.50	2±0	1.00±0.00	28.00±4.67	32.67±0.00	23.33±0.00
<i>Saccharum spp.</i>	19.83±2.57	26.00±0.87	13.67±2.15	7.88±1.33	10.92±1.17	4.83±0.83	6.13±0.87	8.25±0.64	4.00±0.36	33.83±4.62	45.17±1.96	22.5±3.20
<i>Salvinia natans</i>	6.50±0.50	6.50±0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.50±0.50	6.50±0.50	0.00
<i>Scirpus mucronatus</i>	0.00	0.00	0.00	5.33±0.00	5.33±0.00	0.00	0.00	0.00	0.00	5.33±0.00	5.33±0.00	0.00
<i>Scleria terrestris</i>	19.83±2.33	24.67±2.00	15.00±2.39	6.13±0.89	8.00±0.76	4.25±0.86	0.00	0.00	0.00	25.96±3.02	32.67±2.00	19.25±2.95
<i>Setaria pumila</i>	40.83±4.51	51.58±3.94	30.08±1.49	16.67±1.59	20.00±1.42	13.33±1.52	11.83±1.11	14.00±0.89	9.67±1.34	69.33±6.83	85.58±5.47	53.08±3.39
<i>Setaria viridis</i>	11.33±0.00	11.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.33±0.00	11.33±0.00	0.00
<i>Solanum americanum</i>	6.46±0.70	6.92±1.44	6.00±0.24	2.92±0.27	3.25±0.28	2.58±0.42	2.54±0.44	3.00±0.71	2.08±0.50	11.92±1.05	13.17±1.92	10.67±0.62
<i>Spermacoce pusilla</i>	1.75±0.66	2.83±0.50	0.67±0.00	0.83±0.32	1.33±0.33	0.33±0.00	0.00	0.00	0.00	2.58±0.98	4.17±0.83	1.00±0.00
<i>Spirodela polyrrhiza</i>	10.78±0.82	10.67±0.84	10.89±1.64	3.61±0.58	3.22±0.40	4.00±1.17	0.00	0.00	0.00	14.39±1.10	13.89±1.13	14.89±2.12
<i>Typhonium trilobatum</i>	0.67±0.00	0.00	0.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67±0.00	0.00	0.67±0.00
<i>Urochloa panicoides</i>	10.33±0.00	10.33±0.00	0.00	8.00±0.00	8.00±0.00	0.00	0.00	0.00	0.00	18.33±0.00	18.33±0.00	0.00
UI 2	3.33±0.33	0.00	3.33±0.33	0.00	0.00	0.00	0.00	0.00	0.00	3.33±0.33	0.00	3.33±0.33
UI 5	9.04±1.40	7.50±1.78	10.58±2.11	2.88±0.31	3.17±0.57	2.58±0.25	0.00	0.00	0.00	11.92±1.49	10.67±2.03	13.17±2.29
UI 8	4.17±0.69	5.33±0.33	3.00±0.96	1.67±0.23	2.00±0.19	1.33±0.33	1.00±0.23	1.33±0.33	0.67±0.19	6.83±1.02	8.67±0.69	5.00±1.17
UI 13	2.33±0.00	2.33±0.00	0.00	0.67±0.00	0.67±0.00	0.00	0.00	0.00	0.00	3.00±0.00	3.00±0.00	0.00
UI 21	2.50±1.17	2.50±1.17	0.00	0.83±0.17	0.83±0.17	0.00	0.00	0.00	0.00	3.33±1.33	3.33±1.33	0.00
UI 24	8.33±0.00	0.00	8.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.33±0.00	0.00	8.33±0.00
UK (premature mortality)	69.21±6.45	82.33±6.09	56.08±6.48	16.92±3.44	24.33±3.70	9.50±2.20	7.71±1.34	10.17±2.08	5.25±0.21	93.83±10.75	116.83±10.50	70.83±8.75

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.24. Overall and seasonal plant species seed abundances and densities (m⁻²) recorded from different soil layers of short riverine alluvial grasslands soil seed bank during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers															Total								
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D		
<i>Acmella uliginosa</i>	322	63.30	152	59.76	170	66.84	125	24.57	60	23.59	65	25.56	0	0.00	0	0.00	0	0.00	447	29.29	212	27.78	235	30.80
<i>Acroceras munroanum</i>	30	5.90	0	0.00	30	11.80	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	30	1.97	0	0.00	30	3.93
<i>Adiantum caudatum</i>	241	47.38	141	55.44	100	39.32	117	23.00	66	25.95	51	20.05	0	0.00	0	0.00	0	0.00	358	23.46	207	27.13	151	19.79
<i>Adiantum philippense</i>	26	5.11	26	10.22	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	26	1.70	26	3.41	0	0.00
<i>Aeschynomene aspera</i>	55	10.81	55	21.62	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	55	3.60	55	7.21	0	0.00
<i>Ageratum conyzoides</i>	761	149.60	410	161.20	351	138.00	350	68.81	196	77.06	154	60.55	239	46.98	131	51.51	108	42.46	1350	88.46	737	96.59	613	80.34
<i>Alternanthera philoxeroides</i>	146	28.70	146	57.40	0	0.00	0	0.00	0	0.00	0	0.00	70	13.76	70	27.52	0	0.00	216	14.15	216	28.31	0	0.00
<i>Alternanthera pungens</i>	1075	211.33	601	236.30	474	186.36	369	72.54	188	73.92	181	71.16	0	0.00	0	0.00	0	0.00	1444	94.62	789	103.40	655	85.84
<i>Alternanthera sessilis</i>	3540	695.92	2162	850.04	1378	541.79	1334	262.25	833	327.51	501	196.98	849	166.90	505	198.55	344	135.25	5723	375.02	3500	458.70	2223	291.34
<i>Amaranthus viridis</i>	491	96.52	284	111.66	207	81.39	203	39.91	121	47.57	82	32.24	0	0.00	0	0.00	0	0.00	694	45.48	405	53.08	289	37.88
<i>Ammannia multiflora</i>	40	7.86	40	15.73	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	40	2.62	40	5.24	0	0.00
<i>Ampelopteris prolifera</i>	230	45.22	230	90.43	0	0.00	89	17.50	89	34.99	0	0.00	0	0.00	0	0.00	0	0.00	319	20.90	319	41.81	0	0.00
<i>Anagallis arvensis</i>	7	1.38	0	0.00	7	2.75	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	7	0.46	0	0.00	7	0.92
<i>Arenaria serpyllifolia</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.98	5	1.97	0	0.00	5	0.33	5	0.66	0	0.00

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Artemisia carvifolia</i>	111	21.82	111	43.64	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	111	7.27	111	14.55	0	0.00
<i>Axonopus compressus</i>	1914	376.27	1261	495.79	653	256.74	724	142.33	511	200.91	213	83.75	423	83.16	277	108.91	146	57.40	3061	200.58	2049	268.54	1012	132.63
<i>Azolla pinnata</i>	278	54.65	216	84.93	62	24.38	52	10.22	36	14.15	16	6.29	59	11.60	53	20.84	6	2.36	389	25.49	305	39.97	84	11.01
<i>Bacopa monnieri</i>	10	1.97	0	0.00	10	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	0.66	0	0.00	10	1.31
<i>Brachiaria distachya</i>	441	86.69	441	173.39	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	441	28.90	441	57.80	0	0.00
<i>Brachiaria reptans</i>	193	37.94	193	75.88	0	0.00	83	16.32	83	32.63	0	0.00	0	0.00	0	0.00	0	0.00	276	18.09	276	36.17	0	0.00
<i>Carex vesicaria</i>	536	105.37	294	115.59	242	95.15	238	46.79	132	51.90	106	41.68	157	30.86	93	36.57	64	25.16	931	61.01	519	68.02	412	54.00
<i>Cenchrus ciliaris</i>	568	111.66	333	130.93	235	92.40	263	51.70	168	66.05	95	37.35	152	29.88	97	38.14	55	21.62	983	64.42	598	78.37	385	50.46
<i>Centella asiatica</i>	573	112.64	344	135.25	229	90.04	267	52.49	138	54.26	129	50.72	143	28.11	94	36.96	49	19.27	983	64.42	576	75.49	407	53.34
<i>Centipeda minima</i>	1257	247.11	674	265.00	583	229.22	335	65.86	250	98.29	85	33.42	170	33.42	103	40.50	67	26.34	1762	115.46	1027	134.60	735	96.33
<i>Ceratopteris thalictroides</i>	37	7.27	37	14.55	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	37	2.42	37	4.85	0	0.00
<i>Chenopodium album</i>	24	4.72	19	7.47	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	24	1.57	19	2.49	5	0.66
<i>Christella parasitica</i>	510	100.26	347	136.43	163	64.09	239	46.98	136	53.47	103	40.50	157	30.86	80	31.45	77	30.27	906	59.37	563	73.79	343	44.95
<i>Chrysopogon aciculatus</i>	800	157.27	502	197.37	298	117.17	340	66.84	220	86.50	120	47.18	225	44.23	132	51.90	93	36.57	1365	89.45	854	111.92	511	66.97
<i>Commelina benghalensis</i>	225	44.23	134	52.69	91	35.78	64	12.58	29	11.40	35	13.76	0	0.00	0	0.00	0	0.00	289	18.94	163	21.36	126	16.51
<i>Commelina diffusa</i>	15	2.95	0	0.00	15	5.90	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	15	0.98	0	0.00	15	1.97
<i>Cotula hemisphaerica</i>	1538	302.35	963	378.63	575	226.08	330	64.87	193	75.88	137	53.86	0	0.00	0	0.00	0	0.00	1868	122.41	1156	151.50	712	93.31
<i>Cynodon dactylon</i>	10493	2062.79	6399	2515.92	4094	1609.66	4341	853.39	2962	1164.58	1379	542.19	2034	399.86	1238	486.75	796	312.97	16868	1105.34	10599	1389.09	6269	821.60
<i>Cyperus compressus</i>	778	152.94	488	191.87	290	114.02	343	67.43	212	83.35	131	51.51	242	47.57	146	57.40	96	37.74	1363	89.32	846	110.88	517	67.76
<i>Cyperus cyperoides</i>	103	20.25	86	33.81	17	6.68	45	8.85	30	11.80	15	5.90	0	0.00	0	0.00	0	0.00	148	9.70	116	15.20	32	4.19
<i>Cyperus difformis</i>	121	23.79	41	16.12	80	31.45	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	121	7.93	41	5.37	80	10.48
<i>Cyperus distans</i>	230	45.22	90	35.39	140	55.04	113	22.21	43	16.91	70	27.52	0	0.00	0	0.00	0	0.00	343	22.48	133	17.43	210	27.52
<i>Cyperus eragrostis</i>	1018	200.13	653	256.74	365	143.51	404	79.42	260	102.23	144	56.62	313	61.53	186	73.13	127	49.93	1735	113.69	1099	144.03	636	83.35
<i>Cyperus imbricatus</i>	237	46.59	112	44.04	125	49.15	145	28.51	58	22.80	87	34.21	0	0.00	0	0.00	0	0.00	382	25.03	170	22.28	212	27.78
<i>Cyperus iria</i>	324	63.69	202	79.42	122	47.97	200	39.32	111	43.64	89	34.99	0	0.00	0	0.00	0	0.00	524	34.34	313	41.02	211	27.65
<i>Cyperus rotundus</i>	654	128.57	654	257.14	0	0.00	0	0.00	0	0.00	0	0.00	235	46.20	235	92.40	0	0.00	889	58.26	889	116.51	0	0.00
<i>Cyperus squarrosus</i>	790	155.30	518	203.66	272	106.94	310	60.94	177	69.59	133	52.29	212	41.68	133	52.29	79	31.06	1312	85.97	828	108.52	484	63.43
<i>Cyperus tenuispica</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	18	3.54	18	7.08	0	0.00	18	1.18	18	2.36	0	0.00
<i>Dactylis glomerata</i>	14	2.75	14	5.50	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	14	0.92	14	1.83	0	0.00
<i>Dactyloctenium aegyptium</i>	298	58.58	163	64.09	135	53.08	133	26.15	63	24.77	70	27.52	0	0.00	0	0.00	0	0.00	431	28.24	226	29.62	205	26.87
<i>Dentella repens</i>	0	0.00	0	0.00	0	0.00	7	1.38	0	0.00	7	2.75	0	0.00	0	0.00	0	0.00	7	0.46	0	0.00	7	0.92
<i>Desmodium heterophyllum</i>	91	17.89	78	30.67	13	5.11	0	0.00	0	0.00	0	0.00	47	9.24	40	15.73	7	2.75	138	9.04	118	15.46	20	2.62
<i>Dichanthium annulatum</i>	922	181.25	466	183.22	456	179.29	364	71.56	198	77.85	166	65.27	0	0.00	0	0.00	0	0.00	1286	84.27	664	87.02	622	81.52
<i>Dichrocephala integrifolia</i>	475	93.38	319	125.42	156	61.34	151	29.68	82	32.24	69	27.13	0	0.00	0	0.00	0	0.00	626	41.02	401	52.55	225	29.49
<i>Digitaria ciliaris</i>	3182	625.54	1886	741.53	1296	509.55	1188	233.55	721	283.48	467	183.61	741	145.67	445	174.96	296	116.38	5111	334.92	3052	399.99	2059	269.85
<i>Digitaria setigera</i>	51	10.03	51	20.05	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	51	3.34	51	6.68	0	0.00
<i>Digitaria violascens</i>	143	28.11	0	0.00	143	56.22	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	143	9.37	0	0.00	143	18.74
<i>Duchesnea indica</i>	621	122.08	411	161.59	210	82.57	280	55.04	152	59.76	128	50.33	151	29.68	92	36.17	59	23.20	1052	68.94	655	85.84	397	52.03
<i>Dysphania ambrosioides</i>	36	7.08	36	14.15	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	36	2.36	36	4.72	0	0.00
<i>Echinochloa colona</i>	70	13.76	0	0.00	70	27.52	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	70	4.59	0	0.00	70	9.17
<i>Echinochloa crus-galli</i>	1273	250.26	799	314.15	474	186.36	490	96.33	291	114.41	199	78.24	0	0.00	0	0.00	0	0.00	1763	115.53	1090	142.85	673	88.20
<i>Eclipta prostrata</i>	577	113.43	335	131.71	242	95.15	309	60.75	177	69.59	132	51.90	235	46.20	123	48.36	112	44.04	1121	73.46	635	83.22	486	63.69
<i>Eichhornia crassipes</i>	191	37.55	112	44.04	79	31.06	88	17.30	50	19.66	38	14.94	68	13.37	40	15.73	28	11.01	347	22.74	202	26.47	145	19.00
<i>Eleocharis acutangula</i>	0	0.00	0	0.00	0	0.00	225	44.23	133	52.29	92	36.17	0	0.00	0	0.00	0	0.00	225	14.74	133	17.43	92	12.06
<i>Eleusine indica</i>	149	29.29	117	46.00	32	12.58	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	149	9.76	117	15.33	32	4.19
<i>Enhydra fluctuans</i>	9	1.77	9	3.54	0	0.00	8	1.57	8	3.15	0	0.00	0	0.00	0	0.00	0	0.00	17	1.11	17	2.23	0	0.00
<i>Equisetum debile</i>	188	36.96	85	33.42	103	40.50	0	0.00	0	0.														

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Euphorbia thymifolia</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	17	3.34	0	0.00	17	6.68	17	1.11	0	0.00	17	2.23
<i>Evolvulus nummularius</i>	846	166.31	547	215.07	299	117.56	237	46.59	146	57.40	91	35.78	0	0.00	0	0.00	0	0.00	1083	70.97	693	90.82	390	51.11
<i>Fimbristylis aestivalis</i>	3565	700.83	2191	861.45	1374	540.22	1479	290.75	969	380.99	510	200.52	932	183.22	585	230.01	347	136.43	5976	391.60	3745	490.81	2231	292.39
<i>Fimbristylis dichotoma</i>	45	8.85	45	17.69	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	45	2.95	45	5.90	0	0.00
<i>Fimbristylis littoralis</i>	40	7.86	40	15.73	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	40	2.62	40	5.24	0	0.00
<i>Glinus lotoides</i>	660	129.75	336	132.11	324	127.39	214	42.07	84	33.03	130	51.11	0	0.00	0	0.00	0	0.00	874	57.27	420	55.04	454	59.50
<i>Glinus oppositifolius</i>	254	49.93	167	65.66	87	34.21	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	254	16.64	167	21.89	87	11.40
<i>Gnaphalium pensylvanicum</i>	305	59.96	162	63.69	143	56.22	88	17.30	55	21.62	33	12.97	0	0.00	0	0.00	0	0.00	393	25.75	217	28.44	176	23.07
<i>Grangea maderaspatana</i>	2611	513.29	1380	542.58	1231	484.00	1048	206.02	588	231.19	460	180.86	625	122.87	312	122.67	313	123.06	4284	280.73	2280	298.81	2004	262.64
<i>Heliotropium indicum</i>	623	122.47	376	147.83	247	97.11	268	52.69	163	64.09	105	41.28	238	46.79	138	54.26	100	39.32	1129	73.98	677	88.73	452	59.24
<i>Heliotropium strigosum</i>	19	3.74	19	7.47	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	19	1.25	19	2.49	0	0.00
<i>Hemarthria compressa</i>	3997	785.76	2414	949.12	1583	622.40	1825	358.77	1146	450.58	679	266.97	1166	229.22	684	268.93	482	189.51	6988	457.92	4244	556.21	2744	359.62
<i>Hydrocotyle sibthorpioides</i>	56	11.01	22	8.65	34	13.37	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	56	3.67	22	2.88	34	4.46
<i>Hypsis suaveolens</i>	972	191.08	495	194.62	477	187.54	348	68.41	183	71.95	165	64.87	266	52.29	143	56.22	123	48.36	1586	103.93	821	107.60	765	100.26
<i>Isachne globosa</i>	188	36.96	103	40.50	85	33.42	148	29.09	95	37.35	53	20.84	0	0.00	0	0.00	0	0.00	336	22.02	198	25.95	138	18.09
<i>Juncus articulatus</i>	67	13.17	47	18.48	20	7.86	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	67	4.39	47	6.16	20	2.62
<i>Juncus prismatocarpus</i>	0	0.00	0	0.00	0	0.00	12	2.36	12	4.72	0	0.00	0	0.00	0	0.00	0	0.00	12	0.79	12	1.57	0	0.00
<i>Kyllinga brevifolia</i>	1055	207.40	688	270.50	367	144.30	314	61.73	160	62.91	154	60.55	0	0.00	0	0.00	0	0.00	1369	89.71	848	111.14	521	68.28
<i>Laphangium luteoalbum</i>	1287	253.01	809	318.08	478	187.94	418	82.17	233	91.61	185	72.74	307	60.35	184	72.34	123	48.36	2012	131.84	1226	160.68	786	103.01
<i>Lepidagathis incurva</i>	0	0.00	0	0.00	0	0.00	34	6.68	22	8.65	12	4.72	41	8.06	25	9.83	16	6.29	75	4.91	47	6.16	28	3.67
<i>Leucas aspera</i>	70	13.76	39	15.33	31	12.19	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	70	4.59	39	5.11	31	4.06
<i>Limnobia laevigatum</i>	568	111.66	387	152.16	181	71.16	192	37.74	143	56.22	49	19.27	145	28.51	95	37.35	50	19.66	905	59.30	625	81.91	280	36.70
<i>Lindernia crustacea</i>	4704	924.75	2871	1128.80	1833	720.69	1952	383.74	1252	492.25	700	275.22	1201	236.10	729	286.62	472	185.58	7857	514.86	4852	635.89	3005	393.83
<i>Lindernia ruelliioides</i>	157	30.86	157	61.73	0	0.00	87	17.10	87	34.21	0	0.00	0	0.00	0	0.00	0	0.00	244	15.99	244	31.98	0	0.00
<i>Ludwigia adscendens</i>	149	29.29	84	33.03	65	25.56	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	149	9.76	84	11.01	65	8.52
<i>Ludwigia octovalvis</i>	107	21.03	107	42.07	0	0.00	65	12.78	65	25.56	0	0.00	0	0.00	0	0.00	0	0.00	172	11.27	172	22.54	0	0.00
<i>Marsilea quadrifolia</i>	468	92.00	343	134.86	125	49.15	143	28.11	108	42.46	35	13.76	144	28.31	102	40.10	42	16.51	755	49.47	553	72.48	202	26.47
<i>Mazus pumilus</i>	1484	291.74	771	303.14	713	280.33	364	71.56	199	78.24	165	64.87	283	55.63	128	50.33	155	60.94	2131	139.64	1098	143.90	1033	135.38
<i>Mecardonia procumbens</i>	1303	256.15	1029	404.58	274	107.73	342	67.23	255	100.26	87	34.21	263	51.70	190	74.70	73	28.70	1908	125.03	1474	193.18	434	56.88
<i>Melilotus albus</i>	19	3.74	19	7.47	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	19	1.25	19	2.49	0	0.00
<i>Monochoria hastata</i>	10	1.97	10	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	0.66	10	1.31	0	0.00
<i>Nelsonia canescens</i>	22	4.32	0	0.00	22	8.65	26	5.11	0	0.00	26	10.22	0	0.00	0	0.00	0	0.00	48	3.15	0	0.00	48	6.29
<i>Nymphoides cristata</i>	12	2.36	12	4.72	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	12	0.79	12	1.57	0	0.00
<i>Oldenlandia tenelliflora</i>	0	0.00	0	0.00	0	0.00	22	4.32	0	0.00	22	8.65	0	0.00	0	0.00	0	0.00	22	1.44	0	0.00	22	2.88
<i>Onychium japonicum</i>	33	6.49	0	0.00	33	12.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	33	2.16	0	0.00	33	4.32
<i>Oxalis corniculata</i>	3746	736.42	2288	899.58	1458	573.25	1474	289.77	940	369.58	534	209.96	929	182.63	550	216.25	379	149.01	6149	402.94	3778	495.14	2371	310.74
<i>Oxalis debilis</i>	0	0.00	0	0.00	0	0.00	36	7.08	36	14.15	0	0.00	38	7.47	38	14.94	0	0.00	74	4.85	74	9.70	0	0.00
<i>Oxalis latifolia</i>	5	0.98	0	0.00	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.33	0	0.00	5	0.66
<i>Panicum brevifolium</i>	71	13.96	0	0.00	71	27.92	46	9.04	0	0.00	46	18.09	0	0.00	0	0.00	0	0.00	117	7.67	0	0.00	117	15.33
<i>Panicum notatum</i>	661	129.94	342	134.47	319	125.42	241	47.38	114	44.82	127	49.93	0	0.00	0	0.00	0	0.00	902	59.11	456	59.76	446	58.45
<i>Paspalidium flavidum</i>	147	28.90	65	25.56	82	32.24	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	147	9.63	65	8.52	82	10.75
<i>Paspalum conjugatum</i>	3091	607.65	1978	777.70	1113	437.60	1191	234.14	776	305.10	415	163.17	696	136.82	437	171.82	259	101.83	4978	326.20	3191	418.21	1787	234.20
<i>Paspalum dilatatum</i>	263	51.70	175	68.81	88	34.60	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	263	17.23	175	22.94	88	11.53
<i>Peperomia pellucida</i>	2278	447.83	1458	573.25	820	322.40	613	120.51	392	154.12	221	86.89	420	82.57	241	94.76	179	70.38	3311	216.97	2091	274.04	1220	159.89
<i>Persicaria barbata</i>	57	11.21	32	12.58	25	9.83	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	57	3.74	32	4.19	25	3.28
<i>Persicaria hydropiper</i>	346	68.02	218	85.71	128	50.33	212	41.68	118	46.39	94	36.96	189	37.15	103	40.50	86	33.81	747	48.95	439	57.53	308	40.37
<i>Persicaria orientalis</i>	33	6.49	33	12.97	0	0.																		

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Polygala arvensis</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.98	0	0.00	5	1.97	5	0.33	0	0.00	5	0.66
<i>Polygonum plebeium</i>	4365	858.10	2660	1045.84	1705	670.36	1574	309.43	989	388.85	585	230.01	1020	200.52	606	238.26	414	162.77	6959	456.02	4255	557.65	2704	354.38
<i>Portulaca oleracea</i>	0	0.00	0	0.00	0	0.00	7	1.38	0	0.00	7	2.75	0	0.00	0	0.00	0	0.00	7	0.46	0	0.00	7	0.92
<i>Potentilla kleiniana</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.98	0	0.00	5	1.97	5	0.33	0	0.00	5	0.66
<i>Pouzolzia zeylanica</i>	1214	238.66	840	330.27	374	147.05	475	93.38	312	122.67	163	64.09	404	79.42	256	100.65	148	58.19	2093	137.15	1408	184.53	685	89.77
<i>Pycreus pumilus</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	22	4.32	22	8.65	0	0.00	22	1.44	22	2.88	0	0.00
<i>Ranunculus cantoniensis</i>	14	2.75	14	5.50	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	14	0.92	14	1.83	0	0.00
<i>Ranunculus sceleratus</i>	86	16.91	30	11.80	56	22.02	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	86	5.64	30	3.93	56	7.34
<i>Rorippa indica</i>	2285	449.20	1461	574.43	824	323.98	847	166.51	562	220.96	285	112.05	578	113.63	331	130.14	247	97.11	3710	243.11	2354	308.51	1356	177.71
<i>Rungia pectinata</i>	149	29.29	67	26.34	82	32.24	104	20.45	51	20.05	53	20.84	55	10.81	33	12.97	22	8.65	308	20.18	151	19.79	157	20.58
<i>Rungia repens</i>	176	34.60	107	42.07	69	27.13	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	176	11.53	107	14.02	69	9.04
<i>Salvinia natans</i>	39	7.67	39	15.33	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	39	2.56	39	5.11	0	0.00
<i>Scirpus mucronatus</i>	0	0.00	0	0.00	0	0.00	16	3.15	16	6.29	0	0.00	0	0.00	0	0.00	0	0.00	16	1.05	16	2.10	0	0.00
<i>Setaria pumila</i>	1702	334.59	1057	415.59	645	253.60	802	157.66	508	199.73	294	115.59	486	95.54	295	115.99	191	75.10	2990	195.93	1860	243.77	1130	148.10
<i>Setaria viridis</i>	112	22.02	112	44.04	0	0.00	48	9.44	48	18.87	0	0.00	0	0.00	0	0.00	0	0.00	160	10.48	160	20.97	0	0.00
<i>Sida acuta</i>	17	3.34	17	6.68	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	17	1.11	17	2.23	0	0.00
<i>Solanum americanum</i>	371	72.93	209	82.17	162	63.69	226	44.43	122	47.97	104	40.89	187	36.76	103	40.50	84	33.03	784	51.37	434	56.88	350	45.87
<i>Solanum viarum</i>	172	33.81	98	38.53	74	29.09	111	21.82	66	25.95	45	17.69	0	0.00	0	0.00	0	0.00	283	18.54	164	21.49	119	15.60
<i>Spirodela polyrrhiza</i>	194	38.14	96	37.74	98	38.53	65	12.78	29	11.40	36	14.15	0	0.00	0	0.00	0	0.00	259	16.97	125	16.38	134	17.56
<i>Sporobolus diandrus</i>	136	26.74	116	45.61	20	7.86	62	12.19	51	20.05	11	4.32	0	0.00	0	0.00	0	0.00	198	12.97	167	21.89	31	4.06
<i>Stellaria media</i>	381	74.90	222	87.28	159	62.51	215	42.27	124	48.75	91	35.78	0	0.00	0	0.00	0	0.00	596	39.06	346	45.35	250	32.76
<i>Synedrella nodiflora</i>	44	8.65	30	11.80	14	5.50	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	44	2.88	30	3.93	14	1.83
<i>Thespis divaricata</i>	264	51.90	155	60.94	109	42.86	114	22.41	60	23.59	54	21.23	0	0.00	0	0.00	0	0.00	378	24.77	215	28.18	163	21.36
<i>Tridax procumbens</i>	0	0.00	0	0.00	0	0.00	5	0.98	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	5	0.33	5	0.66	0	0.00
<i>Urochloa panicoides</i>	30	5.90	30	11.80	0	0.00	23	4.52	23	9.04	0	0.00	10	1.97	10	3.93	0	0.00	63	4.13	63	8.26	0	0.00
<i>Vicia sativa</i>	12	2.36	12	4.72	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	12	0.79	12	1.57	0	0.00
<i>Xanthium strumarium</i>	148	29.09	80	31.45	68	26.74	83	16.32	44	17.30	39	15.33	0	0.00	0	0.00	0	0.00	231	15.14	124	16.25	107	14.02
UI 1	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	11	2.16	11	4.32	0	0.00	11	0.72	11	1.44	0	0.00
UI 2	38	7.47	0	0.00	38	14.94	20	3.93	0	0.00	20	7.86	0	0.00	0	0.00	0	0.00	58	3.80	0	0.00	58	7.60
UI 3	8	1.57	8	3.15	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	8	0.52	8	1.05	0	0.00
UI 5	423	83.16	140	55.04	283	111.27	236	46.39	120	47.18	116	45.61	0	0.00	0	0.00	0	0.00	659	43.18	260	34.08	399	52.29
UI 7	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	11	2.16	11	4.32	0	0.00	11	0.72	11	1.44	0	0.00
UI 11	29	5.70	29	11.40	0	0.00	25	4.91	25	9.83	0	0.00	0	0.00	0	0.00	0	0.00	54	3.54	54	7.08	0	0.00
UI 12	0	0.00	0	0.00	0	0.00	10	1.97	0	0.00	10	3.93	0	0.00	0	0.00	0	0.00	10	0.66	0	0.00	10	1.31
UI 13	7	1.38	7	2.75	0	0.00	2	0.39	2	0.79	0	0.00	0	0.00	0	0.00	0	0.00	9	0.59	9	1.18	0	0.00
UI 16	3	0.59	0	0.00	3	1.18	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.20	0	0.00	3	0.39
UI 17	153	30.08	114	44.82	39	15.33	0	0.00	0	0.00	0	0.00	76	14.94	50	19.66	26	10.22	229	15.01	164	21.49	65	8.52
UI 20	0	0.00	0	0.00	0	0.00	5	0.98	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	5	0.33	5	0.66	0	0.00
UI 22	0	0.00	0	0.00	0	0.00	7	1.38	7	2.75	0	0.00	0	0.00	0	0.00	0	0.00	7	0.46	7	0.92	0	0.00
UI 24	25	4.91	0	0.00	25	9.83	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	25	1.64	0	0.00	25	3.28
UI 27	0	0.00	0	0.00	0	0.00	12	2.36	12	4.72	0	0.00	0	0.00	0	0.00	0	0.00	12	0.79	12	1.57	0	0.00
UI 29	147	28.90	56	22.02	91	35.78	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	147	9.63	56	7.34	91	11.93
UI (premature mortality)	5856	1151.21	3817	1500.75	2039	801.68	1916	376.66	1385	544.55	531	208.78	592	116.38	410	161.20	182	71.56	8364	548.09	5612	735.50	2752	360.67

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.25. Overall and seasonal plant species total seed abundances recorded from different soil layers of short riverine alluvial grasslands soil seed bank during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Acmella uliginosa</i>	107.33	50.67	56.67	41.67	20.00	21.67	0.00	0.00	0.00	149.00	70.67	78.33
<i>Acroceras munroanum</i>	10.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	10.00
<i>Adiantum caudatum</i>	80.33	47.00	33.33	39.00	22.00	17.00	0.00	0.00	0.00	119.33	69.00	50.33
<i>Adiantum philippense</i>	8.67	8.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.67	8.67	0.00
<i>Aeschynomene aspera</i>	18.33	18.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.33	18.33	0.00
<i>Ageratum conyzoides</i>	253.67	136.67	117.00	116.67	65.33	51.33	79.67	43.67	36.00	450.00	245.67	204.33
<i>Alternanthera philoxeroides</i>	48.67	48.67	0.00	0.00	0.00	0.00	23.33	23.33	0.00	72.00	72.00	0.00
<i>Alternanthera pungens</i>	358.33	200.33	158.00	123.00	62.67	60.33	0.00	0.00	0.00	481.33	263.00	218.33
<i>Alternanthera sessilis</i>	1180.00	720.67	459.33	444.67	277.67	167.00	283.00	168.33	114.67	1907.67	1166.67	741.00
<i>Amaranthus viridis</i>	163.67	94.67	69.00	67.67	40.33	27.33	0.00	0.00	0.00	231.33	135.00	96.33
<i>Ammannia multiflora</i>	13.33	13.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.33	13.33	0.00
<i>Ampelopteris prolifera</i>	76.67	76.67	0.00	29.67	29.67	0.00	0.00	0.00	0.00	106.33	106.33	0.00
<i>Anagallis arvensis</i>	2.33	0.00	2.33	0.00	0.00	0.00	0.00	0.00	0.00	2.33	0.00	2.33
<i>Arenaria serpyllifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.67	1.67	0.00	1.67	1.67	0.00
<i>Artemisia carvifolia</i>	37.00	37.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37.00	37.00	0.00
<i>Axonopus compressus</i>	638.00	420.33	217.67	241.33	170.33	71.00	141.00	92.33	48.67	1020.33	683.00	337.33
<i>Azolla pinnata</i>	92.67	72.00	20.67	17.33	12.00	5.33	19.67	17.67	2.00	129.67	101.67	28.00
<i>Bacopa monnieri</i>	3.33	0.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	3.33	0.00	3.33
<i>Brachiaria distachya</i>	147.00	147.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	147.00	147.00	0.00
<i>Brachiaria reptans</i>	64.33	64.33	0.00	27.67	27.67	0.00	0.00	0.00	0.00	92.00	92.00	0.00
<i>Carex vesicaria</i>	178.67	98.00	80.67	79.33	44.00	35.33	52.33	31.00	21.33	310.33	173.00	137.33
<i>Cenchrus ciliaris</i>	189.33	111.00	78.33	87.67	56.00	31.67	50.67	32.33	18.33	327.67	199.33	128.33
<i>Centella asiatica</i>	191.00	114.67	76.33	89.00	46.00	43.00	47.67	31.33	16.33	327.67	192.00	135.67
<i>Centipeda minima</i>	419.00	224.67	194.33	111.67	83.33	28.33	56.67	34.33	22.33	587.33	342.33	245.00
<i>Ceratopteris thalictroides</i>	12.33	12.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.33	12.33	0.00
<i>Chenopodium album</i>	8.00	6.33	1.67	0.00	0.00	0.00	0.00	0.00	0.00	8.00	6.33	1.67
<i>Christella parasitica</i>	170.00	115.67	54.33	79.67	45.33	34.33	52.33	26.67	25.67	302.00	187.67	114.33
<i>Chrysopogon aciculatus</i>	266.67	167.33	99.33	113.33	73.33	40.00	75.00	44.00	31.00	455.00	284.67	170.33
<i>Commelina benghalensis</i>	75.00	44.67	30.33	21.33	9.67	11.67	0.00	0.00	0.00	96.33	54.33	42.00
<i>Commelina diffusa</i>	5.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	5.00
<i>Cotula hemisphaerica</i>	512.67	321.00	191.67	110.00	64.33	45.67	0.00	0.00	0.00	622.67	385.33	237.33
<i>Cynodon dactylon</i>	3497.67	2133.00	1364.67	1447.00	987.33	459.67	678.00	412.67	265.33	5622.67	3533.00	2089.67
<i>Cyperus compressus</i>	259.33	162.67	96.67	114.33	70.67	43.67	80.67	48.67	32.00	454.33	282.00	172.33
<i>Cyperus cyperoides</i>	34.33	28.67	5.67	15.00	10.00	5.00	0.00	0.00	0.00	49.33	38.67	10.67
<i>Cyperus difformis</i>	40.33	13.67	26.67	0.00	0.00	0.00	0.00	0.00	0.00	40.33	13.67	26.67
<i>Cyperus distans</i>	76.67	30.00	46.67	37.67	14.33	23.33	0.00	0.00	0.00	114.33	44.33	70.00
<i>Cyperus eragrostis</i>	339.33	217.67	121.67	134.67	86.67	48.00	104.33	62.00	42.33	578.33	366.33	212.00
<i>Cyperus imbricatus</i>	79.00	37.33	41.67	48.33	19.33	29.00	0.00	0.00	0.00	127.33	56.67	70.67
<i>Cyperus iria</i>	108.00	67.33	40.67	66.67	37.00	29.67	0.00	0.00	0.00	174.67	104.33	70.33
<i>Cyperus rotundus</i>	218.00	218.00	0.00	0.00	0.00	0.00	78.33	78.33	0.00	296.33	296.33	0.00
<i>Cyperus squarrosus</i>	263.33	172.67	90.67	103.33	59.00	44.33	70.67	44.33	26.33	437.33	276.00	161.33
<i>Cyperus tenuispica</i>	0.00	0.00	0.00	0.00	0.00	0.00	6.00	6.00	0.00	6.00	6.00	0.00
<i>Dactylis glomerata</i>	4.67	4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67	4.67	0.00
<i>Dactyloctenium aegyptium</i>	99.33	54.33	45.00	44.33	21.00	23.33	0.00	0.00	0.00	143.67	75.33	68.33
<i>Dentella repens</i>	0.00	0.00	0.00	2.33	0.00	2.33	0.00	0.00	0.00	2.33	0.00	2.33
<i>Desmodium heterophyllum</i>	30.33	26.00	4.33	0.00	0.00	0.00	15.67	13.33	2.33	46.00	39.33	6.67
<i>Dichanthium annulatum</i>	307.33	155.33	152.00	121.33	66.00	55.33	0.00	0.00	0.00	428.67	221.33	207.33
<i>Dichrocephala integrifolia</i>	158.33	106.33	52.00	50.33	27.33	23.00	0.00	0.00	0.00	208.67	133.67	75.00
<i>Digitaria ciliaris</i>	1060.67	628.67	432.00	396.00	240.33	155.67	247.00	148.33	98.67	1703.67	1017.33	686.33
<i>Digitaria setigera</i>	17.00	17.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.00	17.00	0.00
<i>Digitaria violascens</i>	47.67	0.00	47.67	0.00	0.00	0.00	0.00	0.00	0.00	47.67	0.00	47.67
<i>Duchesnea indica</i>	207.00	137.00	70.00	93.33	50.67	42.67	50.33	30.67	19.67	350.67	218.33	132.33
<i>Dysphania ambrosioides</i>	12.00	12.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	12.00	0.00

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Echinochloa colona</i>	23.33	0.00	23.33	0.00	0.00	0.00	0.00	0.00	0.00	23.33	0.00	23.33
<i>Echinochloa crus-galli</i>	424.33	266.33	158.00	163.33	97.00	66.33	0.00	0.00	0.00	587.67	363.33	224.33
<i>Eclipta prostrata</i>	192.33	111.67	80.67	103.00	59.00	44.00	78.33	41.00	37.33	373.67	211.67	162.00
<i>Eichhornia crassipes</i>	63.67	37.33	26.33	29.33	16.67	12.67	22.67	13.33	9.33	115.67	67.33	48.33
<i>Eleocharis acutangula</i>	0.00	0.00	0.00	75.00	44.33	30.67	0.00	0.00	0.00	75.00	44.33	30.67
<i>Eleusine indica</i>	49.67	39.00	10.67	0.00	0.00	0.00	0.00	0.00	0.00	49.67	39.00	10.67
<i>Enhydra fluctuans</i>	3.00	3.00	0.00	2.67	2.67	0.00	0.00	0.00	0.00	5.67	5.67	0.00
<i>Equisetum debile</i>	62.67	28.33	34.33	0.00	0.00	0.00	0.00	0.00	0.00	62.67	28.33	34.33
<i>Eragrostis amabilis</i>	37.67	37.67	0.00	18.00	18.00	0.00	0.00	0.00	0.00	55.67	55.67	0.00
<i>Eragrostis riparia</i>	85.67	72.00	13.67	36.33	23.67	12.67	0.00	0.00	0.00	122.00	95.67	26.33
<i>Eragrostis unioides</i>	48.00	18.33	29.67	0.00	0.00	0.00	29.67	12.33	17.33	77.67	30.67	47.00
<i>Ethulia conyzoides</i>	565.00	333.33	231.67	216.00	138.67	77.33	146.00	82.00	64.00	927.00	554.00	373.00
<i>Euphorbia hirta</i>	130.00	76.00	54.00	42.67	21.00	21.67	45.00	24.00	21.00	217.67	121.00	96.67
<i>Euphorbia thymifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	5.67	0.00	5.67	5.67	0.00	5.67
<i>Evolvulus nummularius</i>	282.00	182.33	99.67	79.00	48.67	30.33	0.00	0.00	0.00	361.00	231.00	130.00
<i>Fimbristylis aestivalis</i>	1188.33	730.33	458.00	493.00	323.00	170.00	310.67	195.00	115.67	1992.00	1248.33	743.67
<i>Fimbristylis dichotoma</i>	15.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	15.00	0.00
<i>Fimbristylis littoralis</i>	13.33	13.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.33	13.33	0.00
<i>Glinus lotoides</i>	220.00	112.00	108.00	71.33	28.00	43.33	0.00	0.00	0.00	291.33	140.00	151.33
<i>Glinus oppositifolius</i>	84.67	55.67	29.00	0.00	0.00	0.00	0.00	0.00	0.00	84.67	55.67	29.00
<i>Gnaphalium pensylvanicum</i>	101.67	54.00	47.67	29.33	18.33	11.00	0.00	0.00	0.00	131.00	72.33	58.67
<i>Grangea maderaspatana</i>	870.33	460.00	410.33	349.33	196.00	153.33	208.33	104.00	104.33	1428.00	760.00	668.00
<i>Heliotropium indicum</i>	207.67	125.33	82.33	89.33	54.33	35.00	79.33	46.00	33.33	376.33	225.67	150.67
<i>Heliotropium strigosum</i>	6.33	6.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33	6.33	0.00
<i>Hemarthria compressa</i>	1332.33	804.67	527.67	608.33	382.00	226.33	388.67	228.00	160.67	2329.33	1414.67	914.67
<i>Hydrocotyle sibthorpioides</i>	18.67	7.33	11.33	0.00	0.00	0.00	0.00	0.00	0.00	18.67	7.33	11.33
<i>Hyptis suaveolens</i>	324.00	165.00	159.00	116.00	61.00	55.00	88.67	47.67	41.00	528.67	273.67	255.00
<i>Isachne globosa</i>	62.67	34.33	28.33	49.33	31.67	17.67	0.00	0.00	0.00	112.00	66.00	46.00
<i>Juncus articulatus</i>	22.33	15.67	6.67	0.00	0.00	0.00	0.00	0.00	0.00	22.33	15.67	6.67
<i>Juncus prismatocarpus</i>	0.00	0.00	0.00	4.00	4.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00
<i>Kyllinga brevifolia</i>	351.67	229.33	122.33	104.67	53.33	51.33	0.00	0.00	0.00	456.33	282.67	173.67
<i>Laphangium luteoalbum</i>	429.00	269.67	159.33	139.33	77.67	61.67	102.33	61.33	41.00	670.67	408.67	262.00
<i>Lepidagathis incurva</i>	0.00	0.00	0.00	11.33	7.33	4.00	13.67	8.33	5.33	25.00	15.67	9.33
<i>Leucas aspera</i>	23.33	13.00	10.33	0.00	0.00	0.00	0.00	0.00	0.00	23.33	13.00	10.33
<i>Limnobium laevigatum</i>	189.33	129.00	60.33	64.00	47.67	16.33	48.33	31.67	16.67	301.67	208.33	93.33
<i>Lindernia crustacea</i>	1568.00	957.00	611.00	650.67	417.33	233.33	400.33	243.00	157.33	2619.00	1617.33	1001.67
<i>Lindernia ruellioides</i>	52.33	52.33	0.00	29.00	29.00	0.00	0.00	0.00	0.00	81.33	81.33	0.00
<i>Ludwigia adscendens</i>	49.67	28.00	21.67	0.00	0.00	0.00	0.00	0.00	0.00	49.67	28.00	21.67
<i>Ludwigia octovalvis</i>	35.67	35.67	0.00	21.67	21.67	0.00	0.00	0.00	0.00	57.33	57.33	0.00
<i>Marsilea quadrifolia</i>	156.00	114.33	41.67	47.67	36.00	11.67	48.00	34.00	14.00	251.67	184.33	67.33
<i>Mazus pumilus</i>	494.67	257.00	237.67	121.33	66.33	55.00	94.33	42.67	51.67	710.33	366.00	344.33
<i>Mecardonia procumbens</i>	434.33	343.00	91.33	114.00	85.00	29.00	87.67	63.33	24.33	636.00	491.33	144.67
<i>Melilotus albus</i>	6.33	6.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33	6.33	0.00
<i>Monochoria hastata</i>	3.33	3.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33	3.33	0.00
<i>Nelsonia canescens</i>	7.33	0.00	7.33	8.67	0.00	8.67	0.00	0.00	0.00	16.00	0.00	16.00
<i>Nymphoides cristata</i>	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00
<i>Oldenlandia tenelliflora</i>	0.00	0.00	0.00	7.33	0.00	7.33	0.00	0.00	0.00	7.33	0.00	7.33
<i>Onychium japonicum</i>	11.00	0.00	11.00	0.00	0.00	0.00	0.00	0.00	0.00	11.00	0.00	11.00
<i>Oxalis corniculata</i>	1248.67	762.67	486.00	491.33	313.33	178.00	309.67	183.33	126.33	2049.67	1259.33	790.33
<i>Oxalis debilis</i>	0.00	0.00	0.00	12.00	12.00	0.00	12.67	12.67	0.00	24.67	24.67	0.00
<i>Oxalis latifolia</i>	1.67	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	1.67
<i>Panicum brevifolium</i>	23.67	0.00	23.67	15.33	0.00	15.33	0.00	0.00	0.00	39.00	0.00	39.00
<i>Panicum notatum</i>	220.33	114.00	106.33	80.33	38.00	42.33	0.00	0.00	0.00	300.67	152.00	148.67

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Paspalidium flavidum</i>	49.00	21.67	27.33	0.00	0.00	0.00	0.00	0.00	0.00	49.00	21.67	27.33
<i>Paspalum conjugatum</i>	1030.33	659.33	371.00	397.00	258.67	138.33	232.00	145.67	86.33	1659.33	1063.67	595.67
<i>Paspalum dilatatum</i>	87.67	58.33	29.33	0.00	0.00	0.00	0.00	0.00	0.00	87.67	58.33	29.33
<i>Peperomia pellucida</i>	759.33	486.00	273.33	204.33	130.67	73.67	140.00	80.33	59.67	1103.67	697.00	406.67
<i>Persicaria barbata</i>	19.00	10.67	8.33	0.00	0.00	0.00	0.00	0.00	0.00	19.00	10.67	8.33
<i>Persicaria hydropiper</i>	115.33	72.67	42.67	70.67	39.33	31.33	63.00	34.33	28.67	249.00	146.33	102.67
<i>Persicaria orientalis</i>	11.00	11.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.00	11.00	0.00
<i>Phyllanthus niruri</i>	1359.00	809.67	549.33	475.67	296.00	179.67	336.33	199.67	136.67	2171.00	1305.33	865.67
<i>Physalis minima</i>	32.00	32.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.00	32.00	0.00
<i>Pistia stratiotes</i>	26.00	26.00	0.00	15.33	15.33	0.00	13.33	13.33	0.00	54.67	54.67	0.00
<i>Poa annua</i>	0.00	0.00	0.00	18.67	10.00	8.67	14.33	9.00	5.33	33.00	19.00	14.00
<i>Polycarpon prostratum</i>	486.33	340.00	146.33	139.33	91.00	48.33	119.33	72.67	46.67	745.00	503.67	241.33
<i>Polygala arvensis</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	1.67	1.67	0.00	1.67
<i>Polygonum plebeium</i>	1455.00	886.67	568.33	524.67	329.67	195.00	340.00	202.00	138.00	2319.67	1418.33	901.33
<i>Portulaca oleracea</i>	0.00	0.00	0.00	2.33	0.00	2.33	0.00	0.00	0.00	2.33	0.00	2.33
<i>Potentilla kleiniana</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	1.67	1.67	0.00	1.67
<i>Pouzolzia zeylanica</i>	404.67	280.00	124.67	158.33	104.00	54.33	134.67	85.33	49.33	697.67	469.33	228.33
<i>Pycnus pumilus</i>	0.00	0.00	0.00	0.00	0.00	0.00	7.33	7.33	0.00	7.33	7.33	0.00
<i>Ranunculus cantoniensis</i>	4.67	4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67	4.67	0.00
<i>Ranunculus sceleratus</i>	28.67	10.00	18.67	0.00	0.00	0.00	0.00	0.00	0.00	28.67	10.00	18.67
<i>Rorippa indica</i>	761.67	487.00	274.67	282.33	187.33	95.00	192.67	110.33	82.33	1236.67	784.67	452.00
<i>Rungia pectinata</i>	49.67	22.33	27.33	34.67	17.00	17.67	18.33	11.00	7.33	102.67	50.33	52.33
<i>Rungia repens</i>	58.67	35.67	23.00	0.00	0.00	0.00	0.00	0.00	0.00	58.67	35.67	23.00
<i>Salvinia natans</i>	13.00	13.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.00	13.00	0.00
<i>Scirpus mucronatus</i>	0.00	0.00	0.00	5.33	5.33	0.00	0.00	0.00	0.00	5.33	5.33	0.00
<i>Setaria pumila</i>	567.33	352.33	215.00	267.33	169.33	98.00	162.00	98.33	63.67	996.67	620.00	376.67
<i>Setaria viridis</i>	37.33	37.33	0.00	16.00	16.00	0.00	0.00	0.00	0.00	53.33	53.33	0.00
<i>Sida acuta</i>	5.67	5.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.67	5.67	0.00
<i>Solanum americanum</i>	123.67	69.67	54.00	75.33	40.67	34.67	62.33	34.33	28.00	261.33	144.67	116.67
<i>Solanum viarum</i>	57.33	32.67	24.67	37.00	22.00	15.00	0.00	0.00	0.00	94.33	54.67	39.67
<i>Spirodela polyrrhiza</i>	64.67	32.00	32.67	21.67	9.67	12.00	0.00	0.00	0.00	86.33	41.67	44.67
<i>Sporobolus diandrus</i>	45.33	38.67	6.67	20.67	17.00	3.67	0.00	0.00	0.00	66.00	55.67	10.33
<i>Stellaria media</i>	127.00	74.00	53.00	71.67	41.33	30.33	0.00	0.00	0.00	198.67	115.33	83.33
<i>Synedrella nodiflora</i>	14.67	10.00	4.67	0.00	0.00	0.00	0.00	0.00	0.00	14.67	10.00	4.67
<i>Thespis divaricata</i>	88.00	51.67	36.33	38.00	20.00	18.00	0.00	0.00	0.00	126.00	71.67	54.33
<i>Tridax procumbens</i>	0.00	0.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Urochloa panicoides</i>	10.00	10.00	0.00	7.67	7.67	0.00	3.33	3.33	0.00	21.00	21.00	0.00
<i>Vicia sativa</i>	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00
<i>Xanthium strumarium</i>	49.33	26.67	22.67	27.67	14.67	13.00	0.00	0.00	0.00	77.00	41.33	35.67
UI 1	0.00	0.00	0.00	0.00	0.00	0.00	3.67	3.67	0.00	3.67	3.67	0.00
UI 2	12.67	0.00	12.67	6.67	0.00	6.67	0.00	0.00	0.00	19.33	0.00	19.33
UI 3	2.67	2.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67	2.67	0.00
UI 5	141.00	46.67	94.33	78.67	40.00	38.67	0.00	0.00	0.00	219.67	86.67	133.00
UI 7	0.00	0.00	0.00	0.00	0.00	0.00	3.67	3.67	0.00	3.67	3.67	0.00
UI 11	9.67	9.67	0.00	8.33	8.33	0.00	0.00	0.00	0.00	18.00	18.00	0.00
UI 12	0.00	0.00	0.00	3.33	0.00	3.33	0.00	0.00	0.00	3.33	0.00	3.33
UI 13	2.33	2.33	0.00	0.67	0.67	0.00	0.00	0.00	0.00	3.00	3.00	0.00
UI 16	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
UI 17	51.00	38.00	13.00	0.00	0.00	0.00	25.33	16.67	8.67	76.33	54.67	21.67
UI 20	0.00	0.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	1.67	1.67	0.00
UI 22	0.00	0.00	0.00	2.33	2.33	0.00	0.00	0.00	0.00	2.33	2.33	0.00
UI 24	8.33	0.00	8.33	0.00	0.00	0.00	0.00	0.00	0.00	8.33	0.00	8.33
UI 27	0.00	0.00	0.00	4.00	4.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
UI 29	49.00	18.67	30.33	0.00	0.00	0.00	0.00	0.00	0.00	49.00	18.67	30.33
UK (premature mortality)	1952.00	1272.33	679.67	638.67	461.67	177.00	197.33	136.67	60.67	2788.00	1870.67	917.33

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.26. Overall and seasonal plant species mean seed abundances recorded from different soil layers of short riverine alluvial grasslands soil seed bank during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Acmella uliginosa</i>	15.33±1.64	16.89±3.47	14.17±1.55	5.95±1.07	6.67±2.55	5.42±0.75	0.00	0.00	0.00	21.29±2.59	23.56±5.67	19.58±2.28
<i>Acroceras munroanum</i>	10.00±0.00	0.00	10.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00±0.00	0.00	10.00±0.00
<i>Adiantum caudatum</i>	11.48±1.91	15.67±3.10	8.33±0.59	5.57±1.13	7.33±2.17	4.25±0.85	0.00	0.00	0.00	17.05±2.34	23.00±1.95	12.58±1.32
<i>Adiantum philippense</i>	8.67±0.00	8.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.67±0.00	8.67±0.00	0.00
<i>Aeschynomene aspera</i>	4.58±0.28	4.58±0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.58±0.28	4.58±0.28	0.00
<i>Ageratum conyzoides</i>	31.71±2.60	34.17±5.00	29.25±1.57	14.58±1.62	16.33±3.06	12.83±0.89	9.96±1.15	10.92±2.12	9.00±1.01	56.25±4.31	61.42±7.89	51.08±2.55
<i>Alternanthera philoxeroides</i>	24.33±3.00	24.33±3.00	0.00	0.00	0.00	0.00	11.67±1.67	11.67±1.67	0.00	36.00±4.67	36.00±4.67	0.00
<i>Alternanthera pungens</i>	44.79±4.21	50.08±7.56	39.50±2.62	15.38±1.85	15.67±3.06	15.08±2.55	0.00	0.00	0.00	60.17±5.67	65.75±10.53	54.58±4.28
<i>Alternanthera sessilis</i>	147.50±14.98	180.17±11.00	114.83±14.67	55.58±6.39	69.42±7.53	41.75±2.57	35.38±2.92	42.08±2.62	28.67±1.67	238.46±23.70	291.67±20.28	185.25±17.93
<i>Amaranthus viridis</i>	20.46±2.00	23.67±2.67	17.25±2.16	8.46±1.19	10.08±2.11	6.83±0.62	0.00	0.00	0.00	28.92±3.10	33.75±4.74	24.08±2.60
<i>Ammannia multiflora</i>	13.33±0.00	13.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.33±0.00	13.33±0.00	0.00
<i>Ampelopteris prolifera</i>	19.17±3.02	19.17±3.02	0.00	7.42±2.11	7.42±2.11	0.00	0.00	0.00	0.00	26.58±5.07	26.58±5.07	0.00
<i>Anagallis arvensis</i>	2.33±0.00	0.00	2.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00
<i>Arenaria serpyllifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Artemisia carvifolia</i>	18.50±7.50	18.50±7.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.50±7.50	18.50±7.50	0.00
<i>Axonopus compressus</i>	79.75±12.93	105.08±17.82	54.42±5.92	30.17±5.58	42.58±6.52	17.75±0.34	17.63±2.61	23.08±3.36	12.17±0.87	127.54±20.71	170.75±26.75	84.33±6.37
<i>Azolla pinnata</i>	15.44±3.02	18.00±4.01	10.33±1.00	2.89±0.51	3.00±0.69	2.67±1.00	3.93±1.12	4.42±1.30	2±0	21.61±3.45	25.42±3.71	14.00±3.00
<i>Bacopa monnieri</i>	3.33±0.00	0.00	3.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00
<i>Brachiaria distachya</i>	73.50±11.83	73.50±11.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	73.50±11.83	73.50±11.83	0.00
<i>Brachiaria reptans</i>	64.33±0.00	64.33±0.00	0.00	27.67±0.00	27.67±0.00	0.00	0.00	0.00	0.00	92.00±0.00	92.00±0.00	0.00
<i>Carex vesicaria</i>	22.33±1.80	24.50±2.56	20.17±2.34	9.92±0.97	11.00±1.72	8.83±0.82	6.54±0.68	7.75±0.94	5.33±0.56	38.79±3.26	43.25±4.91	34.33±3.51
<i>Cenchrus ciliaris</i>	23.67±2.23	27.75±2.02	19.58±2.84	10.96±1.94	14.00±2.90	7.92±1.74	6.33±0.94	8.08±1.07	4.58±0.96	40.96±4.47	49.83±4.05	32.08±4.94
<i>Centella asiatica</i>	27.29±4.03	38.22±2.23	19.08±1.44	12.71±1.16	15.33±1.15	10.75±1.00	6.81±1.41	10.44±0.87	4.08±0.89	46.81±6.22	64.00±1.35	33.92±2.31
<i>Centipeda minima</i>	69.83±3.72	74.89±3.74	64.78±5.46	18.61±4.53	27.78±3.56	9.44±2.45	9.44±1.10	11.44±1.28	7.44±0.68	97.89±7.92	114.11±5.81	81.67±4.11
<i>Ceratopteris thalictroides</i>	12.33±0.00	12.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.33±0.00	12.33±0.00	0.00
<i>Chenopodium album</i>	2.67±0.51	3.17±0.17	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67±0.51	3.17±0.17	1.67±0.00
<i>Christella parasitica</i>	21.25±3.34	28.92±3.01	13.58±1.97	9.96±0.68	11.33±0.71	8.58±0.63	6.54±0.62	6.67±0.98	6.42±0.92	37.75±3.98	46.92±2.98	28.58±3.00
<i>Chrysopogon aciculatus</i>	33.33±4.71	41.83±3.84	24.83±6.38	14.17±2.43	18.33±3.54	10.00±1.84	9.38±1.19	11.00±1.69	7.75±1.40	56.88±7.82	71.17±7.88	42.58±9.32
<i>Commelina benghalensis</i>	15.00±3.68	22.33±3.67	10.11±3.28	4.27±0.88	4.83±1.17	3.89±1.39	0.00	0.00	0.00	19.27±4.39	27.17±4.83	14.00±4.67
<i>Commelina diffusa</i>	5.00±0.00	0.00	5.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00±0.00	0.00	5.00±0.00
<i>Cotula hemisphaerica</i>	64.08±8.21	80.25±10.88	47.92±4.66	13.75±1.13	16.08±1.42	11.42±0.58	0.00	0.00	0.00	77.83±9.03	96.33±11.23	59.33±5.13
<i>Cynodon dactylon</i>	437.21±40.25	533.25±32.16	341.17±19.41	180.88±28.50	246.83±29.10	114.92±6.50	84.75±7.70	103.17±5.72	66.33±4.21	702.83±75.75	883.25±64.83	522.42±29.51
<i>Cyperus compressus</i>	64.83±14.76	81.33±26.33	48.33±8.33	28.58±5.36	35.33±8.67	21.83±2.50	20.17±3.38	24.33±5.67	16.00±1.33	113.58±23.12	141.00±40.67	86.17±7.17
<i>Cyperus cyperoides</i>	11.44±3.58	14.33±3.67	5.67±0.00	5.00±0.00	5.00±0.00	5.00±0.00	0.00	0.00	0.00	16.44±3.58	19.33±3.67	10.67±0.00
<i>Cyperus difformis</i>	13.44±0.22	13.67±0.00	13.33±0.33	0.00	0.00	0.00	0.00	0.00	0.00	13.44±0.22	13.67±0.00	13.33±0.33
<i>Cyperus distans</i>	12.78±1.12	15.00±2.00	11.67±1.12	6.28±0.66	7.17±1.83	5.83±0.57	0.00	0.00	0.00	19.06±1.73	22.17±3.83	17.50±1.62
<i>Cyperus eragrostis</i>	48.48±5.46	54.42±5.99	40.56±9.06	19.24±2.42	21.67±3.67	16.00±2.19	14.90±2.12	15.50±3.81	14.11±1.39	82.62±8.75	91.58±11.91	70.67±11.26
<i>Cyperus imbricatus</i>	15.80±2.50	18.67±2.67	13.89±3.73	9.67±1.50	9.67±3.67	9.67±1.73	0.00	0.00	0.00	25.47±3.74	28.33±6.33	23.56±5.35
<i>Cyperus iria</i>	13.50±1.92	16.83±3.04	10.17±0.80	8.33±0.96	9.25±1.76	7.42±0.79	0.00	0.00	0.00	21.83±2.78	26.08±4.66	17.58±1.54
<i>Cyperus rotundus</i>	54.50±4.07	54.50±4.07	0.00	0.00	0.00	0.00	19.58±2.06	19.58±2.06	0.00	74.08±4.76	74.08±4.76	0.00

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Cyperus squarrosus</i>	32.92±4.82	43.17±3.29	22.67±5.25	12.92±1.67	14.75±3.09	11.08±1.08	8.83±1.10	11.08±1.18	6.58±0.96	54.67±7.21	69.00±7.37	40.33±7.18
<i>Cyperus tenuispica</i>	0.00	0.00	0.00	0.00	0.00	0.00	6±0	6.00±0.00	0.00	6.00±0.00	6.00±0.00	0.00
<i>Dactylis glomerata</i>	4.67±0.00	4.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67±0.00	4.67±0.00	0.00
<i>Dactyloctenium aegyptium</i>	14.19±2.25	18.11±3.86	11.25±1.87	6.33±0.98	7.00±0.84	5.83±1.68	0.00	0.00	0.00	20.52±3.00	25.11±4.53	17.08±3.45
<i>Dentella repens</i>	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0
<i>Desmodium heterophyllum</i>	10.11±2.91	13.00±0.67	4.33±0.00	0.00	0.00	0.00	5.22±1.49	6.67±0.67	2.33±0.00	15.33±4.33	19.67±0.00	6.67±0
<i>Dichanthium annulatum</i>	38.42±4.52	38.83±9.53	38.00±2.12	15.17±1.81	16.50±3.72	13.83±0.59	0.00	0.00	0.00	53.58±5.82	55.33±12.23	51.83±2.53
<i>Dichrocephala integrifolia</i>	22.62±4.70	35.44±2.73	13.00±1.25	7.19±1.60	9.11±2.96	5.75±1.71	0.00	0.00	0.00	29.81±5.27	44.56±0.78	18.75±1.38
<i>Digitaria ciliaris</i>	132.58±11.10	157.17±7.57	108.00±10.73	49.50±4.33	60.08±2.68	38.92±2.40	30.88±2.73	37.08±2.71	24.67±1.28	212.96±17.76	254.33±12.29	171.58±13.42
<i>Digitaria setigera</i>	17.00±0.00	17.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.00±0.00	17.00±0.00	0.00
<i>Digitaria violascens</i>	23.83±0.17	0.00	23.83±0.17	0.00	0.00	0.00	0.00	0.00	0.00	23.83±0.17	0.00	23.83±0.17
<i>Duchesnea indica</i>	25.88±3.62	34.25±3.25	17.50±1.98	11.67±1.49	12.67±2.54	10.67±1.80	6.29±0.96	7.67±1.63	4.92±0.60	43.83±5.49	54.58±7.04	33.08±3.74
<i>Dysphania ambrosioides</i>	6.00±0.67	6.00±0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00±0.67	6.00±0.67	0.00
<i>Echinochloa colona</i>	23.33±0.00	0.00	23.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.33±0.00	0.00	23.33±0.00
<i>Echinochloa crus-galli</i>	53.04±7.04	66.58±10.30	39.50±1.65	20.42±3.25	24.25±6.14	16.58±1.40	0.00	0.00	0.00	73.46±9.36	90.83±14.35	56.08±1.23
<i>Eclipta prostrata</i>	24.04±2.24	27.92±2.76	20.17±2.41	12.88±0.97	14.75±0.86	11.00±1.13	9.79±0.77	10.25±1.23	9.33±1.05	46.71±3.44	52.92±4.69	40.50±2.76
<i>Eichhornia crassipes</i>	7.96±1.20	9.33±1.98	6.58±1.24	3.67±0.42	4.17±0.52	3.17±0.62	2.83±0.39	3.33±0.41	2.33±0.61	14.46±1.78	16.83±2.60	12.08±2.06
<i>Eleocharis acutangula</i>	0.00	0.00	0.00	9.38±0.76	11.08±0.86	7.67±0.19	0.00	0.00	0.00	9.38±0.76	11.08±0.86	7.67±0.19
<i>Eleusine indica</i>	12.42±4.12	19.50±1.17	5.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.42±4.12	19.50±1.17	5.33±0.00
<i>Enhydra fluctuans</i>	3.00±0.00	3.00±0.00	0.00	2.67±0.00	2.67±0.00	0.00	0.00	0.00	0.00	5.67±0.00	5.67±0.00	0.00
<i>Equisetum debile</i>	7.83±1.00	7.08±1.77	8.58±1.08	0.00	0.00	0.00	0.00	0.00	0.00	7.83±1.00	7.08±1.77	8.58±1.08
<i>Eragrostis amabilis</i>	18.83±1.83	18.83±1.83	0.00	9.00±3.00	9.00±3.00	0.00	0.00	0.00	0.00	27.83±4.83	27.83±4.83	0.00
<i>Eragrostis riparia</i>	28.56±9.54	36.00±10.33	13.67±0.00	12.11±0.56	11.83±0.83	12.67±0.00	0.00	0.00	0.00	40.67±9.02	47.83±9.50	26.33±0.00
<i>Eragrostis unioloides</i>	16.00±1.20	18.33±0.00	14.83±0.50	0.00	0.00	0.00	9.89±1.56	12.33±0.00	8.67±1.67	25.89±2.70	30.67±0.00	23.50±2.17
<i>Ethulia conyzoides</i>	70.63±9.21	83.33±15.17	57.92±7.60	27.00±3.72	34.67±4.61	19.33±1.99	18.25±2.41	20.50±4.51	16.00±1.84	115.88±14.53	138.50±22.83	93.25±11.06
<i>Euphorbia hirta</i>	26.00±5.43	38.00±7.33	18.00±6.67	8.53±1.12	10.50±0.17	7.22±1.42	9.00±1.24	12.00±0.00	7.00±0.33	43.53±7.36	60.50±7.50	32.22±1.35
<i>Euphorbia thymifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	5.67±0.00	0.00	5.67±0.00	5.67±0.00	0.00	5.67±0.00
<i>Evolvulus nummularius</i>	35.25±5.05	45.58±5.29	24.92±4.47	9.88±1.46	12.17±1.82	7.58±1.76	0.00	0.00	0.00	45.13±6.11	57.75±6.54	32.50±5.02
<i>Fimbristylis aestivalis</i>	148.54±14.03	182.58±9.43	114.50±7.52	61.63±7.75	80.75±5.36	42.50±2.77	38.83±4.04	48.75±2.83	28.92±1.65	249.00±25.45	312.08±15.57	185.92±11.24
<i>Fimbristylis dichotoma</i>	15.00±0.00	15.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00±0.00	15.00±0.00	0.00
<i>Fimbristylis littoralis</i>	13.33±0.00	13.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.33±0.00	13.33±0.00	0.00
<i>Glinus lotoides</i>	36.67±8.30	56.00±19.00	27.00±4.34	11.89±1.28	14.00±3.67	10.83±0.88	0.00	0.00	0.00	48.56±9.42	70.00±22.67	37.83±4.60
<i>Glinus oppositifolius</i>	21.17±4.31	27.83±1.50	14.50±4.50	0.00	0.00	0.00	0.00	0.00	0.00	21.17±4.31	27.83±1.50	14.50±4.50
<i>Gnaphalium pensylvanicum</i>	25.42±3.67	27.00±3.00	23.83±8.17	7.33±1.34	9.17±0.83	5.50±1.83	0.00	0.00	0.00	32.75±4.80	36.17±3.83	29.33±10.00
<i>Grangea maderaspatana</i>	108.79±7.33	115.00±10.40	102.58±10.81	43.67±3.03	49.00±3.26	38.33±3.62	26.04±1.85	26.00±1.80	26.08±3.56	178.50±11.18	190±14.42	167.00±16.96
<i>Heliotropium indicum</i>	25.96±2.38	31.33±1.74	20.58±2.02	11.17±1.36	13.58±1.94	8.75±0.98	9.92±0.73	11.50±0.75	8.33±0.49	47.04±4.12	56.42±3.97	37.67±2.22
<i>Heliotropium strigosum</i>	6.33±0.00	6.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33±0.00	6.33±0.00	0.00
<i>Hemarthria compressa</i>	166.54±15.15	201.17±10.53	131.92±12.68	76.04±7.97	95.50±5.28	56.58±4.02	48.58±4.12	57.00±5.05	40.17±2.55	291.17±26.68	353.67±19.58	228.67±18.26
<i>Hydrocotyle sibthorpioides</i>	6.22±0.95	7.33±0.00	5.67±1.33	0.00	0.00	0.00	0.00	0.00	0.00	6.22±0.95	7.33±0.00	5.67±1.33
<i>Hyptis suaveolens</i>	46.29±4.87	55.00±7.37	39.75±4.74	16.57±2.23	20.33±4.14	13.75±1.64	12.67±1.41	15.89±0.68	10.25±1.47	75.52±8.14	91.22±12.10	63.75±7.15
<i>Isachne globosa</i>	12.53±3.13	17.17±7.83	9.44±0.48	9.87±2.86	15.83±4.50	5.89±0.87	0.00	0.00	0.00	22.40±5.87	33.00±12.33	15.33±1.35
<i>Juncus articulatus</i>	7.44±0.40	7.83±0.17	6.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.44±0.40	7.83±0.17	6.67±0.00
<i>Juncus prismatocarpus</i>	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00
<i>Kyllinga brevifolia</i>	43.96±6.60	57.33±8.67	30.58±3.00	13.08±1.59	13.33±2.48	12.83±2.35	0.00	0.00	0.00	57.04±7.09	70.67±9.18	43.42±5.14
<i>Laphangium luteoalbum</i>	53.63±5.99	67.42±4.28	39.83±4.75	17.42±1.16	19.42±0.83	15.42±1.72	12.79±1.58	15.33±2.53	10.25±0.96	83.83±7.68	102.17±4.37	65.5±5.69
<i>Lepidagathis incurva</i>	0.00	0.00	0.00	5.67±1.67	7.33±0.00	4±0	6.83±1.50	8.33±0.00	5.33±0.00	12.50±3.17	15.67±0.00	9.33±0.00
<i>Leucas aspera</i>	4.67±0.78	6.50±0.50	3.44±0.29	0.00	0.00	0.00	0.00	0.00	0.00	4.67±0.78	6.50±0.50	3.44±0.29
<i>Limnobium laevigatum</i>	31.56±3.98	32.25±5.94	30.17±4.83	10.67±1.80	11.92±2.56	8.17±0.17	8.06±0.69	7.92±1.07	8.33±0.33	50.28±5.53	52.08±8.36	46.67±4.33
<i>Lindernia crustacea</i>	196.00±16.65	239.25±6.21	152.75±2.85	81.33±9.65	104.33±7.45	58.33±5.14	50.04±4.81	60.75±4.93	39.33±2.71	327.38±30.60	404.33±18.03	250.42±9.79
<i>Lindernia ruelliioides</i>	26.17±1.17	26.17±1.17	0.00	14.50±1.17	14.50±1.17	0.00	0.00	0.00	0.00	40.67±2.33	40.67±2.33	0.00
<i>Ludwigia adscendens</i>	12.42±1.31	14.00±2.00	10.83±1.17	0.00	0.00	0.00	0.00	0.00	0.00	12.42±1.31	14.00±2.00	10.83±1.17
<i>Ludwigia octovalvis</i>	17.83±5.17	17.83±5.17	0.00	10.83±2.17	10.83±2.17	0.00	0.00	0.00	0.00	28.67±7.33	28.67±7.33	0.00
<i>Marsilea quadrifolia</i>	26.00±4.05	28.58±5.69	20.83±3.50	7.94±1.11	9.00±1.33	5.83±1.17	8.00±0.98	8.50±1.40	7.00±1.00	41.94±5.72	46.08±7.69	33.67±5.67

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Mazus pumilus</i>	70.67±6.39	85.67±7.81	59.42±3.74	17.33±2.80	22.11±5.50	13.75±1.51	13.48±0.48	14.22±0.95	12.92±0.32	101.48±8.96	122.00±12.68	86.08±4.07
<i>Mecardonia procumbens</i>	72.39±12.93	85.75±15.32	45.67±5.33	19.00±2.75	21.25±3.30	14.50±4.17	14.61±2.15	15.83±3.12	12.17±1.50	106.00±17.22	122.83±20.92	72.33±11.00
<i>Melilotus albus</i>	3.17±1.50	3.17±1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.17±1.50	3.17±1.50	0.00
<i>Monochoria hastata</i>	3.33±0.00	3.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33±0.00	3.33±0.00	0.00
<i>Nelsonia canescens</i>	3.67±0.67	0.00	3.67±0.67	4.33±0.33	0.00	4.33±0.33	0.00	0.00	0.00	8.00±1.00	0.00	8.00±1.00
<i>Nymphoides cristata</i>	4.00±0.00	4.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00±0.00	4±0	0.00
<i>Oldenlandia tenelliflora</i>	0.00	0.00	0.00	7.33±0.00	0.00	7.33±0	0.00	0.00	0.00	7.33±0.00	0.00	7.33±0.00
<i>Onychium japonicum</i>	11.00±0.00	0.00	11.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.00±0.00	0.00	11.00±0.00
<i>Oxalis corniculata</i>	156.08±13.56	190.67±7.13	121.50±3.12	61.42±7.84	78.33±8.19	44.50±5.37	38.71±3.25	45.83±3.39	31.58±2.01	256.21±24	314.83±17.29	197.58±9.87
<i>Oxalis debilis</i>	0.00	0.00	0.00	6.00±1.67	6.00±1.67	0.00	6.33±0.00	6.33±0.00	0.00	12.33±1.67	12.33±1.67	0.00
<i>Oxalis latifolia</i>	1.67±0.00	0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00
<i>Panicum brevifolium</i>	23.67±0.00	0.00	23.67±0.00	15.33±0.00	0.00	15.33±0.00	0.00	0.00	0.00	39.00±0.00	0.00	39.00±0.00
<i>Panicum notatum</i>	36.72±7.37	57.00±12.33	26.58±2.76	13.39±1.86	19.00±1.00	10.58±0.80	0.00	0.00	0.00	50.11±9.09	76.00±13.33	37.17±3.04
<i>Paspalidium flavidum</i>	12.25±2.29	10.83±4.83	13.67±2.00	0.00	0.00	0.00	0.00	0.00	0.00	12.25±2.29	10.83±4.83	13.67±2.00
<i>Paspalum conjugatum</i>	128.79±16.54	164.83±18.61	92.75±8.01	49.63±7.51	64.67±10.33	34.58±2.43	29.00±3.60	36.42±4.69	21.58±1.36	207.42±26.40	265.92±29.45	148.92±10.24
<i>Paspalum dilatatum</i>	21.92±4.38	29.17±3.17	14.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.92±4.38	29.17±3.17	14.67±0.00
<i>Peperomia pellucida</i>	94.92±12.13	121.5±11.64	68.33±8.93	25.54±4.09	32.67±6.27	18.42±2.25	17.50±1.59	20.08±2.65	14.92±0.60	137.96±16.30	174.25±17.87	101.67±6.52
<i>Persicaria barbata</i>	6.33±1.15	5.33±1.00	8.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33±1.15	5.33±1.00	8.33±0.00
<i>Persicaria hydropiper</i>	14.42±1.52	18.17±0.75	10.67±0.89	8.83±0.85	9.83±1.42	7.83±0.84	7.88±0.98	8.58±1.54	7.17±1.32	31.13±2.59	36.58±2.50	25.67±2.27
<i>Persicaria orientalis</i>	5.50±0.50	5.50±0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.50±0.50	5.50±0.50	0.00
<i>Phyllanthus niruri</i>	169.88±14.85	202.42±12.49	137.33±12.92	59.46±7.35	74.00±9.84	44.92±3.81	42.04±3.41	49.92±3.42	34.17±1.04	271.38±24.99	326.33±24.54	216.42±17.29
<i>Physalis minima</i>	16.00±2.67	16.00±2.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.00±2.67	16.00±2.67	0.00
<i>Pistia stratiotes</i>	6.50±0.57	6.50±0.57	0.00	3.83±0.42	3.83±0.42	0.00	3.33±0.71	3.33±0.71	0.00	13.67±1.08	13.67±1.08	0.00
<i>Poa annua</i>	0.00	0.00	0.00	9.33±0.67	10.00±0.00	8.67±0.00	7.17±1.83	9.00±0.00	5.33±0.00	16.50±2.50	19.00±0.00	14±0
<i>Polycarpon prostratum</i>	60.79±10.55	85.00±10.98	36.58±2.85	17.42±2.36	22.75±2.51	12.08±0.82	14.92±1.93	18.17±3.10	11.67±0.85	93.13±14.49	125.92±16.03	60.33±2.34
<i>Polygala arvensis</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00	1.67±0.00	0.00	1.67±0.00
<i>Polygonum plebeium</i>	181.88±17.05	221.67±13.47	142.08±10.91	65.58±7.37	82.42±6.73	48.75±4.41	42.50±3.53	50.50±3.36	34.50±2.09	289.96±27.7	354.58±22.54	225.33±16.99
<i>Portulaca oleracea</i>	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00
<i>Potentilla kleiniana</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00	1.67±0.00	0.00	1.67±0.00
<i>Pouzolzia zeylanica</i>	50.58±11.10	70.00±17.90	31.17±1.78	19.79±3.43	26.00±4.94	13.58±2.21	16.83±2.96	21.33±5.05	12.33±1.37	87.21±17	117.33±27.13	57.08±2.74
<i>Pycnus pumilus</i>	0.00	0.00	0.00	0.00	0.00	0.00	7.33±0.00	7.33±0.00	0.00	7.33±0.00	7.33±0.00	0.00
<i>Ranunculus cantoniensis</i>	4.67±0.00	4.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67±0.00	4.67±0.00	0.00
<i>Ranunculus sceleratus</i>	9.56±0.22	10.00±0.00	9.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.56±0.22	10.00±0.00	9.33±0.00
<i>Rorippa indica</i>	95.21±11.41	121.75±9.76	68.67±6.58	35.29±5.07	46.83±5.33	23.75±1.66	24.08±2.02	27.58±3.03	20.58±1.32	154.58±17.75	196.17±16.28	113.00±7.28
<i>Rungia pectinata</i>	24.83±2.50	22.33±0.00	27.33±0.00	17.33±0.33	17.00±0.00	17.67±0.00	9.17±1.83	11.00±0.00	7.33±0.00	51.33±1.00	50.33±0.00	52.33±0.00
<i>Rungia repens</i>	14.67±3.09	17.83±5.83	11.50±1.83	0.00	0.00	0.00	0.00	0.00	0.00	14.67±3.09	17.83±5.83	11.50±1.83
<i>Salvinia natans</i>	6.50±0.50	6.50±0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.50±0.50	6.50±0.50	0.00
<i>Scirpus mucronatus</i>	0.00	0.00	0.00	5.33±0.00	5.33±0.00	0.00	0.00	0.00	0.00	5.33±0.00	5.33±0.00	0.00
<i>Setaria pumila</i>	70.92±8.47	88.08±11.37	53.75±2.97	33.42±4.76	42.33±6.70	24.5±2.81	20.25±2.55	24.58±3.52	15.92±2.33	124.58±15.52	155±21.22	94.17±7.52
<i>Setaria viridis</i>	37.33±0.00	37.33±0.00	0.00	16.00±0.00	16.00±0.00	0.00	0.00	0.00	0.00	53.33±0.00	53.33±0.00	0.00
<i>Sida acuta</i>	2.83±0.50	2.83±0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.83±0.50	2.83±0.50	0.00
<i>Solanum americanum</i>	15.46±1.78	17.42±3.10	13.50±1.62	9.42±1.00	10.17±2.05	8.67±0.33	7.79±0.88	8.58±1.47	7.00±1.01	32.67±3.40	36.17±6.42	29.17±2.15
<i>Solanum viarum</i>	7.17±1.06	8.17±1.51	6.17±1.51	4.63±0.46	5.50±0.35	3.75±0.58	0.00	0.00	0.00	11.79±1.34	13.67±1.78	9.92±1.69
<i>Spirodela polyrrhiza</i>	10.78±0.82	10.67±0.84	10.89±1.64	3.61±0.58	3.22±0.40	4.00±1.17	0.00	0.00	0.00	14.39±1.10	13.89±1.13	14.89±2.12
<i>Sporobolus diandrus</i>	15.11±6.85	19.33±9.33	6.67±0.00	6.89±1.68	8.50±0.83	3.67±0.00	0.00	0.00	0.00	22.00±8.28	27.83±10.17	10.33±0.00
<i>Stellaria media</i>	18.14±3.30	24.67±4.93	13.25±2.71	10.24±2.12	13.78±4.08	7.58±1.37	0.00	0.00	0.00	28.38±5.29	38.44±8.99	20.83±3.66
<i>Synedrella nodiflora</i>	3.67±0.91	5.00±0.67	2.33±1.00	0.00	0.00	0.00	0.00	0.00	0.00	3.67±0.91	5.00±0.67	2.33±1.00
<i>Thespis divaricata</i>	17.60±4.59	25.83±5.83	12.11±4.61	7.60±2.41	10.00±5.67	6.00±2.33	0.00	0.00	0.00	25.20±6.78	35.83±11.5	18.11±6.82
<i>Tridax procumbens</i>	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Urochloa panicoides</i>	10.00±0.00	10.00±0.00	0.00	7.67±0.00	7.67±0.00	0.00	3.33±0.00	3.33±0.00	0.00	21.00±0.00	21.00±0.00	0.00
<i>Vicia sativa</i>	4.00±0.00	4.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00
<i>Xanthium strumarium</i>	7.05±0.97	8.89±1.54	5.67±0.78	3.95±0.84	4.89±1.94	3.25±0.46	0.00	0.00	0.00	11.00±1.63	13.78±2.98	8.92±1.24
UI 1	0.00	0.00	0.00	0.00	0.00	0.00	3.67±0.00	3.67±0.00	0.00	3.67±0.00	3.67±0.00	0.00

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
UI 2	6.33±1.00	0.00	6.33±1.00	3.33±0.33	0.00	3.33±0.33	0.00	0.00	0.00	9.67±1.33	0.00	9.67±1.33
UI 3	2.67±0.00	2.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67±0.00	2.67±0.00	0.00
UI 5	23.50±2.76	23.33±4.00	23.58±4.05	13.11±2.51	20.00±1.00	9.67±1.92	0.00	0.00	0.00	36.61±4.20	43.33±3.00	33.25±5.59
UI 7	0.00	0.00	0.00	0.00	0.00	0.00	3.67±0.00	3.67±0.00	0.00	3.67±0.00	3.67±0.00	0.00
UI 11	4.83±1.17	4.83±1.17	0.00	4.17±0.17	4.17±0.17	0.00	0.00	0.00	0.00	9.00±1.00	9.00±1.00	0.00
UI 12	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00
UI 13	2.33±0.00	2.33±0.00	0.00	0.67±0.00	0.67±0.00	0.00	0.00	0.00	0.00	3.00±0.00	3.00±0.00	0.00
UI 16	1.00±0.00	0.00	1.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00
UI 17	10.20±1.73	12.67±1.39	6.50±1.17	0.00	0.00	0.00	5.07±0.91	5.56±1.46	4.33±1.00	15.27±2.32	18.22±2.35	10.83±2.17
UI 20	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
UI 22	0.00	0.00	0.00	2.33±0.00	2.33±0.00	0.00	0.00	0.00	0.00	2.33±0.00	2.33±0.00	0.00
UI 24	8.33±0.00	0.00	8.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.33±0.00	0.00	8.33±0.00
UI 27	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00
UI 29	9.80±0.65	9.33±0.33	10.11±1.11	0.00	0.00	0.00	0.00	0.00	0.00	9.80±0.65	9.33±0.33	10.11±1.11
UK (premature mortality)	244.00±32.07	318.08±29.66	169.92±16.19	79.83±15.16	115.42±13.88	44.25±6.03	24.67±4.50	34.17±5.38	15.17±2.29	348.5±51.23	467.67±47.28	229.33±23.38

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.27. Overall and seasonal plant species seed abundances and densities (m⁻²) recorded from different soil layers of short riverine alluvial grasslands soil seed bank given natural treatment during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers															Total								
	Upper layer (0-5)						Middle layer (5-10)					Lower layer (10-15)												
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Acmella uliginosa</i>	239	93.97	134	105.37	105	82.57	125	49.15	60	47.18	65	51.11	0	0.00	0	0.00	0	0.00	364	47.71	194	50.85	170	44.56
<i>Acroceras munroanum</i>	30	11.80	0	0.00	30	23.59	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	30	3.93	0	0.00	30	7.86
<i>Adiantum caudatum</i>	191	75.10	122	95.93	69	54.26	93	36.57	51	40.10	42	33.03	0	0.00	0	0.00	0	0.00	284	37.22	173	45.35	111	29.09
<i>Adiantum philippense</i>	26	10.22	26	20.45	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	26	3.41	26	6.82	0	0.00
<i>Ageratum conyzoides</i>	564	221.75	323	253.99	241	189.51	269	105.76	154	121.10	115	90.43	145	57.01	89	69.99	56	44.04	978	128.17	566	148.36	412	107.99
<i>Alternanthera philoxeroides</i>	88	34.60	88	69.20	0	0.00	0	0.00	0	0.00	0	0.00	43	16.91	43	33.81	0	0.00	131	17.17	131	34.34	0	0.00
<i>Alternanthera pungens</i>	780	306.68	458	360.15	322	253.20	269	105.76	136	106.94	133	104.58	0	0.00	0	0.00	0	0.00	1049	137.48	594	155.70	455	119.26
<i>Alternanthera sessilis</i>	2557	1005.35	1652	1299.05	905	711.65	865	340.10	567	445.86	298	234.33	551	216.64	342	268.93	209	164.35	3973	520.69	2561	671.28	1412	370.11
<i>Amaranthus viridis</i>	336	132.11	206	161.99	130	102.23	145	57.01	89	69.99	56	44.04	0	0.00	0	0.00	0	0.00	481	63.04	295	77.32	186	48.75
<i>Ampelopteris prolifera</i>	151	59.37	151	118.74	0	0.00	68	26.74	68	53.47	0	0.00	0	0.00	0	0.00	0	0.00	219	28.70	219	57.40	0	0.00
<i>Anagallis arvensis</i>	7	2.75	0	0.00	7	5.50	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	7	0.92	0	0.00	7	1.83
<i>Artemisia carvifolia</i>	56	22.02	56	44.04	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	56	7.34	56	14.68	0	0.00
<i>Axonopus compressus</i>	1390	546.51	934	734.45	456	358.58	556	218.61	408	320.83	148	116.38	266	104.58	181	142.33	85	66.84	2212	289.90	1523	399.20	689	180.60
<i>Bacopa monnieri</i>	10	3.93	0	0.00	10	7.86	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	1.31	0	0.00	10	2.62
<i>Brachiaria distachya</i>	441	173.39	441	346.78	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	441	57.80	441	115.59	0	0.00
<i>Brachiaria reptans</i>	143	56.22	143	112.45	0	0.00	55	21.62	55	43.25	0	0.00	0	0.00	0	0.00	0	0.00	198	25.95	198	51.90	0	0.00
<i>Carex vesicaria</i>	332	130.53	185	145.47	147	115.59	146	57.40	84	66.05	62	48.75	103	40.50	65	51.11	38	29.88	581	76.14	334	87.55	247	64.74
<i>Cenchrus ciliaris</i>	404	158.84	238	187.15	166	130.53	184	72.34	122	95.93	62	48.75	94	36.96	64	50.33	30	23.59	682	89.38	424	111.14	258	67.63
<i>Centella asiatica</i>	370	145.47	239	187.94	131	103.01	185	72.74	101	79.42	84	66.05	143	56.22	94	73.92	49	38.53	698	91.48	434	113.76	264	69.20
<i>Centipeda minima</i>	1257	494.22	674	530.00	583	458.44	335	131.71	250	196.59	85	66.84	170	66.84	103	80.99	67	52.69	1762	230.92	1027	269.19	735	192.66
<i>Chenopodium album</i>	24	9.44	19	14.94	5	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	24	3.15	19	4.98	5	1.31
<i>Christella parasitica</i>	340	133.68	242	190.30	98	77.06	159	62.51	93	73.13	66	51.90	98	38.53	50	39.32	48	37.74	597	78.24	385	100.91	212	55.57
<i>Chrysopogon aciculatus</i>	565	222.14	359	282.30	206	161.99	239	93.97	154	121.10	85	66.84	125	49.15	79	62.12	46	36.17	929	121.75	592	155.17	337	88.33
<i>Commelina benghalensis</i>	134	52.69	84	66.05	50	39.32	64	25.16	29	22.80	35	27.52	0	0.00	0	0.00	0	0.00	198	25.95	113	29.62	85	22.28
<i>Commelina diffusa</i>	15	5.90	0	0.00	15	11.80	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	15	1.97	0	0.00	15	3.93
<i>Cotula hemisphaerica</i>	1226	482.03	816	641.66	410	322.40	330	129.75	193	151.77	137	107.73	0	0.00	0	0.00	0	0.00	1556	203.93	1009	264.48	547	143.38

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Cynodon dactylon</i>	7504	2950.38	4543	3572.38	2961	2328.38	3080	1210.98	2217	1743.34	863	678.62	1282	504.05	819	644.02	463	364.08	11866	1555.14	7579	1986.58	4287	1123.69
<i>Cyperus compressus</i>	551	216.64	354	278.37	197	154.91	224	88.07	140	110.09	84	66.05	142	55.83	86	67.63	56	44.04	917	120.18	580	152.03	337	88.33
<i>Cyperus cyperoides</i>	69	27.13	58	45.61	11	8.65	30	11.80	22	17.30	8	6.29	0	0.00	0	0.00	0	0.00	99	12.97	80	20.97	19	4.98
<i>Cyperus difformis</i>	121	47.57	41	32.24	80	62.91	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	121	15.86	41	10.75	80	20.97
<i>Cyperus distans</i>	129	50.72	62	48.75	67	52.69	65	25.56	23	18.09	42	33.03	0	0.00	0	0.00	0	0.00	194	25.43	85	22.28	109	28.57
<i>Cyperus eragrostis</i>	647	254.38	465	365.65	182	143.12	268	105.37	181	142.33	87	68.41	185	72.74	129	101.44	56	44.04	1100	144.16	775	203.14	325	85.19
<i>Cyperus imbricatus</i>	144	56.62	77	60.55	67	52.69	95	37.35	38	29.88	57	44.82	0	0.00	0	0.00	0	0.00	239	31.32	115	30.14	124	32.50
<i>Cyperus iria</i>	225	88.46	148	116.38	77	60.55	135	53.08	72	56.62	63	49.54	0	0.00	0	0.00	0	0.00	360	47.18	220	57.67	140	36.70
<i>Cyperus rotundus</i>	527	207.20	527	414.41	0	0.00	0	0.00	0	0.00	0	0.00	148	58.19	148	116.38	0	0.00	675	88.46	675	176.93	0	0.00
<i>Cyperus squarrosus</i>	790	310.61	518	407.33	272	213.89	310	121.88	177	139.18	133	104.58	212	83.35	133	104.58	79	62.12	1312	171.95	828	217.03	484	126.86
<i>Cyperus tenuispica</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	18	7.08	18	14.15	0	0.00	18	2.36	18	4.72	0	0.00
<i>Dactylis glomerata</i>	14	5.50	14	11.01	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	14	1.83	14	3.67	0	0.00
<i>Dactyloctenium aegyptium</i>	200	78.63	109	85.71	91	71.56	88	34.60	39	30.67	49	38.53	0	0.00	0	0.00	0	0.00	288	37.74	148	38.79	140	36.70
<i>Dentella repens</i>	0	0.00	0	0.00	0	0.00	7	2.75	0	0.00	7	5.50	0	0.00	0	0.00	0	0.00	7	0.92	0	0.00	7	1.83
<i>Desmodium heterophyllum</i>	91	35.78	78	61.34	13	10.22	0	0.00	0	0.00	0	0.00	47	18.48	40	31.45	7	5.50	138	18.09	118	30.93	20	5.24
<i>Dichanthium annulatum</i>	661	259.89	338	265.79	323	253.99	269	105.76	146	114.81	123	96.72	0	0.00	0	0.00	0	0.00	930	121.88	484	126.86	446	116.90
<i>Dichrocephala integrifolia</i>	475	186.76	319	250.85	156	122.67	151	59.37	82	64.48	69	54.26	0	0.00	0	0.00	0	0.00	626	82.04	401	105.11	225	58.98
<i>Digitaria ciliaris</i>	2405	945.58	1479	1163.01	926	728.16	869	341.67	566	445.07	303	238.26	468	184.01	301	236.69	167	131.32	3742	490.42	2346	614.92	1396	365.91
<i>Digitaria setigera</i>	51	20.05	51	40.10	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	51	6.68	51	13.37	0	0.00
<i>Digitaria violascens</i>	143	56.22	0	0.00	143	112.45	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	143	18.74	0	0.00	143	37.48
<i>Duchesnea indica</i>	455	178.89	324	254.78	131	103.01	198	77.85	116	91.22	82	64.48	151	59.37	92	72.34	59	46.39	804	105.37	532	139.45	272	71.30
<i>Dysphania ambrosioides</i>	36	14.15	36	28.31	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	36	4.72	36	9.44	0	0.00
<i>Echinochloa colona</i>	45	17.69	0	0.00	45	35.39	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	45	5.90	0	0.00	45	11.80
<i>Echinochloa crus-galli</i>	882	346.78	576	452.94	306	240.62	345	135.65	224	176.14	121	95.15	0	0.00	0	0.00	0	0.00	1227	160.81	800	209.69	427	111.92
<i>Eclipta prostrata</i>	415	163.17	253	198.95	162	127.39	193	75.88	110	86.50	83	65.27	132	51.90	69	54.26	63	49.54	740	96.98	432	113.23	308	80.73
<i>Eleocharis acutangula</i>	0	0.00	0	0.00	0	0.00	125	49.15	71	55.83	54	42.46	0	0.00	0	0.00	0	0.00	125	16.38	71	18.61	54	14.15
<i>Eleusine indica</i>	149	58.58	117	92.00	32	25.16	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	149	19.53	117	30.67	32	8.39
<i>Eragrostis amabilis</i>	113	44.43	113	88.86	0	0.00	54	21.23	54	42.46	0	0.00	0	0.00	0	0.00	0	0.00	167	21.89	167	43.77	0	0.00
<i>Eragrostis riparia</i>	208	81.78	183	143.90	25	19.66	72	28.31	51	40.10	21	16.51	0	0.00	0	0.00	0	0.00	280	36.70	234	61.34	46	12.06
<i>Eragrostis unioloides</i>	89	34.99	39	30.67	50	39.32	0	0.00	0	0.00	0	0.00	51	20.05	22	17.30	29	22.80	140	18.35	61	15.99	79	20.71
<i>Ethulia conyzoides</i>	1176	462.37	713	560.67	463	364.08	457	179.68	309	242.98	148	116.38	263	103.40	161	126.60	102	80.21	1896	248.49	1183	310.08	713	186.89
<i>Euphorbia hirta</i>	275	108.12	175	137.61	100	78.63	83	32.63	51	40.10	32	25.16	83	32.63	51	40.10	32	25.16	441	57.80	277	72.61	164	42.99
<i>Euphorbia thymifolia</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	17	6.68	0	0.00	17	13.37	17	2.23	0	0.00	17	4.46
<i>Evolvulus nummularius</i>	697	274.04	474	372.73	223	175.36	186	73.13	118	92.79	68	53.47	0	0.00	0	0.00	0	0.00	883	115.72	592	155.17	291	76.28
<i>Fimbristylis aestivalis</i>	2509	986.47	1589	1249.51	920	723.44	1034	406.54	711	559.09	323	253.99	571	224.50	375	294.88	196	154.12	4114	539.17	2675	701.16	1439	377.19
<i>Fimbristylis dichotoma</i>	45	17.69	45	35.39	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	45	5.90	45	11.80	0	0.00
<i>Fimbristylis littoralis</i>	21	8.26	21	16.51	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	21	2.75	21	5.50	0	0.00
<i>Glinus lotoides</i>	498	195.80	260	204.45	238	187.15	145	57.01	56	44.04	89	69.99	0	0.00	0	0.00	0	0.00	643	84.27	316	82.83	327	85.71
<i>Glinus oppositifolius</i>	254	99.87	167	131.32	87	68.41	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	254	33.29	167	43.77	87	22.80
<i>Gnaphalium pensylvanicum</i>	305	119.92	162	127.39	143	112.45	88	34.60	55	43.25	33	25.95	0	0.00	0	0.00	0	0.00	393	51.51	217	56.88	176	46.13
<i>Grangea maderaspatana</i>	1936	761.19	1052	827.24	884	695.13	730	287.02	416	327.12	314	246.91	402	158.06	217	170.64	185	145.47	3068	402.09	1685	441.67	1383	362.51
<i>Heliotropium indicum</i>	408	160.42	255	200.52	153	120.31	168	66.05	107	84.14	61	47.97	149	58.58	90	70.77	59	46.39	725	95.02	452	118.48	273	71.56
<i>Heliotropium strigosum</i>	19	7.47	19	14.94	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	19	2.49	19	4.98	0	0.00
<i>Hemarthra compressa</i>	2826	1111.11	1774	1394.98	1052	827.24	1233	484.78	808	635.37	425	334.20	687	270.11	424	333.41	263	206.81	4746	622.00	3006	787.92	1740	456.08
<i>Hydrocotyle sibthorpioides</i>	56	22.02	22	17.30	34	26.74	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	56	7.34	22	5.77	34	8.91
<i>Hyptis suaveolens</i>	726	285.44	378	297.24	348	273.65	266	104.58	147	115.59	119	93.58	178	69.99	102	80.21	76	59.76	1170	153.34	627	164.35	543	14

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
Lindernia crustacea	3413	1341.90	2110	1659.20	1303	1024.61	1357	533.54	894	703.00	463	364.08	797	313.36	503	395.53	294	231.19	5567	729.60	3507	919.24	2060	539.96
Lindernia ruellioides	157	61.73	157	123.46	0	0.00	87	34.21	87	68.41	0	0.00	0	0.00	0	0.00	0	0.00	244	31.98	244	63.96	0	0.00
Ludwigia adscendens	79	31.06	50	39.32	29	22.80	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	79	10.35	50	13.11	29	7.60
Ludwigia octovalvis	107	42.07	107	84.14	0	0.00	65	25.56	65	51.11	0	0.00	0	0.00	0	0.00	0	0.00	172	22.54	172	45.08	0	0.00
Mazus pumilus	1232	484.39	677	532.36	555	436.42	280	110.09	157	123.46	123	96.72	175	68.81	85	66.84	90	70.77	1687	221.10	919	240.88	768	201.31
Mecardonia procumbens	1093	429.74	890	699.85	203	159.63	283	111.27	216	169.85	67	52.69	168	66.05	127	99.87	41	32.24	1544	202.35	1233	323.19	311	81.52
Melilotus albus	19	7.47	19	14.94	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	19	2.49	19	4.98	0	0.00
Nelsonia canescens	22	8.65	0	0.00	22	17.30	26	10.22	0	0.00	26	20.45	0	0.00	0	0.00	0	0.00	48	6.29	0	0.00	48	12.58
Oldenlandia tenelliflora	0	0.00	0	0.00	0	0.00	12	4.72	0	0.00	12	9.44	0	0.00	0	0.00	0	0.00	12	1.57	0	0.00	12	3.15
Onychium japonicum	33	12.97	0	0.00	33	25.95	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	33	4.32	0	0.00	33	8.65
Oxalis corniculata	2788	1096.17	1729	1359.60	1059	832.74	1064	418.34	710	558.31	354	278.37	585	230.01	359	282.30	226	177.71	4437	581.51	2798	733.40	1639	429.61
Oxalis debilis	0	0.00	0	0.00	0	0.00	36	14.15	36	28.31	0	0.00	38	14.94	38	29.88	0	0.00	74	9.70	74	19.40	0	0.00
Oxalis latifolia	5	1.97	0	0.00	5	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.66	0	0.00	5	1.31
Panicum brevifolium	52	20.45	0	0.00	52	40.89	27	10.62	0	0.00	27	21.23	0	0.00	0	0.00	0	0.00	79	10.35	0	0.00	79	20.71
Panicum notatum	514	202.09	288	226.47	226	177.71	160	62.91	85	66.84	75	58.98	0	0.00	0	0.00	0	0.00	674	88.33	373	97.77	301	78.90
Paspalidium flavidum	147	57.80	65	51.11	82	64.48	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	147	19.27	65	17.04	82	21.49
Paspalum conjugatum	2364	929.46	1542	1212.55	822	646.38	833	327.51	567	445.86	266	209.17	425	167.10	281	220.96	144	113.23	3622	474.69	2390	626.46	1232	322.93
Paspalum dilatatum	263	103.40	175	137.61	88	69.20	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	263	34.47	175	45.87	88	23.07
Peperomia pellucida	1903	748.21	1271	999.45	632	496.97	463	182.04	317	249.27	146	114.81	256	100.65	164	128.96	92	72.34	2622	343.63	1752	459.23	870	228.04
Persicaria barbata	28	11.01	17	13.37	11	8.65	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	28	3.67	17	4.46	11	2.88
Persicaria hydropiper	198	77.85	128	100.65	70	55.04	123	48.36	65	51.11	58	45.61	108	42.46	58	45.61	50	39.32	429	56.22	251	65.79	178	46.66
Persicaria orientalis	18	7.08	18	14.15	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	18	2.36	18	4.72	0	0.00
Phyllanthus niruri	2874	1129.98	1772	1393.41	1102	866.56	947	372.34	622	489.11	325	255.56	605	237.87	366	287.80	239	187.94	4426	580.06	2760	723.44	1666	436.69
Physalis minima	60	23.59	60	47.18	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	60	7.86	60	15.73	0	0.00
Poa annua	0	0.00	0	0.00	0	0.00	56	22.02	30	23.59	26	20.45	43	16.91	27	21.23	16	12.58	99	12.97	57	14.94	42	11.01
Polycarpon prostratum	1127	443.11	829	651.88	298	234.33	283	111.27	188	147.83	95	74.70	241	94.76	149	117.17	92	72.34	1651	216.38	1166	305.63	485	127.13
Polygala arvensis	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	1.97	0	0.00	5	3.93	5	0.66	0	0.00	5	1.31
Polygonum plebeium	3085	1212.94	1905	1497.99	1180	927.89	1049	412.44	684	537.86	365	287.02	614	241.41	380	298.81	234	184.01	4748	622.26	2969	778.22	1779	466.30
Portulaca oleracea	0	0.00	0	0.00	0	0.00	7	2.75	0	0.00	7	5.50	0	0.00	0	0.00	0	0.00	7	0.92	0	0.00	7	1.83
Pouzolzia zeylanica	763	299.99	599	471.02	164	128.96	308	121.10	199	156.48	109	85.71	248	97.51	165	129.75	83	65.27	1319	172.87	963	252.42	356	93.31
Pycneus pumilus	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	22	8.65	22	17.30	0	0.00	22	2.88	22	5.77	0	0.00
Ranunculus sceleratus	41	16.12	15	11.80	26	20.45	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	41	5.37	15	3.93	26	6.82
Rorippa indica	1607	631.83	1035	813.87	572	449.79	599	235.51	403	316.90	196	154.12	336	132.11	199	156.48	137	107.73	2542	333.15	1637	429.08	905	237.22
Rungia pectinata	99	38.92	38	29.88	61	47.97	56	22.02	24	18.87	32	25.16	55	21.62	33	25.95	22	17.30	210	27.52	95	24.90	115	30.14
Rungia repens	176	69.20	107	84.14	69	54.26	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	176	23.07	107	28.05	69	18.09
Setaria pumila	1180	463.95	745	585.83	435	342.06	569	223.72	377	296.45	192	150.98	315	123.85	200	157.27	115	90.43	2064	270.50	1322	346.52	742	194.49
Setaria viridis	78	30.67	78	61.34	0	0.00	48	18.87	48	37.74	0	0.00	0	0.00	0	0.00	0	0.00	126	16.51	126	33.03	0	0.00
Sida acuta	17	6.68	17	13.37	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	17	2.23	17	4.46	0	0.00
Solanum americanum	216	84.93	126	99.08	90	70.77	156	61.34	83	65.27	73	57.40	126	49.54	67	52.69	59	46.39	498	65.27	276	72.34	222	58.19
Solanum viarum	172	67.63	98	77.06	74	58.19	111	43.64	66	51.90	45	35.39	0	0.00	0	0.00	0	0.00	283	37.09	164	42.99	119	31.19
Sporobolus diandrus	136	53.47	116	91.22	20	15.73	62	24.38	51	40.10	11	8.65	0	0.00	0	0.00	0	0.00	198	25.95	167	43.77	31	8.13
Stellaria media	381	149.80	222	174.57	159	125.03	215	84.53	124	97.51	91	71.56	0	0.00	0	0.00	0	0.00	596	78.11	346	90.69	250	65.53
Synedrella nodiflora	44	17.30	30	23.59	14	11.01	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	44	5.77	30	7.86	14	3.67
Thespis divaricata	264	103.80	155	121.88	109	85.71	114	44.82	60	47.18	54	42.46	0	0.00	0	0.00	0	0.00	378	49.54	215	56.36	163	42.72
Tridax procumbens	0	0.00	0	0.00	0	0.00	5	1.97	5	3.93	0	0.00	0	0.00	0	0.00	0	0.00	5	0.66	5	1.31	0	0.00
Urochloa panicoides	20	7.86	20	15.73	0	0.00	11	4.32	11	8.65	0	0.00	10	3.93	10	7.86	0	0.00	41	5.37	41	10.75	0	0.00
Vicia sativa	12	4.72	12	9.44	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	12	1.57	12	3.15	0	0.00
Xanthium strumarium	148	58.19	80	62.91	68	53.47	83	32.63	44	34.60	39	30.67	0	0.00										

Plant species	Soil layers																Total							
	Upper layer (0-5)						Middle layer (5-10)				Lower layer (10-15)													
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
UI 7	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	11	4.32	11	8.65	0	0.00	11	1.44	11	2.88	0	0.00
UI 11	29	11.40	29	22.80	0	0.00	25	9.83	25	19.66	0	0.00	0	0.00	0	0.00	0	0.00	54	7.08	54	14.15	0	0.00
UI 12	0	0.00	0	0.00	0	0.00	10	3.93	0	0.00	10	7.86	0	0.00	0	0.00	0	0.00	10	1.31	0	0.00	10	2.62
UI 16	3	1.18	0	0.00	3	2.36	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.39	0	0.00	3	0.79
UI 17	153	60.16	114	89.64	39	30.67	0	0.00	0	0.00	0	0.00	76	29.88	50	39.32	26	20.45	229	30.01	164	42.99	65	17.04
UI 20	0	0.00	0	0.00	0	0.00	5	1.97	5	3.93	0	0.00	0	0.00	0	0.00	0	0.00	5	0.66	5	1.31	0	0.00
UI 22	0	0.00	0	0.00	0	0.00	7	2.75	7	5.50	0	0.00	0	0.00	0	0.00	0	0.00	7	0.92	7	1.83	0	0.00
UI 27	0	0.00	0	0.00	0	0.00	12	4.72	12	9.44	0	0.00	0	0.00	0	0.00	0	0.00	12	1.57	12	3.15	0	0.00
UI 29	147	57.80	56	44.04	91	71.56	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	147	19.27	56	14.68	91	23.85
UI (premature mortality)	4382	1722.89	2958	2326.02	1424	1119.76	1555	611.39	1135	892.51	420	330.27	427	167.89	308	242.20	119	93.58	6364	834.05	4401	1153.57	1963	514.53

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.28. Overall and seasonal plant species total seed abundances recorded from different soil layers of short riverine alluvial grasslands soil seed bank given natural treatment during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Acmella uliginosa</i>	79.67	44.67	35.00	41.67	20.00	21.67	0.00	0.00	0.00	121.33	64.67	56.67
<i>Acroceras munroanum</i>	10.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	10.00
<i>Adiantum caudatum</i>	63.67	40.67	23.00	31.00	17.00	14.00	0.00	0.00	0.00	94.67	57.67	37.00
<i>Adiantum philippense</i>	8.67	8.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.67	8.67	0.00
<i>Ageratum conyzoides</i>	188.00	107.67	80.33	89.67	51.33	38.33	48.33	29.67	18.67	326.00	188.67	137.33
<i>Alternanthera philoxeroides</i>	29.33	29.33	0.00	0.00	0.00	0.00	14.33	14.33	0.00	43.67	43.67	0.00
<i>Alternanthera pungens</i>	260.00	152.67	107.33	89.67	45.33	44.33	0.00	0.00	0.00	349.67	198.00	151.67
<i>Alternanthera sessilis</i>	852.33	550.67	301.67	288.33	189.00	99.33	183.67	114.00	69.67	1324.33	853.67	470.67
<i>Amaranthus viridis</i>	112.00	68.67	43.33	48.33	29.67	18.67	0.00	0.00	0.00	160.33	98.33	62.00
<i>Ampelopteris prolifera</i>	50.33	50.33	0.00	22.67	22.67	0.00	0.00	0.00	0.00	73.00	73.00	0.00
<i>Anagallis arvensis</i>	2.33	0.00	2.33	0.00	0.00	0.00	0.00	0.00	0.00	2.33	0.00	2.33
<i>Artemisia carvifolia</i>	18.67	18.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.67	18.67	0.00
<i>Axonopus compressus</i>	463.33	311.33	152.00	185.33	136.00	49.33	88.67	60.33	28.33	737.33	507.67	229.67
<i>Bacopa monnieri</i>	3.33	0.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	3.33	0.00	3.33
<i>Brachiaria distachya</i>	147.00	147.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	147.00	147.00	0.00
<i>Brachiaria reptans</i>	47.67	47.67	0.00	18.33	18.33	0.00	0.00	0.00	0.00	66.00	66.00	0.00
<i>Carex vesicaria</i>	110.67	61.67	49.00	48.67	28.00	20.67	34.33	21.67	12.67	193.67	111.33	82.33
<i>Cenchrus ciliaris</i>	134.67	79.33	55.33	61.33	40.67	20.67	31.33	21.33	10.00	227.33	141.33	86.00
<i>Centella asiatica</i>	123.33	79.67	43.67	61.67	33.67	28.00	47.67	31.33	16.33	232.67	144.67	88.00
<i>Centipeda minima</i>	419.00	224.67	194.33	111.67	83.33	28.33	56.67	34.33	22.33	587.33	342.33	245.00
<i>Chenopodium album</i>	8.00	6.33	1.67	0.00	0.00	0.00	0.00	0.00	0.00	8.00	6.33	1.67
<i>Christella parasitica</i>	113.33	80.67	32.67	53.00	31.00	22.00	32.67	16.67	16.00	199.00	128.33	70.67
<i>Chrysopogon aciculatus</i>	188.33	119.67	68.67	79.67	51.33	28.33	41.67	26.33	15.33	309.67	197.33	112.33
<i>Commelina benghalensis</i>	44.67	28.00	16.67	21.33	9.67	11.67	0.00	0.00	0.00	66.00	37.67	28.33
<i>Commelina diffusa</i>	5.00	0.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	0.00	5.00
<i>Cotula hemisphaerica</i>	408.67	272.00	136.67	110.00	64.33	45.67	0.00	0.00	0.00	518.67	336.33	182.33
<i>Cynodon dactylon</i>	2501.33	1514.33	987.00	1026.67	739.00	287.67	427.33	273.00	154.33	3955.33	2526.33	1429.00
<i>Cyperus compressus</i>	183.67	118.00	65.67	74.67	46.67	28.00	47.33	28.67	18.67	305.67	193.33	112.33
<i>Cyperus cyperoides</i>	23.00	19.33	3.67	10.00	7.33	2.67	0.00	0.00	0.00	33.00	26.67	6.33
<i>Cyperus difformis</i>	40.33	13.67	26.67	0.00	0.00	0.00	0.00	0.00	0.00	40.33	13.67	26.67
<i>Cyperus distans</i>	43.00	20.67	22.33	21.67	7.67	14.00	0.00	0.00	0.00	64.67	28.33	36.33

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Cyperus eragrostis</i>	215.67	155.00	60.67	89.33	60.33	29.00	61.67	43.00	18.67	366.67	258.33	108.33
<i>Cyperus imbricatus</i>	48.00	25.67	22.33	31.67	12.67	19.00	0.00	0.00	0.00	79.67	38.33	41.33
<i>Cyperus iria</i>	75.00	49.33	25.67	45.00	24.00	21.00	0.00	0.00	0.00	120.00	73.33	46.67
<i>Cyperus rotundus</i>	175.67	175.67	0.00	0.00	0.00	0.00	49.33	49.33	0.00	225.00	225.00	0.00
<i>Cyperus squarrosus</i>	263.33	172.67	90.67	103.33	59.00	44.33	70.67	44.33	26.33	437.33	276.00	161.33
<i>Cyperus tenuispica</i>	0.00	0.00	0.00	0.00	0.00	0.00	6.00	6.00	0.00	6.00	6.00	0.00
<i>Dactylis glomerata</i>	4.67	4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67	4.67	0.00
<i>Dactyloctenium aegyptium</i>	66.67	36.33	30.33	29.33	13.00	16.33	0.00	0.00	0.00	96.00	49.33	46.67
<i>Dentella repens</i>	0.00	0.00	0.00	2.33	0.00	2.33	0.00	0.00	0.00	2.33	0.00	2.33
<i>Desmodium heterophyllum</i>	30.33	26.00	4.33	0.00	0.00	0.00	15.67	13.33	2.33	46.00	39.33	6.67
<i>Dichanthium annulatum</i>	220.33	112.67	107.67	89.67	48.67	41.00	0.00	0.00	0.00	310.00	161.33	148.67
<i>Dichrocephala integrifolia</i>	158.33	106.33	52.00	50.33	27.33	23.00	0.00	0.00	0.00	208.67	133.67	75.00
<i>Digitaria ciliaris</i>	801.67	493.00	308.67	289.67	188.67	101.00	156.00	100.33	55.67	1247.33	782.00	465.33
<i>Digitaria setigera</i>	17.00	17.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.00	17.00	0.00
<i>Digitaria violascens</i>	47.67	0.00	47.67	0.00	0.00	0.00	0.00	0.00	0.00	47.67	0.00	47.67
<i>Duchesnea indica</i>	151.67	108.00	43.67	66.00	38.67	27.33	50.33	30.67	19.67	268.00	177.33	90.67
<i>Dysphania ambrosioides</i>	12.00	12.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	12.00	0.00
<i>Echinochloa colona</i>	15.00	0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	0.00	15.00
<i>Echinochloa crus-galli</i>	294.00	192.00	102.00	115.00	74.67	40.33	0.00	0.00	0.00	409.00	266.67	142.33
<i>Eclipta prostrata</i>	138.33	84.33	54.00	64.33	36.67	27.67	44.00	23.00	21.00	246.67	144.00	102.67
<i>Eleocharis acutangula</i>	0.00	0.00	0.00	41.67	23.67	18.00	0.00	0.00	0.00	41.67	23.67	18.00
<i>Eleusine indica</i>	49.67	39.00	10.67	0.00	0.00	0.00	0.00	0.00	0.00	49.67	39.00	10.67
<i>Eragrostis amabilis</i>	37.67	37.67	0.00	18.00	18.00	0.00	0.00	0.00	0.00	55.67	55.67	0.00
<i>Eragrostis riparia</i>	69.33	61.00	8.33	24.00	17.00	7.00	0.00	0.00	0.00	93.33	78.00	15.33
<i>Eragrostis unioloides</i>	29.67	13.00	16.67	0.00	0.00	0.00	17.00	7.33	9.67	46.67	20.33	26.33
<i>Ethulia conyzoides</i>	392.00	237.67	154.33	152.33	103.00	49.33	87.67	53.67	34.00	632.00	394.33	237.67
<i>Euphorbia hirta</i>	91.67	58.33	33.33	27.67	17.00	10.67	17.00	10.67	10.67	147.00	92.33	54.67
<i>Euphorbia thymifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	5.67	0.00	5.67	5.67	0.00	5.67
<i>Evolvulus nummularius</i>	232.33	158.00	74.33	62.00	39.33	22.67	0.00	0.00	0.00	294.33	197.33	97.00
<i>Fimbristylis aestivalis</i>	836.33	529.67	306.67	344.67	237.00	107.67	190.33	125.00	65.33	1371.33	891.67	479.67
<i>Fimbristylis dichotoma</i>	15.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	15.00	0.00
<i>Fimbristylis littoralis</i>	7.00	7.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00	7.00	0.00
<i>Glinus lotoides</i>	166.00	86.67	79.33	48.33	18.67	29.67	0.00	0.00	0.00	214.33	105.33	109.00
<i>Glinus oppositifolius</i>	84.67	55.67	29.00	0.00	0.00	0.00	0.00	0.00	0.00	84.67	55.67	29.00
<i>Gnaphalium pensylvanicum</i>	101.67	54.00	47.67	29.33	18.33	11.00	0.00	0.00	0.00	131.00	72.33	58.67
<i>Grangea maderaspatana</i>	645.33	350.67	294.67	243.33	138.67	104.67	134.00	72.33	61.67	1022.67	561.67	461.00
<i>Heliotropium indicum</i>	136.00	85.00	51.00	56.00	35.67	20.33	49.67	30.00	19.67	241.67	150.67	91.00
<i>Heliotropium strigosum</i>	6.33	6.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33	6.33	0.00
<i>Hemarthria compressa</i>	942.00	591.33	350.67	411.00	269.33	141.67	229.00	141.33	87.67	1582.00	1002.00	580.00
<i>Hydrocotyle sibthorpioides</i>	18.67	7.33	11.33	0.00	0.00	0.00	0.00	0.00	0.00	18.67	7.33	11.33
<i>Hyptis suaveolens</i>	242.00	126.00	116.00	88.67	49.00	39.67	59.33	34.00	25.33	390.00	209.00	181.00
<i>Isachne globosa</i>	38.67	23.33	15.33	36.33	25.00	11.33	0.00	0.00	0.00	75.00	48.33	26.67
<i>Juncus articulatus</i>	12.00	8.67	3.33	0.00	0.00	0.00	0.00	0.00	0.00	12.00	8.67	3.33
<i>Kyllinga brevifolia</i>	248.00	162.67	85.33	71.67	38.00	33.67	0.00	0.00	0.00	319.67	200.67	119.00
<i>Laphangium luteoalbum</i>	328.67	204.00	124.67	94.00	50.00	44.00	57.00	36.00	21.00	479.67	290.00	189.67
<i>Lepidagathis incurva</i>	0.00	0.00	0.00	11.33	7.33	4.00	13.67	8.33	5.33	25.00	15.67	9.33
<i>Leucas aspera</i>	23.33	13.00	10.33	0.00	0.00	0.00	0.00	0.00	0.00	23.33	13.00	10.33
<i>Lindernia crustacea</i>	1137.67	703.33	434.33	452.33	298.00	154.33	265.67	167.67	98.00	1855.67	1169.00	686.67
<i>Lindernia ruelliioides</i>	52.33	52.33	0.00	29.00	29.00	0.00	0.00	0.00	0.00	81.33	81.33	0.00
<i>Ludwigia adscendens</i>	26.33	16.67	9.67	0.00	0.00	0.00	0.00	0.00	0.00	26.33	16.67	9.67
<i>Ludwigia octovalvis</i>	35.67	35.67	0.00	21.67	21.67	0.00	0.00	0.00	0.00	57.33	57.33	0.00
<i>Mazus pumilus</i>	410.67	225.67	185.00	93.33	52.33	41.00	58.33	28.33	30.00	562.33	306.33	256.00
<i>Mecardonia procumbens</i>	364.33	296.67	67.67	94.33	72.00	22.33	56.00	42.33	13.67	514.67	411.00	103.67

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
Melilotus albus	6.33	6.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33	6.33	0.00
Nelsonia canescens	7.33	0.00	7.33	8.67	0.00	8.67	0.00	0.00	0.00	16.00	0.00	16.00
Oldenlandia tenelliflora	0.00	0.00	0.00	4.00	0.00	4.00	0.00	0.00	0.00	4.00	0.00	4.00
Onychium japonicum	11.00	0.00	11.00	0.00	0.00	0.00	0.00	0.00	0.00	11.00	0.00	11.00
Oxalis corniculata	929.33	576.33	353.00	354.67	236.67	118.00	195.00	119.67	75.33	1479.00	932.67	546.33
Oxalis debilis	0.00	0.00	0.00	12.00	12.00	0.00	12.67	12.67	0.00	24.67	24.67	0.00
Oxalis latifolia	1.67	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	1.67
Panicum brevifolium	17.33	0.00	17.33	9.00	0.00	9.00	0.00	0.00	0.00	26.33	0.00	26.33
Panicum notatum	171.33	96.00	75.33	53.33	28.33	25.00	0.00	0.00	0.00	224.67	124.33	100.33
Paspalidium flavidum	49.00	21.67	27.33	0.00	0.00	0.00	0.00	0.00	0.00	49.00	21.67	27.33
Paspalum conjugatum	788.00	514.00	274.00	277.67	189.00	88.67	141.67	93.67	48.00	1207.33	796.67	410.67
Paspalum dilatatum	87.67	58.33	29.33	0.00	0.00	0.00	0.00	0.00	0.00	87.67	58.33	29.33
Peperomia pellucida	634.33	423.67	210.67	154.33	105.67	48.67	85.33	54.67	30.67	874.00	584.00	290.00
Persicaria barbata	9.33	5.67	3.67	0.00	0.00	0.00	0.00	0.00	0.00	9.33	5.67	3.67
Persicaria hydropiper	66.00	42.67	23.33	41.00	21.67	19.33	36.00	19.33	16.67	143.00	83.67	59.33
Persicaria orientalis	6.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	6.00	0.00
Phyllanthus niruri	958.00	590.67	367.33	315.67	207.33	108.33	201.67	122.00	79.67	1475.33	920.00	555.33
Physalis minima	20.00	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	20.00	0.00
Poa annua	0.00	0.00	0.00	18.67	10.00	8.67	14.33	9.00	5.33	33.00	19.00	14.00
Polycarpon prostratum	375.67	276.33	99.33	94.33	62.67	31.67	80.33	49.67	30.67	550.33	388.67	161.67
Polygala arvensis	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	1.67	1.67	0.00	1.67
Polygonum plebeium	1028.33	635.00	393.33	349.67	228.00	121.67	204.67	126.67	78.00	1582.67	989.67	593.00
Portulaca oleracea	0.00	0.00	0.00	2.33	0.00	2.33	0.00	0.00	0.00	2.33	0.00	2.33
Pouzolzia zeylanica	254.33	199.67	54.67	102.67	66.33	36.33	82.67	55.00	27.67	439.67	321.00	118.67
Pycreus pumilus	0.00	0.00	0.00	0.00	0.00	0.00	7.33	7.33	0.00	7.33	7.33	0.00
Ranunculus sceleratus	13.67	5.00	8.67	0.00	0.00	0.00	0.00	0.00	0.00	13.67	5.00	8.67
Rorippa indica	535.67	345.00	190.67	199.67	134.33	65.33	112.00	66.33	45.67	847.33	545.67	301.67
Rungia pectinata	33.00	12.67	20.33	18.67	8.00	10.67	18.33	11.00	7.33	70.00	31.67	38.33
Rungia repens	58.67	35.67	23.00	0.00	0.00	0.00	0.00	0.00	0.00	58.67	35.67	23.00
Setaria pumila	393.33	248.33	145.00	189.67	125.67	64.00	105.00	66.67	38.33	688.00	440.67	247.33
Setaria viridis	26.00	26.00	0.00	16.00	16.00	0.00	0.00	0.00	0.00	42.00	42.00	0.00
Sida acuta	5.67	5.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.67	5.67	0.00
Solanum americanum	72.00	42.00	30.00	52.00	27.67	24.33	42.00	22.33	19.67	166.00	92.00	74.00
Solanum viarum	57.33	32.67	24.67	37.00	22.00	15.00	0.00	0.00	0.00	94.33	54.67	39.67
Sporobolus diandrus	45.33	38.67	6.67	20.67	17.00	3.67	0.00	0.00	0.00	66.00	55.67	10.33
Stellaria media	127.00	74.00	53.00	71.67	41.33	30.33	0.00	0.00	0.00	198.67	115.33	83.33
Synedrella nodiflora	14.67	10.00	4.67	0.00	0.00	0.00	0.00	0.00	0.00	14.67	10.00	4.67
Thespis divaricata	88.00	51.67	36.33	38.00	20.00	18.00	0.00	0.00	0.00	126.00	71.67	54.33
Tridax procumbens	0.00	0.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	1.67	1.67	0.00
Urochloa panicoides	6.67	6.67	0.00	3.67	3.67	0.00	3.33	3.33	0.00	13.67	13.67	0.00
Vicia sativa	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00
Xanthium strumarium	49.33	26.67	22.67	27.67	14.67	13.00	0.00	0.00	0.00	77.00	41.33	35.67
UI 1	0.00	0.00	0.00	0.00	0.00	0.00	3.67	3.67	0.00	3.67	3.67	0.00
UI 2	6.00	0.00	6.00	6.67	0.00	6.67	0.00	0.00	0.00	12.67	0.00	12.67
UI 3	2.67	2.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67	2.67	0.00
UI 5	91.67	29.33	62.33	66.67	34.00	32.67	0.00	0.00	0.00	158.33	63.33	95.00
UI 7	0.00	0.00	0.00	0.00	0.00	0.00	3.67	3.67	0.00	3.67	3.67	0.00
UI 11	9.67	9.67	0.00	8.33	8.33	0.00	0.00	0.00	0.00	18.00	18.00	0.00
UI 12	0.00	0.00	0.00	3.33	0.00	3.33	0.00	0.00	0.00	3.33	0.00	3.33
UI 16	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
UI 17	51.00	38.00	13.00	0.00	0.00	0.00	25.33	16.67	8.67	76.33	54.67	21.67
UI 20	0.00	0.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	1.67	1.67	0.00
UI 22	0.00	0.00	0.00	2.33	2.33	0.00	0.00	0.00	0.00	2.33	2.33	0.00

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
UI 27	0.00	0.00	0.00	4.00	4.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00
UI 29	49.00	18.67	30.33	0.00	0.00	0.00	0.00	0.00	0.00	49.00	18.67	30.33
UK (premature mortality)	1460.67	986.00	474.67	518.33	378.33	140.00	142.33	102.67	39.67	2121.33	1467.00	654.33

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.29. Overall and seasonal plant species mean seed abundances recorded from different soil layers of short riverine alluvial grasslands soil seed bank given natural treatment during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Acmella uliginosa</i>	11.38±1.74	14.89±2.84	8.75±1.07	5.95±1.07	6.67±2.55	5.42±0.75	0.00	0.00	0.00	17.33±2.48	21.56±4.68	14.17±1.68
<i>Acroceras munroanum</i>	10.00±0.00	0.00	10.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00±0.00	0.00	10.00±0.00
<i>Adiantum caudatum</i>	9.10±1.83	13.56±2.19	5.75±0.76	4.43±0.90	5.67±1.76	3.50±0.78	0.00	0.00	0.00	13.52±2.30	19.22±2.12	9.25±1.42
<i>Adiantum philippense</i>	8.67±0.00	8.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.67±0.00	8.67±0.00	0.00
<i>Ageratum conyzoides</i>	23.50±2.71	26.92±4.71	20.08±2.09	11.21±1.39	12.83±2.47	9.58±1.05	6.04±0.93	7.42±1.57	4.67±0.56	40.75±4.44	47.17±7.41	34.33±3.11
<i>Alternanthera philoxeroides</i>	14.67±2.67	14.67±2.67	0.00	0.00	0.00	0.00	7.17±1.17	7.17±1.17	0.00	21.83±3.83	21.83±3.83	0.00
<i>Alternanthera pungens</i>	32.50±4.38	38.17±7.71	26.83±2.96	11.21±1.39	11.33±2.03	11.08±2.20	0.00	0.00	0.00	43.71±5.46	49.50±9.57	37.92±5.00
<i>Alternanthera sessilis</i>	106.54±13.64	137.67±8.77	75.42±12.04	36.04±5.40	47.25±6.98	24.83±1.97	22.96±2.45	28.50±1.98	17.42±1.89	165.54±21.06	213.42±17.56	117.67±15.25
<i>Amaranthus viridis</i>	14.00±1.84	17.17±2.49	10.83±1.73	6.04±0.92	7.42±1.48	4.67±0.72	0.00	0.00	0.00	20.04±2.67	24.58±3.93	15.50±2.04
<i>Ampelopteris prolifera</i>	12.58±2.16	12.58±2.16	0.00	5.67±1.57	5.67±1.57	0.00	0.00	0.00	0.00	18.25±3.64	18.25±3.64	0.00
<i>Anagallis arvensis</i>	2.33±0.00	0.00	2.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00
<i>Artemisia carvifolia</i>	9.33±4.67	9.33±4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.33±4.67	9.33±4.67	0.00
<i>Axonopus compressus</i>	57.92±10.24	77.83±14.01	38.00±5.35	23.17±4.88	34.00±5.67	12.33±0.87	11.08±1.93	15.08±2.52	7.08±0.58	92.17±16.60	126.92±21.09	57.42±5.95
<i>Bacopa monnieri</i>	3.33±0.00	0.00	3.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00
<i>Brachiaria distachya</i>	73.50±11.83	73.50±11.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	73.50±11.83	73.50±11.83	0.00
<i>Brachiaria reptans</i>	47.67±0.00	47.67±0.00	0.00	18.33±0.00	18.33±0.00	0.00	0.00	0.00	0.00	66.00±0.00	66.00±0.00	0.00
<i>Carex vesicaria</i>	13.83±1.36	15.42±2.15	12.25±1.55	6.08±0.74	7.00±1.08	5.17±0.92	4.29±0.64	5.42±0.97	3.17±0.40	24.21±2.59	27.83±4.12	20.58±2.38
<i>Cenchrus ciliaris</i>	16.83±1.69	19.83±2.17	13.83±1.65	7.67±1.60	10.17±2.47	5.17±1.29	3.92±0.81	5.33±1.13	2.50±0.65	28.42±3.30	35.33±3.37	21.50±2.74
<i>Centella asiatica</i>	17.62±3.23	26.56±1.64	10.92±0.48	8.81±1.17	11.22±1.09	7.00±1.28	6.81±1.41	10.44±0.87	4.08±0.89	33.24±5.39	48.22±1.49	22.00±1.52
<i>Centipeda minima</i>	69.83±3.72	74.89±3.74	64.78±5.46	18.61±4.53	27.78±3.56	9.44±2.45	9.44±1.10	11.44±1.28	7.44±0.68	97.89±7.92	114.11±5.81	81.67±4.11
<i>Chenopodium album</i>	2.67±0.51	3.17±0.17	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67±0.51	3.17±0.17	1.67±0.00
<i>Christella parasitica</i>	14.17±2.94	20.17±3.94	8.17±0.96	6.63±0.47	7.75±0.32	5.50±0.29	4.08±0.38	4.17±0.70	4.00±0.43	24.88±3.18	32.08±3.26	17.67±1.35
<i>Chrysopogon aciculatus</i>	23.54±3.75	29.92±2.80	17.17±5.55	9.96±1.97	12.83±3.18	7.08±1.58	5.21±0.98	6.58±1.61	3.83±0.80	38.71±6.09	49.33±6.17	28.08±7.71
<i>Commelina benghalensis</i>	8.93±2.61	14.00±2.33	5.56±2.56	4.27±0.88	4.83±1.17	3.89±1.39	0.00	0.00	0.00	13.20±3.34	18.83±3.50	9.44±3.95
<i>Commelina diffusa</i>	5.00±0.00	0.00	5.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00±0.00	0.00	5.00±0.00
<i>Cotula hemisphaerica</i>	51.08±7.90	68.00±9.35	34.17±3.57	13.75±1.13	16.08±1.42	11.42±0.58	0.00	0.00	0.00	64.83±8.75	84.08±9.70	45.58±4.04
<i>Cynodon dactylon</i>	312.67±26.10	378.58±12.25	246.75±11.53	128.33±24.33	184.75±24.92	71.92±4.53	53.42±6.10	68.25±4.07	38.58±3.20	494.42±55.84	631.58±40.66	357.25±18.90
<i>Cyperus compressus</i>	45.92±10.38	59.00±16.67	32.83±5.17	18.67±3.52	23.33±4.67	14.00±3.00	11.83±1.55	14.33±1.33	9.33±0.33	76.42±14.95	96.67±22.67	56.17±2.50
<i>Cyperus cyperoides</i>	7.67±3.20	9.67±4.33	3.67±0.00	3.33±0.38	3.67±0.33	2.67±0.00	0.00	0.00	0.00	11.00±3.56	13.33±4.67	6.33±0.00
<i>Cyperus difformis</i>	13.44±0.22	13.67±0.00	13.33±0.33	0.00	0.00	0.00	0.00	0.00	0.00	13.44±0.22	13.67±0.00	13.33±0.33
<i>Cyperus distans</i>	7.17±1.09	10.33±1.33	5.58±0.39	3.61±0.61	3.83±0.83	3.50±0.89	0.00	0.00	0.00	10.78±1.44	14.17±2.17	9.08±1.25
<i>Cyperus eragrostis</i>	30.81±4.45	38.75±3.72	20.22±3.61	12.76±2.38	15.08±3.78	9.67±1.58	8.81±1.74	10.75±2.68	6.22±0.99	52.38±7.58	64.58±8.46	36.11±5.25
<i>Cyperus imbricatus</i>	9.60±2.13	12.83±2.17	7.44±2.78	6.33±1.10	6.33±3.00	6.33±1.00	0.00	0.00	0.00	15.93±2.79	19.17±5.17	13.78±3.35
<i>Cyperus iria</i>	9.38±1.43	12.33±1.75	6.42±0.77	5.63±0.64	6.00±1.03	5.25±0.88	0.00	0.00	0.00	15.00±1.91	18.33±2.62	11.67±1.64
<i>Cyperus rotundus</i>	43.92±2.48	43.92±2.48	0.00	0.00	0.00	0.00	12.33±1.34	12.33±1.34	0.00	56.25±3.35	56.25±3.35	0.00
<i>Cyperus squarrosus</i>	32.92±4.82	43.17±3.29	22.67±5.25	12.92±1.67	14.75±3.09	11.08±1.08	8.83±1.10	11.08±1.18	6.58±0.96	54.67±7.21	69.00±7.37	40.33±7.18
<i>Cyperus tenuispica</i>	0.00	0.00	0.00	0.00	0.00	0.00	6.00±0.00	6.00±0.00	0.00	6.00±0.00	6.00±0.00	0.00
<i>Dactylis glomerata</i>	4.67±0.00	4.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67±0.00	4.67±0.00	0.00
<i>Dactyloctenium aegyptium</i>	9.52±1.72	12.11±3.29	7.58±1.44	4.19±0.82	4.33±0.96	4.08±1.36	0.00	0.00	0.00	13.71±2.20	16.44±3.51	11.67±2.74

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Dentella repens</i>	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00
<i>Desmodium heterophyllum</i>	10.11±2.91	13.00±0.67	4.33±0.00	0.00	0.00	0.00	5.22±1.49	6.67±0.67	2.33±0.00	15.33±4.33	19.67±0.00	6.67±0.00
<i>Dichanthium annulatum</i>	27.54±3.28	28.17±7.00	26.92±1.07	11.21±1.54	12.17±3.10	10.25±0.90	0.00	0.00	0.00	38.75±4.14	40.33±8.72	37.17±1.51
<i>Dichrocephala integrifolia</i>	22.62±4.70	35.44±2.73	13.00±1.25	7.19±1.60	9.11±2.96	5.75±1.71	0.00	0.00	0.00	29.81±5.27	44.56±0.78	18.75±1.38
<i>Digitaria ciliaris</i>	100.21±9.92	123.25±5.12	77.17±8.87	36.21±4.64	47.17±3.59	25.25±2.71	19.50±2.27	25.08±1.38	13.92±1.20	155.92±16.17	195.50±7.20	116.33±11.12
<i>Digitaria setigera</i>	17.00±0.00	17.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.00±0.00	17.00±0.00	0.00
<i>Digitaria violascens</i>	23.83±0.17	0.00	23.83±0.17	0.00	0.00	0.00	0.00	0.00	0.00	23.83±0.17	0.00	23.83±0.17
<i>Duchesnea indica</i>	18.96±3.18	27.00±1.81	10.92±0.83	8.25±1.35	9.67±2.44	6.83±1.10	6.29±0.96	7.67±1.63	4.92±0.60	33.50±4.80	44.33±4.85	22.67±2.38
<i>Dysphania ambrosioides</i>	6.00±0.67	6.00±0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00±0.67	6.00±0.67	0.00
<i>Echinochloa colona</i>	15.00±0.00	0.00	15.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00±0.00	0.00	15.00±0.00
<i>Echinochloa crus-galli</i>	36.75±5.80	48.00±8.37	25.50±1.65	14.38±3.48	18.67±6.47	10.08±1.49	0.00	0.00	0.00	51.13±8.37	66.67±12.82	35.58±1.21
<i>Eclipta prostrata</i>	17.29±2.42	21.08±2.91	13.50±3.05	8.04±0.82	9.17±0.96	6.92±1.18	5.50±0.33	5.75±0.50	5.25±0.48	30.83±2.83	36.00±3.59	25.67±2.59
<i>Eleocharis acutangula</i>	0.00	0.00	0.00	5.21±0.48	5.92±0.69	4.50±0.50	0.00	0.00	0.00	5.21±0.48	5.92±0.69	4.50±0.50
<i>Eleusine indica</i>	12.42±4.12	19.50±1.17	5.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.42±4.12	19.50±1.17	5.33±0.00
<i>Eragrostis amabilis</i>	18.83±1.83	18.83±1.83	0.00	9.00±3.00	9.00±3.00	0.00	0.00	0.00	0.00	27.83±4.83	27.83±4.83	0.00
<i>Eragrostis riparia</i>	23.11±9.56	30.50±10.50	8.33±0.00	8.00±0.69	8.50±0.83	7.00±0.00	0.00	0.00	0.00	31.11±9.66	39.00±9.67	15.33±0.00
<i>Eragrostis unioloides</i>	9.89±1.94	13.00±0.00	8.33±2.00	0.00	0.00	0.00	5.67±1.07	7.33±0.00	4.83±1.17	15.56±3.01	20.33±0.00	13.17±3.17
<i>Ethulia conyzoides</i>	49.00±6.91	59.42±11.68	38.58±3.78	19.04±2.99	25.75±3.22	12.33±1.15	10.96±1.18	13.42±3.14	8.50±0.97	79.00±11.13	98.58±17.20	59.42±5.16
<i>Euphorbia hirta</i>	18.33±4.65	29.17±3.83	11.11±1.46	5.53±1.46	8.50±0.50	3.56±1.47	5.53±1.24	8.50±0.50	3.56±0.40	29.40±6.98	46.17±3.83	18.22±1.18
<i>Euphorbia thymifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	5.67±0.00	0.00	5.67±0.00	5.67±0.00	0.00	5.67±0.00
<i>Evolvulus nummularius</i>	29.04±4.85	39.50±5.02	18.58±3.42	7.75±1.39	9.83±1.69	5.67±1.80	0.00	0.00	0.00	36.79±5.80	49.33±5.89	24.25±4.20
<i>Fimbristylis aestivalis</i>	104.54±11.51	132.42±8.79	76.67±4.78	43.08±6.43	59.25±3.57	26.92±2.41	23.79±3.04	31.25±2.24	16.33±1.01	171.42±20.67	222.92±12.89	119.92±7.67
<i>Fimbristylis dichotoma</i>	15.00±0.00	15.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00±0.00	15.00±0.00	0.00
<i>Fimbristylis littoralis</i>	7.00±0.00	7.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00±0.00	7.00±0.00	0.00
<i>Glinus lotoides</i>	27.67±6.28	43.33±11.00	19.83±4.12	8.06±0.67	9.33±1.33	7.42±0.64	0.00	0.00	0.00	35.72±6.78	52.67±12.33	27.25±4.22
<i>Glinus oppositifolius</i>	21.17±4.31	27.83±1.50	14.50±4.50	0.00	0.00	0.00	0.00	0.00	0.00	21.17±4.31	27.83±1.50	14.50±4.50
<i>Gnaphalium pensylvanicum</i>	25.42±3.67	27.00±3.00	23.83±8.17	7.33±1.34	9.17±0.83	5.50±1.83	0.00	0.00	0.00	32.75±4.80	36.17±3.83	29.33±10.00
<i>Grangea maderaspatana</i>	80.67±5.89	87.67±7.96	73.67±8.11	30.42±2.51	34.67±2.99	26.17±2.92	16.75±1.39	18.08±2.09	15.42±1.85	127.83±9.01	140.42±11.14	115.25±12.22
<i>Heliotropium indicum</i>	17.00±2.03	21.25±2.36	12.75±1.26	7.00±1.03	8.92±1.24	5.08±0.98	6.21±0.64	7.50±0.87	4.92±0.25	30.21±3.39	37.67±4.03	22.75±0.57
<i>Heliotropium strigosum</i>	6.33±0.00	6.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33±0.00	6.33±0.00	0.00
<i>Hemarthria compressa</i>	117.75±13.28	147.83±10.49	87.67±10.46	51.38±6.49	67.33±3.84	35.42±3.48	28.63±3.04	35.33±3.38	21.92±1.29	197.75±22.31	250.50±16.22	145.00±14.33
<i>Hydrocotyle sibthorpioides</i>	6.22±0.95	7.33±0.00	5.67±1.33	0.00	0.00	0.00	0.00	0.00	0.00	6.22±0.95	7.33±0.00	5.67±1.33
<i>Hyptis suaveolens</i>	34.57±4.06	42.00±5.20	29.00±4.49	12.67±1.66	16.33±2.59	9.92±0.67	8.48±1.20	11.33±0.96	6.33±0.99	55.71±6.59	69.67±8.18	45.25±5.76
<i>Isachne globosa</i>	7.73±2.41	11.67±5.67	5.11±0.22	7.27±2.59	12.50±4.50	3.78±0.59	0.00	0.00	0.00	15.00±4.94	24.17±10.17	8.89±0.59
<i>Juncus articulatus</i>	4.00±0.67	4.33±1.00	3.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00±0.67	4.33±1.00	3.33±0.00
<i>Kyllinga brevifolia</i>	31.00±5.10	40.67±7.39	21.33±2.09	8.96±1.15	9.50±1.90	8.42±1.54	0.00	0.00	0.00	39.96±5.50	50.17±7.79	29.75±3.35
<i>Laphangium luteoalbum</i>	41.08±4.77	51.00±3.88	31.17±5.06	11.75±0.85	12.50±1.29	11.00±1.17	7.13±1.07	9.00±1.64	5.25±0.55	59.96±5.71	72.50±4.18	47.42±5.48
<i>Lepidagathis incurva</i>	0.00	0.00	0.00	5.67±1.67	7.33±0.00	4.00±0.00	6.83±1.50	8.33±0.00	5.33±0.00	12.50±3.17	15.67±0.00	9.33±0.00
<i>Leucas aspera</i>	4.67±0.78	6.50±0.50	3.44±0.29	0.00	0.00	0.00	0.00	0.00	0.00	4.67±0.78	6.50±0.50	3.44±0.29
<i>Lindernia crustacea</i>	142.21±13.31	175.83±5.76	108.58±6.34	56.54±7.51	74.50±5.22	38.58±4.61	33.21±3.79	41.92±3.68	24.50±1.72	231.96±24.27	292.25±13.27	171.67±12.19
<i>Lindernia ruelliioides</i>	26.17±1.17	26.17±1.17	0.00	14.50±1.17	14.50±1.17	0.00	0.00	0.00	0.00	40.67±2.33	40.67±2.33	0.00
<i>Ludwigia adscendens</i>	6.58±1.02	8.33±0.33	4.83±0.17	0.00	0.00	0.00	0.00	0.00	0.00	6.58±1.02	8.33±0.33	4.83±0.17
<i>Ludwigia octovalvis</i>	17.83±5.17	17.83±5.17	0.00	10.83±2.17	10.83±2.17	0.00	0.00	0.00	0.00	28.67±7.33	28.67±7.33	0.00
<i>Mazus pumilus</i>	58.67±6.98	75.22±9.62	46.25±2.14	13.33±2.35	17.44±4.59	10.25±1.17	8.33±0.73	9.44±1.31	7.50±0.70	80.33±9.44	102.11±14.11	64.00±2.13
<i>Mecardonia procumbens</i>	60.72±12.52	74.17±14.46	33.83±3.17	15.72±2.95	18.00±3.80	11.17±3.50	9.33±1.34	10.58±1.64	6.83±1.17	85.78±16.28	102.75±19.09	51.83±7.83
<i>Melilotus albus</i>	3.17±1.50	3.17±1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.17±1.50	3.17±1.50	0.00
<i>Nelsonia canescens</i>	3.67±0.67	0.00	3.67±0.67	4.33±0.33	0.00	4.33±0.33	0.00	0.00	0.00	8.00±1.00	0.00	8.00±1.00
<i>Oldenlandia tenelliflora</i>	0.00	0.00	0.00	4.00±0.00	0.00	4.00±0.00	0.00	0.00	0.00	4.00±0.00	0.00	4.00±0.00
<i>Onychium japonicum</i>	11.00±0.00	0.00	11.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.00±0.00	0.00	11.00±0.00
<i>Oxalis corniculata</i>	116.17±11.41	144.08±8.22	88.25±4.57	44.33±6.68	59.17±6.65	29.50±4.15	24.38±2.29	29.92±1.54	18.83±1.27	184.88±20.06	233.17±15.09	136.58±9.76
<i>Oxalis debilis</i>	0.00	0.00	0.00	6.00±1.67	6.00±1.67	0.00	6.33±0.00	6.33±0.00	0.00	12.33±1.67	12.33±1.67	0.00
<i>Oxalis latifolia</i>	1.67±0.00	0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00
<i>Panicum brevifolium</i>	17.33±0.00	0.00	17.33±0.00	9.00±0.00	0.00	9.00±0.00	0.00	0.00	0.00	26.33±0.00	0.00	26.33±0.00

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Panicum notatum</i>	28.56±6.81	48.00±10.00	18.83±2.20	8.89±1.74	14.17±0.50	6.25±0.72	0.00	0.00	0.00	37.44±8.36	62.17±9.50	25.08±2.61
<i>Paspalidium flavidum</i>	12.25±2.29	10.83±4.83	13.67±2.00	0.00	0.00	0.00	0.00	0.00	0.00	12.25±2.29	10.83±4.83	13.67±2.00
<i>Paspalum conjugatum</i>	98.50±14.39	128.50±17.40	68.50±7.95	34.71±6.36	47.25±8.76	22.17±2.70	17.71±2.78	23.42±3.54	12.00±1.38	150.92±22.33	199.17±25.88	102.67±10.24
<i>Paspalum dilatatum</i>	21.92±4.38	29.17±3.17	14.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.92±4.38	29.17±3.17	14.67±0.00
<i>Peperomia pellucida</i>	79.29±11.68	105.92±9.84	52.67±8.21	19.29±3.86	26.42±5.63	12.17±1.95	10.67±1.47	13.67±2.02	7.67±0.19	109.25±15.72	146.00±14.56	72.50±6.37
<i>Persicaria barbata</i>	3.11±0.40	2.83±0.50	3.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.11±0.40	2.83±0.50	3.67±0.00
<i>Persicaria hydropiper</i>	8.25±1.08	10.67±1.13	5.83±0.52	5.13±0.64	5.42±1.20	4.83±0.63	4.50±0.56	4.83±0.97	4.17±0.67	17.88±1.90	20.92±2.85	14.83±1.61
<i>Persicaria orientalis</i>	3.00±0.33	3.00±0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00±0.33	3.00±0.33	0.00
<i>Phyllanthus niruri</i>	119.75±12.92	147.67±12.84	91.83±9.75	39.46±6.23	51.83±8.24	27.08±3.31	25.21±2.32	30.50±2.42	19.92±0.71	184.42±20.64	230.00±20.67	138.83±13.23
<i>Physalis minima</i>	10.00±1.67	10.00±1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00±1.67	10.00±1.67	0.00
<i>Poa annua</i>	0.00	0.00	0.00	9.33±0.67	10.00±0.00	8.67±0.00	7.17±1.83	9.00±0.00	5.33±0.00	16.50±2.50	19.00±0.00	14.00±0.00
<i>Polycarpon prostratum</i>	46.96±9.66	69.08±9.85	24.83±3.42	11.79±1.97	15.67±2.81	7.92±0.52	10.04±1.37	12.42±2.18	7.67±0.49	68.79±12.80	97.17±14.66	40.42±3.52
<i>Polygala arvensis</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00	0.00	1.67±0.00	0.00
<i>Polygonum plebeium</i>	128.54±13.51	158.75±13.41	98.33±8.00	43.71±5.81	57.00±4.96	30.42±3.90	25.58±2.55	31.67±2.13	19.50±1.07	197.83±21.61	247.42±19.78	148.25±12.17
<i>Portulaca oleracea</i>	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00
<i>Pouzolzia zeylanica</i>	31.79±8.74	49.92±11.62	13.67±1.53	12.83±2.21	16.58±3.08	9.08±1.96	10.33±1.99	13.75±3.25	6.92±0.25	54.96±12.71	80.25±17.78	29.67±3.42
<i>Pycnopus pumilus</i>	0.00	0.00	0.00	0.00	0.00	0.00	7.33±0.00	7.33±0.00	0.00	7.33±0.00	7.33±0.00	0.00
<i>Ranunculus sceleratus</i>	4.56±0.44	5.00±0.00	4.33±0.67	0.00	0.00	0.00	0.00	0.00	0.00	4.56±0.44	5.00±0.00	4.33±0.67
<i>Rorippa indica</i>	66.96±8.78	86.25±8.22	47.67±6.62	24.96±3.86	33.58±4.24	16.33±1.35	14.00±1.12	16.58±0.76	11.42±0.89	105.92±13.32	136.42±12.55	75.42±7.10
<i>Rungia pectinata</i>	16.50±3.83	12.67±0.00	20.33±0.00	9.33±1.33	8.00±0.00	10.67±0.00	9.17±1.83	11.00±0.00	7.33±0.00	35.00±3.33	31.67±0.00	38.33±0.00
<i>Rungia repens</i>	14.67±3.09	17.83±5.83	11.50±1.83	0.00	0.00	0.00	0.00	0.00	0.00	14.67±3.09	17.83±5.83	11.50±1.83
<i>Setaria pumila</i>	49.17±6.50	62.08±8.59	36.25±3.48	23.71±4.26	31.42±6.37	16.00±2.09	13.13±2.26	16.67±3.60	9.58±1.59	86.00±12.81	110.17±18.16	61.83±6.80
<i>Setaria viridis</i>	26.00±0.00	26.00±0.00	0.00	16.00±0.00	16.00±0.00	0.00	0.00	0.00	0.00	42.00±0.00	42.00±0.00	0.00
<i>Sida acuta</i>	2.83±0.50	2.83±0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.83±0.50	2.83±0.50	0.00
<i>Solanum americanum</i>	9.00±1.26	10.50±1.78	7.50±1.65	6.50±0.89	6.92±1.87	6.08±0.21	5.25±0.56	5.58±1.05	4.92±0.52	20.75±2.41	23.00±4.56	18.50±1.73
<i>Solanum viarum</i>	7.17±1.06	8.17±1.51	6.17±1.51	4.63±0.46	5.50±0.35	3.75±0.58	0.00	0.00	0.00	11.79±1.34	13.67±1.78	9.92±1.69
<i>Sporobolus diandrus</i>	15.11±6.85	19.33±9.33	6.67±0.00	6.89±1.68	8.50±0.83	3.67±0.00	0.00	0.00	0.00	22.00±8.28	27.83±10.17	10.33±0.00
<i>Stellaria media</i>	18.14±3.30	24.67±4.93	13.25±2.71	10.24±2.12	13.78±4.08	7.58±1.37	0.00	0.00	0.00	28.38±5.29	38.44±8.99	20.83±3.66
<i>Synedrella nodiflora</i>	3.67±0.91	5.00±0.67	2.33±1.00	0.00	0.00	0.00	0.00	0.00	0.00	3.67±0.91	5.00±0.67	2.33±1.00
<i>Thespis divaricata</i>	17.60±4.59	25.83±5.83	12.11±4.61	7.60±2.41	10.00±5.67	6.00±2.33	0.00	0.00	0.00	25.20±6.78	35.83±11.50	18.11±6.82
<i>Tridax procumbens</i>	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Urochloa panicoides</i>	6.67±0.00	6.67±0.00	0.00	3.67±0.00	3.67±0.00	0.00	3.33±0.00	3.33±0.00	0.00	13.67±0.00	13.67±0.00	0.00
<i>Vicia sativa</i>	4.00±0.00	4.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00
<i>Xanthium strumarium</i>	7.05±0.97	8.89±1.54	5.67±0.78	3.95±0.84	4.89±1.94	3.25±0.46	0.00	0.00	0.00	11.00±1.63	13.78±2.98	8.92±1.24
UI 1	0.00	0.00	0.00	0.00	0.00	0.00	3.67±0.00	3.67±0.00	0.00	3.67±0.00	3.67±0.00	0.00
UI 2	3.00±1.33	0.00	3.00±1.33	3.33±0.33	0.00	3.33±0.33	0.00	0.00	0.00	6.33±1.67	0.00	6.33±1.67
UI 3	2.67±0.00	2.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67±0.00	2.67±0.00	0.00
UI 5	15.28±1.53	14.67±2.33	15.58±2.20	11.11±2.21	17.00±0.67	8.17±1.85	0.00	0.00	0.00	26.39±2.85	31.67±3.00	23.75±3.44
UI 7	0.00	0.00	0.00	0.00	0.00	0.00	3.67±0.00	3.67±0.00	0.00	3.67±0.00	3.67±0.00	0.00
UI 11	4.83±1.17	4.83±1.17	0.00	4.17±0.17	4.17±0.17	0.00	0.00	0.00	0.00	9.00±1.00	9.00±1.00	0.00
UI 12	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00
UI 16	1.00±0.00	0.00	1.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00
UI 17	10.20±1.73	12.67±1.39	6.50±1.17	0.00	0.00	0.00	5.07±0.91	5.56±1.46	4.33±1.00	15.27±2.32	18.22±2.35	10.83±2.17
UI 20	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
UI 22	0.00	0.00	0.00	2.33±0.00	2.33±0.00	0.00	0.00	0.00	0.00	2.33±0.00	2.33±0.00	0.00
UI 27	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00
UI 29	9.80±0.65	9.33±0.33	10.11±1.11	0.00	0.00	0.00	0.00	0.00	0.00	9.80±0.65	9.33±0.33	10.11±1.11
UK (premature mortality)	182.58±27.52	246.50±25.44	118.67±12.76	64.79±12.70	94.58±12.09	35.00±3.93	17.79±3.61	25.67±3.88	9.92±2.10	265.17±43.43	366.75±40.03	163.58±17.84

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.30. Overall and seasonal plant species seed abundances and densities (m⁻²) recorded from different soil layers of short riverine alluvial grasslands soil seed bank given flooding treatment during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Acmella uliginosa</i>	83	32.63	18	14.15	65	51.11	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	83	10.88	18	4.72	65	17.04
<i>Adiantum caudatum</i>	50	19.66	19	14.94	31	24.38	24	9.44	15	11.80	9	7.08	0	0.00	0	0.00	0	0.00	74	9.70	34	8.91	40	10.48
<i>Aeschynomene aspera</i>	55	21.62	55	43.25	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	55	7.21	55	14.42	0	0.00
<i>Ageratum conyzoides</i>	197	77.46	87	68.41	110	86.50	81	31.85	42	33.03	39	30.67	94	36.96	42	33.03	52	40.89	372	48.75	171	44.82	201	52.69
<i>Alternanthera philoxeroides</i>	58	22.80	58	45.61	0	0.00	0	0.00	0	0.00	0	0.00	27	10.62	27	21.23	0	0.00	85	11.14	85	22.28	0	0.00
<i>Alternanthera pungens</i>	295	115.99	143	112.45	152	119.53	100	39.32	52	40.89	48	37.74	0	0.00	0	0.00	0	0.00	395	51.77	195	51.11	200	52.42
<i>Alternanthera sessilis</i>	983	386.49	510	401.04	473	371.94	469	184.40	266	209.17	203	159.63	298	117.17	163	128.17	135	106.16	1750	229.35	939	246.13	811	212.58
<i>Amaranthus viridis</i>	155	60.94	78	61.34	77	60.55	58	22.80	32	25.16	26	20.45	0	0.00	0	0.00	0	0.00	213	27.92	110	28.83	103	27.00
<i>Ammannia multiflora</i>	40	15.73	40	31.45	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	40	5.24	40	10.48	0	0.00
<i>Ampelopteris prolifera</i>	79	31.06	79	62.12	0	0.00	21	8.26	21	16.51	0	0.00	0	0.00	0	0.00	0	0.00	100	13.11	100	26.21	0	0.00
<i>Arenaria serpyllifolia</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	1.97	5	3.93	0	0.00	5	0.66	5	1.31	0	0.00
<i>Artemisia carvifolia</i>	55	21.62	55	43.25	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	55	7.21	55	14.42	0	0.00
<i>Axonopus compressus</i>	524	206.02	327	257.14	197	154.91	168	66.05	103	80.99	65	51.11	157	61.73	96	75.49	61	47.97	849	111.27	526	137.87	323	84.66
<i>Azolla pinnata</i>	278	109.30	216	169.85	62	48.75	52	20.45	36	28.31	16	12.58	59	23.20	53	41.68	6	4.72	389	50.98	305	79.95	84	22.02
<i>Brachiaria reptans</i>	50	19.66	50	39.32	0	0.00	28	11.01	28	22.02	0	0.00	0	0.00	0	0.00	0	0.00	78	10.22	78	20.45	0	0.00
<i>Carex vesicaria</i>	204	80.21	109	85.71	95	74.70	92	36.17	48	37.74	44	34.60	54	21.23	28	22.02	26	20.45	350	45.87	185	48.49	165	43.25
<i>Cenchrus ciliaris</i>	164	64.48	95	74.70	69	54.26	79	31.06	46	36.17	33	25.95	58	22.80	33	25.95	25	19.66	301	39.45	174	45.61	127	33.29
<i>Centella asiatica</i>	203	79.81	105	82.57	98	77.06	82	32.24	37	29.09	45	35.39	0	0.00	0	0.00	0	0.00	285	37.35	142	37.22	143	37.48
<i>Ceratopteris thalictroides</i>	37	14.55	37	29.09	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	37	4.85	37	9.70	0	0.00
<i>Christella parasitica</i>	170	66.84	105	82.57	65	51.11	80	31.45	43	33.81	37	29.09	59	23.20	30	23.59	29	22.80	309	40.50	178	46.66	131	34.34
<i>Chrysopogon aciculatus</i>	235	92.40	143	112.45	92	72.34	101	39.71	66	51.90	35	27.52	100	39.32	53	41.68	47	36.96	436	57.14	262	68.67	174	45.61
<i>Commelina benghalensis</i>	91	35.78	50	39.32	41	32.24	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	91	11.93	50	13.11	41	10.75
<i>Cotula hemisphaerica</i>	312	122.67	147	115.59	165	129.75	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	312	40.89	147	38.53	165	43.25
<i>Cynodon dactylon</i>	2989	1175.20	1856	1459.46	1133	890.93	1261	495.79	745	585.83	516	405.76	752	295.67	419	329.48	333	261.85	5002	655.55	3020	791.59	1982	519.51
<i>Cyperus compressus</i>	227	89.25	134	105.37	93	73.13	119	46.79	72	56.62	47	36.96	100	39.32	60	47.18	40	31.45	446	58.45	266	69.72	180	47.18
<i>Cyperus cyperoides</i>	34	13.37	28	22.02	6	4.72	15	5.90	8	6.29	7	5.50	0	0.00	0	0.00	0	0.00	49	6.42	36	9.44	13	3.41
<i>Cyperus distans</i>	101	39.71	28	22.02	73	57.40	48	18.87	20	15.73	28	22.02	0	0.00	0	0.00	0	0.00	149	19.53	48	12.58	101	26.47
<i>Cyperus eragrostis</i>	371	145.87	188	147.83	183	143.90	136	53.47	79	62.12	57	44.82	128	50.33	57	44.82	71	55.83	635	83.22	324	84.93	311	81.52
<i>Cyperus imbricatus</i>	93	36.57	35	27.52	58	45.61	50	19.66	20	15.73	30	23.59	0	0.00	0	0.00	0	0.00	143	18.74	55	14.42	88	23.07
<i>Cyperus iria</i>	99	38.92	54	42.46	45	35.39	65	25.56	39	30.67	26	20.45	0	0.00	0	0.00	0	0.00	164	21.49	93	24.38	71	18.61
<i>Cyperus rotundus</i>	127	49.93	127	99.87	0	0.00	0	0.00	0	0.00	0	0.00	87	34.21	87	68.41	0	0.00	214	28.05	214	56.09	0	0.00
<i>Dactyloctenium aegyptium</i>	98	38.53	54	42.46	44	34.60	45	17.69	24	18.87	21	16.51	0	0.00	0	0.00	0	0.00	143	18.74	78	20.45	65	17.04
<i>Dichanthium annulatum</i>	261	102.62	128	100.65	133	104.58	95	37.35	52	40.89	43	33.81	0	0.00	0	0.00	0	0.00	356	46.66	180	47.18	176	46.13
<i>Digitaria ciliaris</i>	777	305.50	407	320.04	370	290.95	319	125.42	155	121.88	164	128.96	273	107.34	144	113.23	129	101.44	1369	179.42	706	185.05	663	173.78
<i>Duchesnea indica</i>	166	65.27	87	68.41	79	62.12	82	32.24	36	28.31	46	36.17	0	0.00	0	0.00	0	0.00	248	32.50	123	32.24	125	32.76
<i>Echinochloa colona</i>	25	9.83	0	0.00	25	19.66	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	25	3.28	0	0.00	25	6.55
<i>Echinochloa crus-galli</i>	391	153.73	223	175.36	168	132.11	145	57.01	67	52.69	78	61.34	0	0.00	0	0.00	0	0.00	536	70.25	290	76.01	246	64.48
<i>Eclipta prostrata</i>	162	63.69	82	64.48	80	62.91	116	45.61	67	52.69	49	38.53	103	40.50	54	42.46	49	38.53	381	49.93	203	53.21	178	46.66
<i>Eichhornia crassipes</i>	191	75.10	112	88.07	79	62.12	88	34.60	50	39.32	38	29.88	68	26.74	40	31.45	28	22.02	347	45.48	202	52.95	145	38.01
<i>Eleocharis acutangula</i>	0	0.00	0	0.00	0	0.00	100	39.32	62	48.75	38	29.88	0	0.00	0	0.00	0	0.00	100	13.11	62	16.25	38	9.96
<i>Enhydra fluctans</i>	9	3.54	9	7.08	0	0.00	8	3.15	8	6.29	0	0.00	0	0.00	0	0.00	0	0.00	17	2.23	17	4.46	0	0.00
<i>Equisetum debile</i>	188	73.92	85	66.84	103	80.99	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	188	24.64	85	22.28	103	27.00
<i>Eragrostis riparia</i>	49	19.27	33	25.95	16	12.58	37	14.55	20	15.73	17	13.37	0	0.00	0	0.00	0	0.00	86	11.27	53	13.89	33	8.65
<i>Eragrostis unioides</i>	55	21.62	16	12.58	39	30.67	0	0.00	0	0.00	0	0.00	38	14.94	15	11.80	23	18.09	93	12.19	31	8.13	62	16.25
<i>Ethulia conyzoides</i>	519	204.06	287	225.68	232	182.43	191	75.10	107	84.14	84	66.05	175	68.81	85	66.84	90	70.77	885	115.99	479	125.55	406	106.42
<i>Euphorbia hirta</i>	115	45.22	53	41.68	62	48.75	45	17.69	12	9.44	33	25.95	52	20.45	21	16.51	31	24.38	212	27.78	86	22.54	126	33.03
<i>Evolvulus nummularius</i>	149	58.58	73	57.40	76	59.76	51	20.05	28	22.02	23	18.09	0	0.00	0	0.00	0	0.00	200	26.21	101	26.47	99	25.95

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Fimbristylis aestivalis</i>	1056	415.19	602	473.38	454	357.00	445	174.96	258	202.88	187	147.05	361	141.94	210	165.13	151	118.74	1862	244.03	1070	280.46	792	207.60
<i>Fimbristylis littoralis</i>	19	7.47	19	14.94	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	19	2.49	19	4.98	0	0.00
<i>Glinus lotoides</i>	162	63.69	76	59.76	86	67.63	69	27.13	28	22.02	41	32.24	0	0.00	0	0.00	0	0.00	231	30.27	104	27.26	127	33.29
<i>Grangea maderaspatana</i>	675	265.39	328	257.92	347	272.86	318	125.03	172	135.25	146	114.81	223	87.68	95	74.70	128	100.65	1216	159.37	595	155.96	621	162.77
<i>Heliotropium indicum</i>	215	84.53	121	95.15	94	73.92	100	39.32	56	44.04	44	34.60	89	34.99	48	37.74	41	32.24	404	52.95	225	58.98	179	46.92
<i>Hemarthria compressa</i>	1171	460.41	640	503.26	531	417.55	592	232.76	338	265.79	254	199.73	479	188.33	260	204.45	219	172.21	2242	293.83	1238	324.50	1004	263.16
<i>Hyptis suaveolens</i>	246	96.72	117	92.00	129	101.44	82	32.24	36	28.31	46	36.17	88	34.60	41	32.24	47	36.96	416	54.52	194	50.85	222	58.19
<i>Isachne globosa</i>	72	28.31	33	25.95	39	30.67	39	15.33	20	15.73	19	14.94	0	0.00	0	0.00	0	0.00	111	14.55	53	13.89	58	15.20
<i>Juncus articulatus</i>	31	12.19	21	16.51	10	7.86	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	31	4.06	21	5.50	10	2.62
<i>Juncus prismatocarpus</i>	0	0.00	0	0.00	0	0.00	12	4.72	12	9.44	0	0.00	0	0.00	0	0.00	0	0.00	12	1.57	12	3.15	0	0.00
<i>Kyllinga brevifolia</i>	311	122.28	200	157.27	111	87.28	99	38.92	46	36.17	53	41.68	0	0.00	0	0.00	0	0.00	410	53.73	246	64.48	164	42.99
<i>Lophangium luteoalbum</i>	301	118.35	197	154.91	104	81.78	136	53.47	83	65.27	53	41.68	136	53.47	76	59.76	60	47.18	573	75.10	356	93.31	217	56.88
<i>Limnobium laevigatum</i>	568	223.32	387	304.32	181	142.33	192	75.49	143	112.45	49	38.53	145	57.01	95	74.70	50	39.32	905	118.61	625	163.82	280	73.39
<i>Lindernia crustacea</i>	1291	507.59	761	598.41	530	416.76	595	233.94	358	281.51	237	186.36	404	158.84	226	177.71	178	139.97	2290	300.12	1345	352.55	945	247.70
<i>Ludwigia adscendens</i>	70	27.52	34	26.74	36	28.31	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	70	9.17	34	8.91	36	9.44
<i>Marsilea quadrifolia</i>	468	184.01	343	269.72	125	98.29	143	56.22	108	84.93	35	27.52	144	56.62	102	80.21	42	33.03	755	98.95	553	144.95	202	52.95
<i>Mazus pumilus</i>	252	99.08	94	73.92	158	124.24	84	33.03	42	33.03	42	33.03	108	42.46	43	33.81	65	51.11	444	58.19	179	46.92	265	69.46
<i>Mecardonia procumbens</i>	210	82.57	139	109.30	71	55.83	59	23.20	39	30.67	20	15.73	95	37.35	63	49.54	32	25.16	364	47.71	241	63.17	123	32.24
<i>Monochoria hastata</i>	10	3.93	10	7.86	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	1.31	10	2.62	0	0.00
<i>Nymphoides cristata</i>	12	4.72	12	9.44	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	12	1.57	12	3.15	0	0.00
<i>Oldenlandia tenelliflora</i>	0	0.00	0	0.00	0	0.00	10	3.93	0	0.00	10	7.86	0	0.00	0	0.00	0	0.00	10	1.31	0	0.00	10	2.62
<i>Oxalis corniculata</i>	958	376.66	559	439.57	399	313.75	410	161.20	230	180.86	180	141.54	344	135.25	191	150.19	153	120.31	1712	224.37	980	256.87	732	191.87
<i>Panicum brevifolium</i>	19	7.47	0	0.00	19	14.94	19	7.47	0	0.00	19	14.94	0	0.00	0	0.00	0	0.00	38	4.98	0	0.00	38	9.96
<i>Panicum notatum</i>	147	57.80	54	42.46	93	73.13	81	31.85	29	22.80	52	40.89	0	0.00	0	0.00	0	0.00	228	29.88	83	21.76	145	38.01
<i>Paspalum conjugatum</i>	727	285.84	436	342.85	291	228.83	358	140.76	209	164.35	149	117.17	271	106.55	156	122.67	115	90.43	1356	177.71	801	209.96	555	145.47
<i>Peperomia pellucida</i>	375	147.44	187	147.05	188	147.83	150	58.98	75	58.98	75	58.98	164	64.48	77	60.55	87	68.41	689	90.30	339	88.86	350	91.74
<i>Persicaria barbata</i>	29	11.40	15	11.80	14	11.01	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	29	3.80	15	3.93	14	3.67
<i>Persicaria hydropiper</i>	148	58.19	90	70.77	58	45.61	89	34.99	53	41.68	36	28.31	81	31.85	45	35.39	36	28.31	318	41.68	188	49.28	130	34.08
<i>Persicaria orientalis</i>	15	5.90	15	11.80	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	15	1.97	15	3.93	0	0.00
<i>Phyllanthus niruri</i>	1203	472.99	657	516.63	546	429.35	480	188.72	266	209.17	214	168.28	404	158.84	233	183.22	171	134.47	2087	273.52	1156	303.01	931	244.03
<i>Physalis minima</i>	36	14.15	36	28.31	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	36	4.72	36	9.44	0	0.00
<i>Pistia stratiotes</i>	78	30.67	78	61.34	0	0.00	46	18.09	46	36.17	0	0.00	40	15.73	40	31.45	0	0.00	164	21.49	164	42.99	0	0.00
<i>Polycarpon prostratum</i>	332	130.53	191	150.19	141	110.88	135	53.08	85	66.84	50	39.32	117	46.00	69	54.26	48	37.74	584	76.54	345	90.43	239	62.65
<i>Polygonum plebeium</i>	1280	503.26	755	593.69	525	412.83	525	206.42	305	239.84	220	173.00	406	159.63	226	177.71	180	141.54	2211	289.77	1286	337.08	925	242.46
<i>Potentilla kleiniana</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	1.97	0	0.00	5	3.93	5	0.66	0	0.00	5	1.31
<i>Pouzolzia zeylanica</i>	451	177.32	241	189.51	210	165.13	167	65.66	113	88.86	54	42.46	156	61.34	91	71.56	65	51.11	774	101.44	445	116.64	329	86.24
<i>Ranunculus cantoniensis</i>	14	5.50	14	11.01	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	14	1.83	14	3.67	0	0.00
<i>Ranunculus scleratus</i>	45	17.69	15	11.80	30	23.59	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	45	5.90	15	3.93	30	7.86
<i>Rorippa indica</i>	678	266.57	426	334.98	252	198.16	248	97.51	159	125.03	89	69.99	242	95.15	132	103.80	110	86.50	1168	153.08	717	187.94	451	118.21
<i>Rungia pectinata</i>	50	19.66	29	22.80	21	16.51	48	18.87	27	21.23	21	16.51	0	0.00	0	0.00	0	0.00	98	12.84	56	14.68	42	11.01
<i>Salvinia natans</i>	39	15.33	39	30.67	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	39	5.11	39	10.22	0	0.00
<i>Scirpus mucronatus</i>	0	0.00	0	0.00	0	0.00	16	6.29	16	12.58	0	0.00	0	0.00	0	0.00	0	0.00	16	2.10	16	4.19	0	0.00
<i>Setaria pumila</i>	522	205.24	312	245.34	210	165.13	233	91.61	131	103.01	102	80.21	171	67.23	95	74.70	76	59.76	926	121.36	538	141.02	388	101.70
<i>Setaria viridis</i>	34	13.37	34	26.74	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	34	4.46	34	8.91	0	0.00
<i>Solanum americanum</i>	155	60.94	83	65.27	72	56.62	70	27.52	39	30.67	31	24.38	61	23.98	36	28.31	25	19.66	286	37.48	158	41.41	128	33.55
<i>Spirodela polyrrhiza</i>	194	76.28	96	75.49	98	77.06	65	25.56	29	22.80	36	28.31	0	0.00	0	0.00	0	0.00	259	33.94	125	32.76	134	35.12
<i>Urochloa panicoides</i>	10	3.93	10	7.86	0	0.00	12	4.72	12	9.														

Plant species	Soil layers															Total											
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)														
	O			DS			WS			O			DS			WS			O			DS			WS		
	A	D		A	D		A	D		A	D		A	D		A	D		A	D		A	D		A	D	

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.31. Overall and seasonal plant species total seed abundances recorded from different soil layers of short riverine alluvial grasslands soil seed bank given flooding treatment during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Acmella uliginosa</i>	27.67	6.00	21.67	0.00	0.00	0.00	0.00	0.00	0.00	27.67	6.00	21.67
<i>Adiantum caudatum</i>	16.67	6.33	10.33	8.00	5.00	3.00	0.00	0.00	0.00	24.67	11.33	13.33
<i>Aeschynomene aspera</i>	18.33	18.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.33	18.33	0.00
<i>Ageratum conyzoides</i>	65.67	29.00	36.67	27.00	14.00	13.00	31.33	14.00	17.33	124.00	57.00	67.00
<i>Alternanthera philoxeroides</i>	19.33	19.33	0.00	0.00	0.00	0.00	9.00	9.00	0.00	28.33	28.33	0.00
<i>Alternanthera pungens</i>	98.33	47.67	50.67	33.33	17.33	16.00	0.00	0.00	0.00	131.67	65.00	66.67
<i>Alternanthera sessilis</i>	327.67	170.00	157.67	156.33	88.67	67.67	99.33	54.33	45.00	583.33	313.00	270.33
<i>Amaranthus viridis</i>	51.67	26.00	25.67	19.33	10.67	8.67	0.00	0.00	0.00	71.00	36.67	34.33
<i>Ammannia multiflora</i>	13.33	13.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.33	13.33	0.00
<i>Ampelopteris prolifera</i>	26.33	26.33	0.00	7.00	7.00	0.00	0.00	0.00	0.00	33.33	33.33	0.00
<i>Arenaria serpyllifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.67	1.67	0.00	1.67	1.67	0.00
<i>Artemisia carvifolia</i>	18.33	18.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.33	18.33	0.00
<i>Axonopus compressus</i>	174.67	109.00	65.67	56.00	34.33	21.67	52.33	32.00	20.33	283.00	175.33	107.67
<i>Azolla pinnata</i>	92.67	72.00	20.67	17.33	12.00	5.33	19.67	17.67	2.00	129.67	101.67	28.00
<i>Brachiaria reptans</i>	16.67	16.67	0.00	9.33	9.33	0.00	0.00	0.00	0.00	26.00	26.00	0.00
<i>Carex vesicaria</i>	68.00	36.33	31.67	30.67	16.00	14.67	18.00	9.33	8.67	116.67	61.67	55.00
<i>Cenchrus ciliaris</i>	54.67	31.67	23.00	26.33	15.33	11.00	19.33	11.00	8.33	100.33	58.00	42.33
<i>Centella asiatica</i>	67.67	35.00	32.67	27.33	12.33	15.00	0.00	0.00	0.00	95.00	47.33	47.67
<i>Ceratopteris thalictroides</i>	12.33	12.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.33	12.33	0.00
<i>Christella parasitica</i>	56.67	35.00	21.67	26.67	14.33	12.33	19.67	10.00	9.67	103.00	59.33	43.67
<i>Chrysopogon aciculatus</i>	78.33	47.67	30.67	33.67	22.00	11.67	33.33	17.67	15.67	145.33	87.33	58.00
<i>Commelina benghalensis</i>	30.33	16.67	13.67	0.00	0.00	0.00	0.00	0.00	0.00	30.33	16.67	13.67
<i>Cotula hemisphaerica</i>	104.00	49.00	55.00	0.00	0.00	0.00	0.00	0.00	0.00	104.00	49.00	55.00
<i>Cynodon dactylon</i>	996.33	618.67	377.67	420.33	248.33	172.00	250.67	139.67	111.00	1667.33	1006.67	660.67
<i>Cyperus compressus</i>	75.67	44.67	31.00	39.67	24.00	15.67	33.33	20.00	13.33	148.67	88.67	60.00
<i>Cyperus cyperoides</i>	11.33	9.33	2.00	5.00	2.67	2.33	0.00	0.00	0.00	16.33	12.00	4.33
<i>Cyperus distans</i>	33.67	9.33	24.33	16.00	6.67	9.33	0.00	0.00	0.00	49.67	16.00	33.67
<i>Cyperus eragrostis</i>	123.67	62.67	61.00	45.33	26.33	19.00	42.67	19.00	23.67	211.67	108.00	103.67
<i>Cyperus imbricatus</i>	31.00	11.67	19.33	16.67	6.67	10.00	0.00	0.00	0.00	47.67	18.33	29.33
<i>Cyperus iria</i>	33.00	18.00	15.00	21.67	13.00	8.67	0.00	0.00	0.00	54.67	31.00	23.67
<i>Cyperus rotundus</i>	42.33	42.33	0.00	0.00	0.00	0.00	29.00	29.00	0.00	71.33	71.33	0.00
<i>Dactyloctenium aegyptium</i>	32.67	18.00	14.67	15.00	8.00	7.00	0.00	0.00	0.00	47.67	26.00	21.67
<i>Dichanthium annulatum</i>	87.00	42.67	44.33	31.67	17.33	14.33	0.00	0.00	0.00	118.67	60.00	58.67
<i>Digitaria ciliaris</i>	259.00	135.67	123.33	106.33	51.67	54.67	91.00	48.00	43.00	456.33	235.33	221.00
<i>Duchesnea indica</i>	55.33	29.00	26.33	27.33	12.00	15.33	0.00	0.00	0.00	82.67	41.00	41.67
<i>Echinochloa colona</i>	8.33	0.00	8.33	0.00	0.00	0.00	0.00	0.00	0.00	8.33	0.00	8.33
<i>Echinochloa crus-galli</i>	130.33	74.33	56.00	48.33	22.33	26.00	0.00	0.00	0.00	178.67	96.67	82.00
<i>Eclipta prostrata</i>	54.00	27.33	26.67	38.67	22.33	16.33	34.33	18.00	16.33	127.00	67.67	59.33
<i>Eichhornia crassipes</i>	63.67	37.33	26.33	29.33	16.67	12.67	22.67	13.33	9.33	115.67	67.33	48.33
<i>Eleocharis acutangula</i>	0.00	0.00	0.00	33.33	20.67	12.67	0.00	0.00	0.00	33.33	20.67	12.67
<i>Enhydra fluctuans</i>	3.00	3.00	0.00	2.67	2.67	0.00	0.00	0.00	0.00	5.67	5.67	0.00

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Equisetum debile</i>	62.67	28.33	34.33	0.00	0.00	0.00	0.00	0.00	0.00	62.67	28.33	34.33
<i>Eragrostis riparia</i>	16.33	11.00	5.33	12.33	6.67	5.67	0.00	0.00	0.00	28.67	17.67	11.00
<i>Eragrostis unioloides</i>	18.33	5.33	13.00	0.00	0.00	0.00	12.67	5.00	7.67	31.00	10.33	20.67
<i>Ethulia conyzoides</i>	173.00	95.67	77.33	63.67	35.67	28.00	58.33	28.33	30.00	295.00	159.67	135.33
<i>Euphorbia hirta</i>	38.33	17.67	20.67	15.00	4.00	11.00	17.33	7.00	10.33	70.67	28.67	42.00
<i>Evolvulus nummularius</i>	49.67	24.33	25.33	17.00	9.33	7.67	0.00	0.00	0.00	66.67	33.67	33.00
<i>Fimbristylis aestivalis</i>	352.00	200.67	151.33	148.33	86.00	62.33	120.33	70.00	50.33	620.67	356.67	264.00
<i>Fimbristylis littoralis</i>	6.33	6.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33	6.33	0.00
<i>Glinus lotoides</i>	54.00	25.33	28.67	23.00	9.33	13.67	0.00	0.00	0.00	77.00	34.67	42.33
<i>Grangea maderaspatana</i>	225.00	109.33	115.67	106.00	57.33	48.67	74.33	31.67	42.67	405.33	198.33	207.00
<i>Heliotropium indicum</i>	71.67	40.33	31.33	33.33	18.67	14.67	29.67	16.00	13.67	134.67	75.00	59.67
<i>Hemarthria compressa</i>	390.33	213.33	177.00	197.33	112.67	84.67	159.67	86.67	73.00	747.33	412.67	334.67
<i>Hyptis suaveolens</i>	82.00	39.00	43.00	27.33	12.00	15.33	29.33	13.67	15.67	138.67	64.67	74.00
<i>Isachne globosa</i>	24.00	11.00	13.00	13.00	6.67	6.33	0.00	0.00	0.00	37.00	17.67	19.33
<i>Juncus articulatus</i>	10.33	7.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	10.33	7.00	3.33
<i>Juncus prismatocarpus</i>	0.00	0.00	0.00	4.00	4.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00
<i>Kyllinga brevifolia</i>	103.67	66.67	37.00	33.00	15.33	17.67	0.00	0.00	0.00	136.67	82.00	54.67
<i>Laphangium luteoalbum</i>	100.33	65.67	34.67	45.33	27.67	17.67	45.33	25.33	20.00	191.00	118.67	72.33
<i>Limnobiium laevigatum</i>	189.33	129.00	60.33	64.00	47.67	16.33	48.33	31.67	16.67	301.67	208.33	93.33
<i>Lindernia crustacea</i>	430.33	253.67	176.67	198.33	119.33	79.00	134.67	75.33	59.33	763.33	448.33	315.00
<i>Ludwigia adscendens</i>	23.33	11.33	12.00	0.00	0.00	0.00	0.00	0.00	0.00	23.33	11.33	12.00
<i>Marsilea quadrifolia</i>	156.00	114.33	41.67	47.67	36.00	11.67	48.00	34.00	14.00	251.67	184.33	67.33
<i>Mazus pumilus</i>	84.00	31.33	52.67	28.00	14.00	14.00	36.00	14.33	21.67	148.00	59.67	88.33
<i>Mecardonia procumbens</i>	70.00	46.33	23.67	19.67	13.00	6.67	31.67	21.00	10.67	121.33	80.33	41.00
<i>Monochoria hastata</i>	3.33	3.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33	3.33	0.00
<i>Nymphoides cristata</i>	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00
<i>Oldenlandia tenelliflora</i>	0.00	0.00	0.00	3.33	0.00	3.33	0.00	0.00	0.00	3.33	0.00	3.33
<i>Oxalis corniculata</i>	319.33	186.33	133.00	136.67	76.67	60.00	114.67	63.67	51.00	570.67	326.67	244.00
<i>Panicum brevifolium</i>	6.33	0.00	6.33	6.33	0.00	6.33	0.00	0.00	0.00	12.67	0.00	12.67
<i>Panicum notatum</i>	49.00	18.00	31.00	27.00	9.67	17.33	0.00	0.00	0.00	76.00	27.67	48.33
<i>Paspalum conjugatum</i>	242.33	145.33	97.00	119.33	69.67	49.67	90.33	52.00	38.33	452.00	267.00	185.00
<i>Peperomia pellucida</i>	125.00	62.33	62.67	50.00	25.00	25.00	54.67	25.67	29.00	229.67	113.00	116.67
<i>Persicaria barbata</i>	9.67	5.00	4.67	0.00	0.00	0.00	0.00	0.00	0.00	9.67	5.00	4.67
<i>Persicaria hydropiper</i>	49.33	30.00	19.33	29.67	17.67	12.00	27.00	15.00	12.00	106.00	62.67	43.33
<i>Persicaria orientalis</i>	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00
<i>Phyllanthus niruri</i>	401.00	219.00	182.00	160.00	88.67	71.33	134.67	77.67	57.00	695.67	385.33	310.33
<i>Physalis minima</i>	12.00	12.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	12.00	0.00
<i>Pistia stratiotes</i>	26.00	26.00	0.00	15.33	15.33	0.00	13.33	13.33	0.00	54.67	54.67	0.00
<i>Polycarpon prostratum</i>	110.67	63.67	47.00	45.00	28.33	16.67	39.00	23.00	16.00	194.67	115.00	79.67
<i>Polygonum plebeium</i>	426.67	251.67	175.00	175.00	101.67	73.33	135.33	75.33	60.00	737.00	428.67	308.33
<i>Potentilla kleiniana</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	1.67	1.67	0.00	1.67
<i>Pouzolzia zeylanica</i>	150.33	80.33	70.00	55.67	37.67	18.00	52.00	30.33	21.67	258.00	148.33	109.67
<i>Ranunculus cantoniensis</i>	4.67	4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67	4.67	0.00
<i>Ranunculus sceleratus</i>	15.00	5.00	10.00	0.00	0.00	0.00	0.00	0.00	0.00	15.00	5.00	10.00
<i>Rorippa indica</i>	226.00	142.00	84.00	82.67	53.00	29.67	80.67	44.00	36.67	389.33	239.00	150.33
<i>Rungia pectinata</i>	16.67	9.67	7.00	16.00	9.00	7.00	0.00	0.00	0.00	32.67	18.67	14.00
<i>Salvinia natans</i>	13.00	13.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.00	13.00	0.00
<i>Scirpus mucronatus</i>	0.00	0.00	0.00	5.33	5.33	0.00	0.00	0.00	0.00	5.33	5.33	0.00
<i>Setaria pumila</i>	174.00	104.00	70.00	77.67	43.67	34.00	57.00	31.67	25.33	308.67	179.33	129.33
<i>Setaria viridis</i>	11.33	11.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.33	11.33	0.00
<i>Solanum americanum</i>	51.67	27.67	24.00	23.33	13.00	10.33	20.33	12.00	8.33	95.33	52.67	42.67
<i>Spirodela polyrrhiza</i>	64.67	32.00	32.67	21.67	9.67	12.00	0.00	0.00	0.00	86.33	41.67	44.67
<i>Urochloa panicoides</i>	3.33	3.33	0.00	4.00	4.00	0.00	0.00	0.00	0.00	7.33	7.33	0.00

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
UI 2	6.67	0.00	6.67	0.00	0.00	0.00	0.00	0.00	0.00	6.67	0.00	6.67
UI 5	49.33	17.33	32.00	12.00	6.00	6.00	0.00	0.00	0.00	61.33	23.33	38.00
UI 13	2.33	2.33	0.00	0.67	0.67	0.00	0.00	0.00	0.00	3.00	3.00	0.00
UI 24	8.33	0.00	8.33	0.00	0.00	0.00	0.00	0.00	0.00	8.33	0.00	8.33
UK (premature mortality)	491.33	286.33	205.00	120.33	83.33	37.00	55.00	34.00	21.00	666.67	403.67	263.00

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.32. Overall and seasonal plant species mean seed abundances recorded from different soil layers of short riverine alluvial grasslands soil seed bank given flooding treatment during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Acmella uliginosa</i>	4.61±0.80	3.00±1.33	5.42±0.82	0.00	0.00	0.00	0.00	0.00	0.00	4.61±0.80	3.00±1.33	5.42±0.82
<i>Adiantum caudatum</i>	2.38±0.48	2.11±0.99	2.58±0.53	1.60±0.39	1.67±0.69	1.50±0.17	0.00	0.00	0.00	3.52±0.55	3.78±0.48	3.33±0.96
<i>Aeschynomene aspera</i>	4.58±0.28	4.58±0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.58±0.28	4.58±0.28	0.00
<i>Ageratum conyzoides</i>	8.21±1.15	7.25±1.65	9.17±1.69	3.38±0.53	3.50±0.96	3.25±0.63	3.92±0.52	3.50±0.74	4.33±0.78	15.50±1.37	14.25±2.59	16.75±0.99
<i>Alternanthera philoxeroides</i>	9.67±0.33	9.67±0.33	0.00	0.00	0.00	0.00	4.50±0.50	4.50±0.50	0.00	14.17±0.83	14.17±0.83	0.00
<i>Alternanthera pungens</i>	12.29±0.46	11.92±0.70	12.67±0.62	4.17±0.82	4.33±1.11	4.00±1.37	0.00	0.00	0.00	16.46±0.91	16.25±1.32	16.67±1.43
<i>Alternanthera sessilis</i>	40.96±3.00	42.50±4.86	39.42±4.10	19.54±1.54	22.17±1.31	16.92±2.18	12.42±0.88	13.58±1.49	11.25±0.69	72.92±4.97	78.25±7.50	67.58±6.33
<i>Amaranthus viridis</i>	6.46±0.36	6.50±0.65	6.42±0.44	2.42±0.47	2.67±0.86	2.17±0.52	0.00	0.00	0.00	8.88±0.77	9.17±1.43	8.58±0.83
<i>Ammannia multiflora</i>	13.33±0.00	13.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.33±0.00	13.33±0.00	0.00
<i>Ampelopteris prolifera</i>	6.58±1.93	6.58±1.93	0.00	1.75±0.55	1.75±0.55	0.00	0.00	0.00	0.00	8.33±2.31	8.33±2.31	0.00
<i>Arenaria serpyllifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Artemisia carvifolia</i>	9.17±2.83	9.17±2.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.17±2.83	9.17±2.83	0.00
<i>Axonopus compressus</i>	21.83±2.82	27.25±4.10	16.42±0.94	7.00±0.82	8.58±1.02	5.42±0.63	6.54±0.88	8.00±1.45	5.08±0.34	35.38±4.32	43.83±6.20	26.92±0.93
<i>Azolla pinnata</i>	15.44±3.02	18.00±4.01	10.33±1.00	2.89±0.51	3.00±0.69	2.67±1.00	3.93±1.12	4.42±1.30	2.00±0.00	21.61±3.45	25.42±3.71	14.00±3.00
<i>Brachiaria reptans</i>	16.67±0.00	16.67±0.00	0.00	9.33±0.00	9.33±0.00	0.00	0.00	0.00	0.00	26.00±0.00	26.00±0.00	0.00
<i>Carex vesicaria</i>	8.50±0.65	9.08±1.05	7.92±0.80	3.83±0.38	4.00±0.73	3.67±0.36	2.25±0.25	2.33±0.36	2.17±0.40	14.58±0.83	15.42±1.10	13.75±1.24
<i>Cenchrus ciliaris</i>	6.83±0.91	7.92±0.95	5.75±1.47	3.29±0.40	3.83±0.55	2.75±0.50	2.42±0.27	2.75±0.25	2.08±0.44	12.54±1.44	14.50±1.43	10.58±2.25
<i>Centella asiatica</i>	9.67±1.13	11.67±1.86	8.17±1.00	3.90±0.23	4.11±0.29	3.75±0.34	0.00	0.00	0.00	13.57±1.14	15.78±1.89	11.92±0.80
<i>Ceratopteris thalictroides</i>	12.33±0.00	12.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.33±0.00	12.33±0.00	0.00
<i>Christella parasitica</i>	7.08±1.11	8.75±1.62	5.42±1.13	3.33±0.40	3.58±0.63	3.08±0.57	2.46±0.29	2.50±0.29	2.42±0.55	12.88±1.38	14.83±1.75	10.92±1.81
<i>Chrysopogon aciculatus</i>	9.79±1.16	11.92±1.51	7.67±1.01	4.21±0.58	5.50±0.63	2.92±0.28	4.17±0.37	4.42±0.44	3.92±0.64	18.17±1.85	21.83±2.04	14.50±1.69
<i>Commelina benghalensis</i>	6.07±1.09	8.33±1.33	4.56±0.73	0.00	0.00	0.00	0.00	0.00	0.00	6.07±1.09	8.33±1.33	4.56±0.73
<i>Cotula hemisphaerica</i>	13.00±1.09	12.25±1.99	13.75±1.09	0.00	0.00	0.00	0.00	0.00	0.00	13.00±1.09	12.25±1.99	13.75±1.09
<i>Cynodon dactylon</i>	124.54±15.89	154.67±21.05	94.42±11.41	52.54±4.74	62.08±6.21	43.00±2.33	31.33±1.89	34.92±1.67	27.75±2.29	208.42±21.79	251.67±27.47	165.17±14.61
<i>Cyperus compressus</i>	18.92±4.60	22.33±9.67	15.50±3.17	9.92±2.04	12.00±4.00	7.83±0.50	8.33±2.05	10.00±4.33	6.67±1.00	37.17±8.65	44.33±18.00	30.00±4.67
<i>Cyperus cyperoides</i>	3.78±0.97	4.67±0.67	2.00±0.00	1.67±0.38	1.33±0.33	2.33±0.00	0.00	0.00	0.00	5.44±0.80	6.00±1.00	4.33±0.00
<i>Cyperus distans</i>	5.61±0.65	4.67±0.67	6.08±0.86	2.67±0.53	3.33±1.00	2.33±0.65	0.00	0.00	0.00	8.28±0.72	8.00±1.67	8.42±0.91
<i>Cyperus eragrostis</i>	17.67±2.76	15.67±2.51	20.33±5.89	6.48±0.46	6.58±0.46	6.33±1.02	6.10±0.93	4.75±1.21	7.89±0.48	30.24±3.62	27.00±3.53	34.56±7.12
<i>Cyperus imbricatus</i>	6.20±0.62	5.83±0.50	6.44±1.06	3.33±0.59	3.33±0.67	3.33±1.00	0.00	0.00	0.00	9.53±1.17	9.17±1.17	9.78±2.00
<i>Cyperus iria</i>	4.13±0.65	4.50±1.35	3.75±0.25	2.71±0.42	3.25±0.75	2.17±0.22	0.00	0.00	0.00	6.83±1.04	7.75±2.08	5.92±0.34
<i>Cyperus rotundus</i>	10.58±2.02	10.58±2.02	0.00	0.00	0.00	0.00	7.25±1.38	7.25±1.38	0.00	17.83±1.44	17.83±1.44	0.00
<i>Dactyloctenium aegyptium</i>	4.67±0.89	6.00±1.45	3.67±0.97	2.14±0.32	2.67±0.38	1.75±0.39	0.00	0.00	0.00	6.81±1.05	8.67±1.35	5.42±1.21
<i>Dichanthium annulatum</i>	10.88±1.56	10.67±3.09	11.08±1.32	3.96±0.49	4.33±0.95	3.58±0.37	0.00	0.00	0.00	14.83±1.84	15.00±3.83	14.67±1.04
<i>Digitaria ciliaris</i>	32.38±3.11	33.92±5.97	30.83±2.80	13.29±1.40	12.92±2.75	13.67±1.22	11.38±0.97	12.00±1.97	10.75±0.48	57.04±3.12	58.83±5.26	55.25±3.95
<i>Duchesnea indica</i>	6.92±1.34	7.25±2.31	6.58±1.73	3.42±0.57	3.00±0.68	3.83±0.97	0.00	0.00	0.00	10.33±1.70	10.25±2.77	10.42±2.42
<i>Echinochloa colona</i>	8.33±0.00	0.00	8.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.33±0.00	0.00	8.33±0.00
<i>Echinochloa crus-galli</i>	16.29±1.58	18.58±2.51	14.00±1.38	6.04±0.57	5.58±1.16	6.50±0.17	0.00	0.00	0.00	22.33±1.95	24.17±3.64	20.50±1.48

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Eclipta prostrata</i>	6.75±0.53	6.83±0.84	6.67±0.76	4.83±0.43	5.58±0.69	4.08±0.16	4.29±0.53	4.50±0.84	4.08±0.75	15.88±0.86	16.92±1.55	14.83±0.55
<i>Eichhornia crassipes</i>	7.96±1.20	9.33±1.98	6.58±1.24	3.67±0.42	4.17±0.52	3.17±0.62	2.83±0.39	3.33±0.41	2.33±0.61	14.46±1.78	16.83±2.60	12.08±2.06
<i>Eleocharis acutangula</i>	0.00	0.00	0.00	4.17±0.58	5.17±0.87	3.17±0.42	0.00	0.00	0.00	4.17±0.58	5.17±0.87	3.17±0.42
<i>Enhydra fluctuans</i>	3.00±0.00	3.00±0.00	0.00	2.67±0.00	2.67±0.00	0.00	0.00	0.00	0.00	5.67±0.00	5.67±0.00	0.00
<i>Equisetum debile</i>	7.83±1.00	7.08±1.77	8.58±1.08	0.00	0.00	0.00	0.00	0.00	0.00	7.83±1.00	7.08±1.77	8.58±1.08
<i>Eragrostis riparia</i>	5.44±0.11	5.50±0.17	5.33±0.00	4.11±0.78	3.33±0.00	5.67±0.00	0.00	0.00	0.00	9.56±0.73	8.83±0.17	11.00±0.00
<i>Eragrostis unioloides</i>	6.11±0.95	5.33±0.00	6.50±1.50	0.00	0.00	0.00	4.22±0.48	5.00±0.00	3.83±0.50	10.33±0.58	10.33±0.00	10.33±1.00
<i>Ethulia conyzoides</i>	21.63±2.66	23.92±3.72	19.33±3.97	7.96±0.98	8.92±1.41	7.00±1.38	7.29±0.88	7.08±1.65	7.50±0.92	36.88±4.08	39.92±5.70	33.83±6.24
<i>Euphorbia hirta</i>	7.67±1.28	8.83±3.50	6.89±0.80	3.00±0.43	2.00±0.33	3.67±0.19	3.47±0.23	3.50±0.50	3.44±0.29	14.13±1.18	14.33±3.67	14.00±0.38
<i>Evolvulus nummularius</i>	6.21±0.76	6.08±0.63	6.33±1.51	2.13±0.35	2.33±0.38	1.92±0.63	0.00	0.00	0.00	8.33±0.99	8.42±0.71	8.25±2.02
<i>Fimbristylis aestivalis</i>	44.00±3.56	50.17±3.74	37.83±4.44	18.54±1.72	21.50±2.77	15.58±0.52	15.04±1.09	17.50±0.69	12.58±1.04	77.58±5.32	89.17±3.04	66.00±5.79
<i>Fimbristylis littoralis</i>	6.33±0.00	6.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33±0.00	6.33±0.00	0.00
<i>Glinus lotoides</i>	9.00±2.47	12.67±8.00	7.17±1.09	3.83±0.70	4.67±2.33	3.42±0.37	0.00	0.00	0.00	12.83±3.13	17.33±10.33	10.58±1.26
<i>Grangea maderaspatana</i>	28.13±1.79	27.33±2.66	28.92±2.74	13.25±1.03	14.33±1.38	12.17±1.49	9.29±1.00	7.92±0.50	10.67±1.78	50.67±2.94	49.58±3.44	51.75±5.28
<i>Heliotropium indicum</i>	8.96±0.71	10.08±0.90	7.83±0.82	4.17±0.52	4.67±0.78	3.67±0.68	3.71±0.18	4.00±0.14	3.42±0.28	16.83±1.26	18.75±1.40	14.92±1.72
<i>Hemarthria compressa</i>	48.79±2.14	53.33±1.14	44.25±2.52	24.67±1.76	28.17±2.41	21.17±0.65	19.96±1.21	21.67±1.74	18.25±1.38	93.42±4.66	103.17±4.35	83.67±4.34
<i>Hyptis suaveolens</i>	11.71±1.32	13.00±2.52	10.75±1.50	3.90±0.91	4.00±1.71	3.83±1.19	4.19±0.48	4.56±0.91	3.92±0.58	19.81±1.89	21.56±4.01	18.50±1.77
<i>Isachne globosa</i>	4.80±0.79	5.50±2.17	4.33±0.51	2.60±0.34	3.33±0.00	2.11±0.29	0.00	0.00	0.00	7.40±1.00	8.83±2.17	6.44±0.78
<i>Juncus articulatus</i>	3.44±0.68	3.50±1.17	3.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.44±0.68	3.50±1.17	3.33±0.00
<i>Juncus prismatocarpus</i>	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00
<i>Kyllinga brevifolia</i>	12.96±1.79	16.67±2.18	9.25±1.04	4.13±0.63	3.83±1.00	4.42±0.9	0.00	0.00	0.00	17.08±1.84	20.50±2.07	13.67±1.91
<i>Laphanqium luteoalbum</i>	12.54±1.69	16.42±0.90	8.67±1.56	5.67±0.71	6.92±0.98	4.42±0.58	5.67±0.56	6.33±0.95	5.00±0.49	23.88±2.51	29.67±1.98	18.08±1.74
<i>Limnolobium laevigatum</i>	31.56±3.98	32.25±5.94	30.17±4.83	10.67±1.80	11.92±2.56	8.17±0.17	8.06±0.69	7.92±1.07	8.33±0.33	50.28±5.53	52.08±8.36	46.67±4.33
<i>Lindernia crustacea</i>	53.79±4.17	63.42±2.64	44.17±3.53	24.79±2.19	29.83±2.25	19.75±0.64	16.83±1.21	18.83±1.54	14.83±1.34	95.42±6.94	112.08±5.13	78.75±3.65
<i>Ludwigia adscendens</i>	5.83±0.80	5.67±1.67	6.00±1.00	0.00	0.00	0.00	0.00	0.00	0.00	5.83±0.80	5.67±1.67	6.00±1.00
<i>Marsilea quadrifolia</i>	26.00±4.05	28.58±5.69	20.83±3.50	7.94±1.11	9.00±1.33	5.83±1.17	8.00±0.98	8.50±1.40	7.00±1.00	41.94±5.72	46.08±7.69	33.67±5.67
<i>Mazus pumilus</i>	12.00±1.26	10.44±1.82	13.17±1.68	4.00±0.96	4.67±2.40	3.50±0.40	5.14±0.43	4.78±0.87	5.42±0.46	21.14±1.69	19.89±2.98	22.08±2.19
<i>Mecardonia procumbens</i>	11.67±1.97	11.58±2.99	11.83±2.17	3.28±0.53	3.25±0.79	3.33±0.67	5.28±0.95	5.25±1.49	5.33±0.33	20.22±2.62	20.08±3.94	20.50±3.17
<i>Monochoria hastata</i>	3.33±0.00	3.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33±0.00	3.33±0.00	0.00
<i>Nymphoides cristata</i>	4.00±0.00	4.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00
<i>Oldenlandia tenelliflora</i>	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00
<i>Oxalis corniculata</i>	39.92±3.08	46.58±1.87	33.25±3.34	17.08±1.33	19.17±1.77	15.00±1.48	14.33±1.15	15.92±1.86	12.75±1.05	71.33±4.54	81.67±3.99	61.00±3.01
<i>Panicum brevifolium</i>	6.33±0.00	0.00	6.33±0.00	6.33±0.00	0.00	6.33±0.00	0.00	0.00	0.00	12.67±0.00	0.00	12.67±0.00
<i>Panicum notatum</i>	8.17±0.82	9.00±2.33	7.75±0.77	4.50±0.51	4.83±1.50	4.33±0.49	0.00	0.00	0.00	12.67±1.18	13.83±3.83	12.08±0.82
<i>Paspalum conjugatum</i>	30.29±2.66	36.33±1.47	24.25±2.53	14.92±1.37	17.42±1.86	12.42±1.08	11.29±1.00	13.00±1.59	9.58±0.39	56.50±4.42	66.75±3.58	46.25±2.88
<i>Peperomia pellucida</i>	15.63±1.31	15.58±2.51	15.67±1.29	6.25±0.70	6.25±1.38	6.25±0.64	6.83±0.52	6.42±0.93	7.25±0.55	28.71±1.84	28.25±3.57	29.17±1.71
<i>Persicaria barbata</i>	3.22±0.78	2.50±0.50	4.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.22±0.78	2.50±0.50	4.67±0.00
<i>Persicaria hydropiper</i>	6.17±0.70	7.50±0.84	4.83±0.63	3.71±0.35	4.42±0.39	3.00±0.30	3.38±0.48	3.75±0.67	3.00±0.72	13.25±1.07	15.67±0.86	10.83±0.82
<i>Persicaria orientalis</i>	2.50±0.17	2.50±0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.50±0.17	2.50±0.17	0.00
<i>Phyllanthus niruri</i>	50.13±2.99	54.75±3.28	45.50±4.09	20.00±1.82	22.17±3.27	17.83±1.26	16.83±1.27	19.42±1.71	14.25±0.39	86.96±4.99	96.33±6.13	77.58±4.49
<i>Physalis minima</i>	6.00±1.00	6.00±1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00±1.00	6.00±1.00	0.00
<i>Pistia stratiotes</i>	6.50±0.57	6.50±0.57	0.00	3.83±0.42	3.83±0.42	0.00	3.33±0.71	3.33±0.71	0.00	13.67±1.08	13.67±1.08	0.00
<i>Polycarpon prostratum</i>	13.83±1.28	15.92±2.09	11.75±0.58	5.63±0.75	7.08±1.01	4.17±0.44	4.88±0.83	5.75±1.51	4.00±0.64	24.33±2.40	28.75±3.39	19.92±1.57
<i>Polygonum plebeium</i>	53.33±4.31	62.92±3.87	43.75±3.22	21.88±1.96	25.42±2.70	18.33±1.52	16.92±1.30	18.83±1.78	15.00±1.50	92.13±6.77	107.17±6.29	77.08±4.85
<i>Potentilla kleiniana</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00	0.00	0.00	1.67±0.00
<i>Pouzolzia zeylanica</i>	18.79±3.38	20.08±6.56	17.50±3.01	6.96±1.51	9.42±2.56	4.50±0.32	6.50±1.13	7.58±1.98	5.42±1.13	32.25±5.19	37.08±9.86	27.42±3.57
<i>Ranunculus cantoniensis</i>	4.67±0.00	4.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67±0.00	4.67±0.00	0.00
<i>Ranunculus sceleratus</i>	5.00±0.38	5.00±0.00	5.00±0.67	0.00	0.00	0.00	0.00	0.00	0.00	5.00±0.38	5.00±0.00	5.00±0.67
<i>Rorippa indica</i>	28.25±2.90	35.50±1.70	21.00±1.15	10.33±1.65	13.25±2.43	7.42±1.07	10.08±1.27	11.00±2.57	9.17±0.62	48.67±4.97	59.75±5.09	37.58±2.72
<i>Rungia pectinata</i>	8.33±1.33	9.67±0.00	7.00±0.00	8.00±1.00	9.00±0.00	7.00±0.00	0.00	0.00	0.00	16.33±2.33	18.67±0.00	14.00±0.00
<i>Salvinia natans</i>	6.50±0.5	6.50±0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.50±0.50	6.50±0.50	0.00
<i>Scirpus mucronatus</i>	0.00	0.00	0.00	5.33±0.00	5.33±0.00	0.00	0.00	0.00	0.00	5.33±0.00	5.33±0.00	0.00
<i>Setaria pumila</i>	21.75±2.17	26.00±3.12	17.50±0.52	9.71±0.71	10.92±0.71	8.50±0.92	7.13±0.68	7.92±0.82	6.33±1.04	38.58±2.90	44.83±3.43	32.33±1.16

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Setaria viridis</i>	11.33±0.00	11.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.33±0.00	11.33±0.00	0.00
<i>Solanum americanum</i>	6.46±0.70	6.92±1.44	6.00±0.24	2.92±0.27	3.25±0.28	2.58±0.42	2.54±0.44	3.00±0.71	2.08±0.50	11.92±1.05	13.17±1.92	10.67±0.62
<i>Spirodela polyrrhiza</i>	10.78±0.82	10.67±0.84	10.89±1.64	3.61±0.58	3.22±0.40	4.00±1.17	0.00	0.00	0.00	14.39±1.10	13.89±1.13	14.89±2.12
<i>Urochloa panicoides</i>	3.33±0.00	3.33±0.00	0.00	4.00±0.00	4.00±0.00	0.00	0.00	0.00	0.00	7.33±0.00	7.33±0.00	0.00
UI 2	3.33±0.33	0.00	3.33±0.33	0.00	0.00	0.00	0.00	0.00	0.00	3.33±0.33	0.00	3.33±0.33
UI 5	8.22±1.56	8.67±1.67	8.00±2.36	2.00±0.54	3.00±1.67	1.50±0.10	0.00	0.00	0.00	10.22±1.59	11.67±0.00	9.50±2.41
UI 13	2.33±0.00	2.33±0.00	0.00	0.67±0.00	0.67±0.00	0.00	0.00	0.00	0.00	3.00±0.00	3.00±0.00	0.00
UI 24	8.33±0.00	0.00	8.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.33±0.00	0.00	8.33±0.00
UK (premature mortality)	61.42±5.27	71.58±5.50	51.25±5.50	15.04±2.76	20.83±2.84	9.25±2.24	6.88±0.93	8.50±1.51	5.25±0.21	83.33±8.42	100.92±8.10	65.75±7.71

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.33. Overall and seasonal plant species seed abundances and densities (m⁻²) recorded from different soil layers of tall riverine alluvial grasslands soil seed bank during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS							
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Achyranthes aspera</i>	10	1.97	0	0.00	10	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	0.66	0	0.00	10	1.31
<i>Acmella uliginosa</i>	282	55.44	184	72.34	98	38.53	73	14.35	49	19.27	24	9.44	0	0.00	0	0.00	0	0.00	355	23.26	233	30.54	122	15.99
<i>Acroceras zizanioides</i>	1135	223.13	821	322.80	314	123.46	375	73.72	288	113.23	87	34.21	248	48.75	174	68.41	74	29.09	1758	115.20	1283	168.15	475	62.25
<i>Acroceras munroanum</i>	24	4.72	0	0.00	24	9.44	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	24	1.57	0	0.00	24	3.15
<i>Adenostemma lavenia</i>	0	0.00	0	0.00	0	0.00	5	0.98	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	5	0.33	5	0.66	0	0.00
<i>Adiantum caudatum</i>	629	123.65	444	174.57	185	72.74	181	35.58	122	47.97	59	23.20	140	27.52	88	34.60	52	20.45	950	62.25	654	85.71	296	38.79
<i>Adiantum philippense</i>	49	9.63	49	19.27	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	49	3.21	49	6.42	0	0.00
<i>Adiantum capillus-veneris</i>	5	0.98	0	0.00	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.33	0	0.00	5	0.66
<i>Ageratum conyzoides</i>	560	110.09	409	160.81	151	59.37	191	37.55	129	50.72	62	24.38	131	25.75	93	36.57	38	14.94	882	57.80	631	82.70	251	32.90
<i>Alpinia nigra</i>	74	14.55	51	20.05	23	9.04	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	74	4.85	51	6.68	23	3.01
<i>Alternanthera pungens</i>	697	137.02	398	156.48	299	117.56	147	28.90	99	38.92	48	18.87	0	0.00	0	0.00	0	0.00	844	55.31	497	65.14	347	45.48
<i>Alternanthera sessilis</i>	1312	257.92	892	350.71	420	165.13	426	83.75	312	122.67	114	44.82	243	47.77	171	67.23	72	28.31	1981	129.81	1375	180.20	606	79.42
<i>Amaranthus spinosus</i>	228	44.82	114	44.82	114	44.82	125	24.57	72	28.31	53	20.84	0	0.00	0	0.00	0	0.00	353	23.13	186	24.38	167	21.89
<i>Ampelopteris prolifera</i>	368	72.34	368	144.69	0	0.00	105	20.64	105	41.28	0	0.00	0	0.00	0	0.00	0	0.00	473	31.00	473	61.99	0	0.00
<i>Apluda mutica</i>	2800	550.44	1903	748.21	897	352.68	901	177.13	619	243.38	282	110.88	571	112.25	364	143.12	207	81.39	4272	279.94	2886	378.23	1386	181.65
<i>Arenaria serpyllifolia</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.59	3	1.18	0	0.00	3	0.20	3	0.39	0	0.00
<i>Aristida adscensionis</i>	103	20.25	103	40.50	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	103	6.75	103	13.50	0	0.00
<i>Arundinella bengalensis</i>	372	73.13	372	146.26	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	372	24.38	372	48.75	0	0.00
<i>Azolla pinnata</i>	97	19.07	70	27.52	27	10.62	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	97	6.36	70	9.17	27	3.54
<i>Blumea lacera</i>	3	0.59	0	0.00	3	1.18	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.20	0	0.00	3	0.39
<i>Boerhavia diffusa</i>	0	0.00	0	0.00	0	0.00	5	0.98	0	0.00	5	1.97	0	0.00	0	0.00	0	0.00	5	0.33	0	0.00	5	0.66
<i>Brachiaria distachya</i>	194	38.14	194	76.28	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	194	12.71	194	25.43	0	0.00
<i>Brachiaria reptans</i>	33	6.49	33	12.97	0	0.00	15	2.95	15	5.90	0	0.00	0	0.00	0	0.00	0	0.00	48	3.15	48	6.29	0	0.00
<i>Cajanus scarabaeoides</i>	10	1.97	0	0.00	10	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	0.66	0	0.00	10	1.31
<i>Capillipedium assimile</i>	73	14.35	0	0.00	73	28.70	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	73	4.78	0	0.00	73	9.57
<i>Capsella bursa-pastoris</i>	5	0.98	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.33	5	0.66	0	0.00
<i>Cardiospermum halicacabum</i>	146	28.70	146	57.40	0	0.00	37	7.27	37	14.55	0	0.00	0	0.00	0	0.00	0	0.00	183	11.99	183	23.98	0	0.00
<i>Centella asiatica</i>	452	88.86	315	123.85	137	53.86	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	452	29.62	315	41.28	137	17.95
<i>Centothea lappacea</i>	50	9.83	0	0.00	50	19.66	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	50	3.28	0	0.00	50	6.55
<i>Chenopodium album</i>	26	5.11	21	8.26	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	26	1.70	21	2.75	5	0.66
<i>Christella parasitica</i>	2433	478.30	1576	619.64	857	336.95	854	167.89	581	228.43	273	107.34	483	94.95	314	123.46	169	66.45	3770	247.04	2471	323.84	1299	170.24
<i>Chromolaena odorata</i>	23	4.52	23	9.04	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	23	1.51	23	3.01	0	0.00

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Cissampelos pareira</i>	5	0.98	0	0.00	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.33	0	0.00	5	0.66
<i>Colocasia esculenta</i>	5	0.98	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.33	5	0.66	0	0.00
<i>Crassocephalum crepidioides</i>	3	0.59	0	0.00	3	1.18	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.20	0	0.00	3	0.39
<i>Cuphea carthagenensis</i>	1523	299.40	1018	400.25	505	198.55	597	117.36	451	177.32	146	57.40	0	0.00	0	0.00	0	0.00	2120	138.92	1469	192.52	651	85.32
<i>Cyathula prostrata</i>	0	0.00	0	0.00	0	0.00	9	1.77	0	0.00	9	3.54	0	0.00	0	0.00	0	0.00	9	0.59	0	0.00	9	1.18
<i>Cynodon dactylon</i>	2302	452.54	1574	618.86	728	286.23	658	129.35	449	176.54	209	82.17	502	98.69	332	130.53	170	66.84	3462	226.86	2355	308.64	1107	145.08
<i>Cyperus compactus</i>	15	2.95	15	5.90	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	15	0.98	15	1.97	0	0.00
<i>Cyperus compressus</i>	534	104.98	373	146.65	161	63.30	179	35.19	123	48.36	56	22.02	109	21.43	73	28.70	36	14.15	822	53.86	569	74.57	253	33.16
<i>Cyperus cyperoides</i>	36	7.08	33	12.97	3	1.18	13	2.56	11	4.32	2	0.79	0	0.00	0	0.00	0	0.00	49	3.21	44	5.77	5	0.66
<i>Cyperus difformis</i>	87	17.10	56	22.02	31	12.19	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	87	5.70	56	7.34	31	4.06
<i>Cyperus digitatus</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	24	4.72	24	9.44	0	0.00	24	1.57	24	3.15	0	0.00
<i>Cyperus distans</i>	298	58.58	176	69.20	122	47.97	103	20.25	53	20.84	50	19.66	0	0.00	0	0.00	0	0.00	401	26.28	229	30.01	172	22.54
<i>Cyperus eleusinoides</i>	0	0.00	0	0.00	0	0.00	2	0.39	2	0.79	0	0.00	0	0.00	0	0.00	0	0.00	2	0.13	2	0.26	0	0.00
<i>Cyperus imbricatus</i>	117	23.00	53	20.84	64	25.16	55	10.81	28	11.01	27	10.62	0	0.00	0	0.00	0	0.00	172	11.27	81	10.62	91	11.93
<i>Cyperus iria</i>	471	92.59	303	119.13	168	66.05	172	33.81	111	43.64	61	23.98	0	0.00	0	0.00	0	0.00	643	42.14	414	54.26	229	30.01
<i>Cyperus strigosus</i>	0	0.00	0	0.00	0	0.00	14	2.75	14	5.50	0	0.00	0	0.00	0	0.00	0	0.00	14	0.92	14	1.83	0	0.00
<i>Cyperus tenuispica</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	0.39	2	0.79	0	0.00	2	0.13	2	0.26	0	0.00
<i>Cyrtococcum oxyphyllum</i>	0	0.00	0	0.00	0	0.00	50	9.83	50	19.66	0	0.00	0	0.00	0	0.00	0	0.00	50	3.28	50	6.55	0	0.00
<i>Cyrtococcum patens</i>	71	13.96	57	22.41	14	5.50	32	6.29	26	10.22	6	2.36	0	0.00	0	0.00	0	0.00	103	6.75	83	10.88	20	2.62
<i>Dicranopteris linearis</i>	0	0.00	0	0.00	0	0.00	3	0.59	0	0.00	3	1.18	0	0.00	0	0.00	0	0.00	3	0.20	0	0.00	3	0.39
<i>Digitaria ciliaris</i>	1438	282.69	1039	408.51	399	156.88	417	81.98	324	127.39	93	36.57	303	59.57	213	83.75	90	35.39	2158	141.41	1576	206.55	582	76.28
<i>Digitaria setigera</i>	74	14.55	74	29.09	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	74	4.85	74	9.70	0	0.00
<i>Digitaria violascens</i>	98	19.27	0	0.00	98	38.53	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	98	6.42	0	0.00	98	12.84
<i>Diplazium esculentum</i>	62	12.19	53	20.84	9	3.54	38	7.47	32	12.58	6	2.36	0	0.00	0	0.00	0	0.00	100	6.55	85	11.14	15	1.97
<i>Drymaria cordata</i>	0	0.00	0	0.00	0	0.00	10	1.97	10	3.93	0	0.00	0	0.00	0	0.00	0	0.00	10	0.66	10	1.31	0	0.00
<i>Duchesnea indica</i>	384	75.49	248	97.51	136	53.47	108	21.23	72	28.31	36	14.15	68	13.37	41	16.12	27	10.62	560	36.70	361	47.31	199	26.08
<i>Dysphania ambrosioides</i>	40	7.86	40	15.73	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	40	2.62	40	5.24	0	0.00
<i>Eclipta prostrata</i>	538	105.76	380	149.41	158	62.12	134	26.34	91	35.78	43	16.91	105	20.64	61	23.98	44	17.30	777	50.92	532	69.72	245	32.11
<i>Emilia sonchifolia</i>	16	3.15	16	6.29	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	16	1.05	16	2.10	0	0.00
<i>Erigeron bonariensis</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.20	0	0.00	1	0.39	1	0.07	0	0.00	1	0.13
<i>Ethulia conyzoides</i>	802	157.66	530	208.38	272	106.94	255	50.13	190	74.70	65	25.56	179	35.19	117	46.00	62	24.38	1236	80.99	837	109.70	399	52.29
<i>Euphorbia heterophylla</i>	17	3.34	0	0.00	17	6.68	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	17	1.11	0	0.00	17	2.23
<i>Euphorbia hirta</i>	335	65.86	165	64.87	170	66.84	126	24.77	60	23.59	66	25.95	104	20.45	59	23.20	45	17.69	565	37.02	284	37.22	281	36.83
<i>Euphorbia hypericifolia</i>	569	111.86	569	223.72	0	0.00	165	32.44	165	64.87	0	0.00	76	14.94	76	29.88	0	0.00	810	53.08	810	106.16	0	0.00
<i>Euphorbia thymifolia</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	14	2.75	0	0.00	14	5.50	14	0.92	0	0.00	14	1.83
<i>Flemingia lineata</i>	299	58.78	214	84.14	85	33.42	74	14.55	52	20.45	22	8.65	0	0.00	0	0.00	0	0.00	373	24.44	266	34.86	107	14.02
<i>Floscopa scandens</i>	0	0.00	0	0.00	0	0.00	1	0.20	0	0.00	1	0.39	0	0.00	0	0.00	0	0.00	1	0.07	0	0.00	1	0.13
<i>Glinus oppositifolius</i>	360	70.77	234	92.00	126	49.54	0	0.00	0	0.00	0	0.00	91	17.89	60	23.59	31	12.19	451	29.55	294	38.53	157	20.58
<i>Gnaphalium pensylvanicum</i>	209	41.09	159	62.51	50	19.66	89	17.50	56	22.02	33	12.97	0	0.00	0	0.00	0	0.00	298	19.53	215	28.18	83	10.88
<i>Grangea maderaspatana</i>	975	191.67	634	249.27	341	134.07	296	58.19	224	88.07	72	28.31	202	39.71	131	51.51	71	27.92	1473	96.52	989	129.62	484	63.43
<i>Heliotropium indicum</i>	382	75.10	221	86.89	161	63.30	156	30.67	92	36.17	64	25.16	133	26.15	77	30.27	56	22.02	671	43.97	390	51.11	281	36.83
<i>Heliotropium ovalifolium</i>	42	8.26	0	0.00	42	16.51	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	42	2.75	0	0.00	42	5.50
<i>Hemarthria compressa</i>	1889	371.35	1326	521.35	563	221.36	543	106.75	382	150.19	161	63.30	429	84.34	284	111.66	145	57.01	2861	187.48	1992	261.07	869	113.89
<i>Houttuynia cordata</i>	3	0.59	0	0.00	3	1.18	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.20	0	0.00	3	0.39
<i>Hydrocotyle sibthorpioides</i>	84	16.51	21	8.26	63	24.77	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	84	5.50	21	2.75	63	8.26
<i>Hymenachne amplexicaulis</i>	23	4.52	18	7.08	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	23	1.51	18	2.36	5	0.66
<i>Hyptis suaveolens</i>	437	85.91	293	115.20	144	56.62	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	437	28.64	293	38.40	144	18.87
<i>Ichnanthus pallens</i>	0	0.00	0	0.00	0	0.00	5	0.98	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	5	0.33	5	0.66	0	0.00
<i>Impatiens tripetala</i>	9	1.77	0	0.00	9	3.54	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	9	0.59	0	0.00	9	1.18
<i>Imperata cylindrica</i>	22770</																							

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
Leersia hexandra	54	10.62	54	21.23	0	0.00	17	3.34	17	6.68	0	0.00	0	0.00	0	0.00	0	0.00	71	4.65	71	9.31	0	0.00
Leucas aspera	244	47.97	143	56.22	101	39.71	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	244	15.99	143	18.74	101	13.24
Leucostegia immersa	5	0.98	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.33	5	0.66	0	0.00
Lygodium flexuosum	821	161.40	540	212.31	281	110.48	303	59.57	208	81.78	95	37.35	148	29.09	101	39.71	47	18.48	1272	83.35	849	111.27	423	55.44
Lygodium microphyllum	72	14.15	46	18.09	26	10.22	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	72	4.72	46	6.03	26	3.41
Merremia umbellata	2389	469.65	1670	656.60	719	282.69	705	138.59	504	198.16	201	79.03	535	105.17	344	135.25	191	75.10	3629	237.81	2518	330.00	1111	145.61
Mikania micrantha	793	155.89	519	204.06	274	107.73	313	61.53	216	84.93	97	38.14	0	0.00	0	0.00	0	0.00	1106	72.48	735	96.33	371	48.62
Oldenlandia lineata	0	0.00	0	0.00	0	0.00	14	2.75	0	0.00	14	5.50	0	0.00	0	0.00	0	0.00	14	0.92	0	0.00	14	1.83
Oldenlandia tenelliflora	0	0.00	0	0.00	0	0.00	14	2.75	0	0.00	14	5.50	0	0.00	0	0.00	0	0.00	14	0.92	0	0.00	14	1.83
Onychium japonicum	12	2.36	0	0.00	12	4.72	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	12	0.79	0	0.00	12	1.57
Opismenus burmanni	614	120.70	438	172.21	176	69.20	225	44.23	167	65.66	58	22.80	130	25.56	90	35.39	40	15.73	969	63.50	695	91.09	274	35.91
Opismenus compositus	248	48.75	248	97.51	0	0.00	98	19.27	98	38.53	0	0.00	0	0.00	0	0.00	0	0.00	346	22.67	346	45.35	0	0.00
Ottochloa nodosa	0	0.00	0	0.00	0	0.00	3	0.59	3	1.18	0	0.00	0	0.00	0	0.00	0	0.00	3	0.20	3	0.39	0	0.00
Oxalis corniculata	1535	301.76	968	380.59	567	222.93	503	98.88	335	131.71	168	66.05	345	67.82	216	84.93	129	50.72	2383	156.16	1519	199.08	864	113.23
Panicum auritum	29	5.70	29	11.40	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	29	1.90	29	3.80	0	0.00
Panicum brevifolium	100	19.66	0	0.00	100	39.32	22	4.32	0	0.00	22	8.65	0	0.00	0	0.00	0	0.00	122	7.99	0	0.00	122	15.99
Panicum notatum	621	122.08	353	138.79	268	105.37	205	40.30	122	47.97	83	32.63	0	0.00	0	0.00	0	0.00	826	54.13	475	62.25	351	46.00
Parthenium hysterophorus	151	29.68	87	34.21	64	25.16	79	15.53	47	18.48	32	12.58	0	0.00	0	0.00	0	0.00	230	15.07	134	17.56	96	12.58
Paspalidium flavidum	147	28.90	83	32.63	64	25.16	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	147	9.63	83	10.88	64	8.39
Paspalum conjugatum	1647	323.78	1162	456.87	485	190.69	527	103.60	393	154.52	134	52.69	364	71.56	253	99.47	111	43.64	2538	166.31	1808	236.95	730	95.67
Paspalum dilatatum	231	45.41	180	70.77	51	20.05	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	231	15.14	180	23.59	51	6.68
Paspalum scrobiculatum	99	19.46	99	38.92	0	0.00	27	5.31	27	10.62	0	0.00	0	0.00	0	0.00	0	0.00	126	8.26	126	16.51	0	0.00
Persicaria barbata	27	5.31	19	7.47	8	3.15	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	27	1.77	19	2.49	8	1.05
Persicaria chinensis	4	0.79	4	1.57	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	4	0.26	4	0.52	0	0.00
Persicaria hydropiper	339	66.64	243	95.54	96	37.74	142	27.92	89	34.99	53	20.84	105	20.64	64	25.16	41	16.12	586	38.40	396	51.90	190	24.90
Persicaria orientalis	14	2.75	14	5.50	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	14	0.92	14	1.83	0	0.00
Phyla nodiflora	111	21.82	82	32.24	29	11.40	28	5.50	17	6.68	11	4.32	24	4.72	18	7.08	6	2.36	163	10.68	117	15.33	46	6.03
Phyllanthus niruri	2613	513.68	1750	688.06	863	339.31	942	185.19	642	252.42	300	117.95	568	111.66	374	147.05	194	76.28	4123	270.18	2766	362.51	1357	177.85
Phyllanthus virgatus	0	0.00	0	0.00	0	0.00	12	2.36	0	0.00	12	4.72	0	0.00	0	0.00	0	0.00	12	0.79	0	0.00	12	1.57
Plantago major	14	2.75	0	0.00	14	5.50	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	14	0.92	0	0.00	14	1.83
Plectranthus sp.	5	0.98	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.33	5	0.66	0	0.00
Polycarpon prostratum	1305	256.55	878	345.21	427	167.89	329	64.68	229	90.04	100	39.32	209	41.09	141	55.44	68	26.74	1843	120.77	1248	163.56	595	77.98
Polygonum plebeium	1923	378.04	1315	517.02	608	239.05	606	119.13	414	162.77	192	75.49	375	73.72	243	95.54	132	51.90	2904	190.30	1972	258.45	932	122.15
Polygonum posumbo	61	11.99	61	23.98	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	61	4.00	61	7.99	0	0.00
Pouzolzia zeylanica	2496	490.68	1686	662.89	810	318.47	915	179.88	642	252.42	273	107.34	483	94.95	311	122.28	172	67.63	3894	255.17	2639	345.86	1255	164.48
Rorippa indica	1566	307.86	1024	402.61	542	213.10	527	103.60	390	153.34	137	53.86	305	59.96	192	75.49	113	44.43	2398	157.14	1606	210.48	792	103.80
Rumex dentatus	32	6.29	0	0.00	32	12.58	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	32	2.10	0	0.00	32	4.19
Rungia pectinata	160	31.45	95	37.35	65	25.56	41	8.06	19	7.47	22	8.65	38	7.47	26	10.22	12	4.72	239	15.66	140	18.35	99	12.97
Rungia repens	140	27.52	90	35.39	50	19.66	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	140	9.17	90	11.80	50	6.55
Saccharum spp.	1364	268.15	827	325.16	537	211.13	700	137.61	490	192.66	210	82.57	343	67.43	235	92.40	108	42.46	2407	157.73	1552	203.40	855	112.05
Scleria terrestris	1219	239.64	839	329.87	380	149.41	484	95.15	325	127.78	159	62.51	0	0.00	0	0.00	0	0.00	1703	111.60	1164	152.55	539	70.64
Senna tora	19	3.74	7	2.75	12	4.72	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	19	1.25	7	0.92	12	1.57
Setaria pumila	1513	297.44	1030	404.97	483	189.90	502	98.69	353	138.79	149	58.58	325	63.89	224	88.07	101	39.71	2340	153.34	1607	210.61	733	96.07
Sida acuta	12	2.36	12	4.72	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	12	0.79	12	1.57	0	0.00
Solanum viarum	115	22.61	61	23.98	54	21.23	51	10.03	34	13.37	17	6.68	0	0.00	0	0.00	0	0.00	166	10.88	95	12.45	71	9.31
Sonchus oleraceus	3	0.59	3	1.18	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.20	3	0.39	0	0.00
Spermacoce pusilla	21	4.13	17	6.68	4	1.57	10	1.97	8	3.15	2	0.79	0	0.00	0	0.00	0	0.00	31	2.03	25	3.28	6	0.79
Sporobolus fertilis	96	18.87	57	22.41	39	15.33	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	96	6.29	57	7.47	39	5.11
Tetrastigma dubium	12	2.36	12	4.72	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00										

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Verbena officinalis</i>	9	1.77	9	3.54	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	9	0.59	9	1.18	0	0.00
<i>Vicia sativa</i>	9	1.77	9	3.54	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	9	0.59	9	1.18	0	0.00
<i>Younqia japonica</i>	4	0.79	4	1.57	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	4	0.26	4	0.52	0	0.00
UI 4	0	0.00	0	0.00	0	0.00	4	0.79	0	0.00	4	1.57	0	0.00	0	0.00	0	0.00	4	0.26	0	0.00	4	0.52
UI 5	270	53.08	174	68.41	96	37.74	78	15.33	49	19.27	29	11.40	0	0.00	0	0.00	0	0.00	348	22.80	223	29.23	125	16.38
UI 6	0	0.00	0	0.00	0	0.00	5	0.98	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	5	0.33	5	0.66	0	0.00
UI 7	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	4	0.79	4	1.57	0	0.00	4	0.26	4	0.52	0	0.00
UI 8	333	65.46	228	89.64	105	41.28	97	19.07	66	25.95	31	12.19	66	12.97	45	17.69	21	8.26	496	32.50	339	44.43	157	20.58
UI 10	104	20.45	63	24.77	41	16.12	45	8.85	35	13.76	10	3.93	26	5.11	19	7.47	7	2.75	175	11.47	117	15.33	58	7.60
UI 11	42	8.26	42	16.51	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	42	2.75	42	5.50	0	0.00
UI 14	20	3.93	0	0.00	20	7.86	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	20	1.31	0	0.00	20	2.62
UI 18	6	1.18	6	2.36	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	6	0.39	6	0.79	0	0.00
UI 19	9	1.77	9	3.54	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	9	0.59	9	1.18	0	0.00
UI 20	0	0.00	0	0.00	0	0.00	5	0.98	5	1.97	0	0.00	0	0.00	0	0.00	0	0.00	5	0.33	5	0.66	0	0.00
UI 21	57	11.21	57	22.41	0	0.00	17	3.34	17	6.68	0	0.00	0	0.00	0	0.00	0	0.00	74	4.85	74	9.70	0	0.00
UI 25	44	8.65	44	17.30	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	44	2.88	44	5.77	0	0.00
UI 26	24	4.72	24	9.44	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	24	1.57	24	3.15	0	0.00
UI 28	6	1.18	0	0.00	6	2.36	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	6	0.39	0	0.00	6	0.79
UI (premature mortality)	826	162.38	589	231.58	237	93.18	264	51.90	224	88.07	40	15.73	68	13.37	63	24.77	5	1.97	1158	75.88	876	114.81	282	36.96

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.34. Overall and seasonal plant species total seed abundances recorded from different soil layers tall riverine alluvial grasslands soil seed bank during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Achyranthes aspera</i>	3.33	0.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	3.33	0.00	3.33
<i>Acmella uliginosa</i>	94.00	61.33	32.67	24.33	16.33	8.00	0.00	0.00	0.00	118.33	77.67	40.67
<i>Acroceras zizanioides</i>	378.33	273.67	104.67	125.00	96.00	29.00	82.67	58.00	24.67	586.00	427.67	158.33
<i>Acroceras munroanum</i>	8.00	0.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	0.00	8.00
<i>Adenostemma lavenia</i>	0.00	0.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Adiantum caudatum</i>	209.67	148.00	61.67	60.33	40.67	19.67	46.67	29.33	17.33	316.67	218.00	98.67
<i>Adiantum philippense</i>	16.33	16.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.33	16.33	0.00
<i>Adiantum capillus-veneris</i>	1.67	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	1.67
<i>Ageratum conyzoides</i>	186.67	136.33	50.33	63.67	43.00	20.67	43.67	31.00	12.67	294.00	210.33	83.67
<i>Alpinia nigra</i>	24.67	17.00	7.67	0.00	0.00	0.00	0.00	0.00	0.00	24.67	17.00	7.67
<i>Alternanthera pungens</i>	232.33	132.67	99.67	49.00	33.00	16.00	0.00	0.00	0.00	281.33	165.67	115.67
<i>Alternanthera sessilis</i>	437.33	297.33	140.00	142.00	104.00	38.00	81.00	57.00	24.00	660.33	458.33	202.00
<i>Amaranthus spinosus</i>	76.00	38.00	38.00	41.67	24.00	17.67	0.00	0.00	0.00	117.67	62.00	55.67
<i>Ampelopteris prolifera</i>	122.67	122.67	0.00	35.00	35.00	0.00	0.00	0.00	0.00	157.67	157.67	0.00
<i>Apluda mutica</i>	933.33	634.33	299.00	300.33	206.33	94.00	190.33	121.33	69.00	1424.00	962.00	462.00
<i>Arenaria serpyllifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
<i>Aristida adscensionis</i>	34.33	34.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34.33	34.33	0.00
<i>Arundinella bengalensis</i>	124.00	124.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	124.00	124.00	0.00
<i>Azolla pinnata</i>	32.33	23.33	9.00	0.00	0.00	0.00	0.00	0.00	0.00	32.33	23.33	9.00
<i>Blumea lacera</i>	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
<i>Boerhavia diffusa</i>	0.00	0.00	0.00	1.67	0.00	1.67	0.00	0.00	0.00	1.67	0.00	1.67
<i>Brachiaria distachya</i>	64.67	64.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	64.67	64.67	0.00

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Brachiaria reptans</i>	11.00	11.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00	16.00	16.00	0.00
<i>Cajanus scarabaeoides</i>	3.33	0.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	3.33	0.00	3.33
<i>Capillipedium assimile</i>	24.33	0.00	24.33	0.00	0.00	0.00	0.00	0.00	0.00	24.33	0.00	24.33
<i>Capsella bursa-pastoris</i>	1.67	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Cardiospermum halicacabum</i>	48.67	48.67	0.00	12.33	12.33	0.00	0.00	0.00	0.00	61.00	61.00	0.00
<i>Centella asiatica</i>	150.67	105.00	45.67	0.00	0.00	0.00	0.00	0.00	0.00	150.67	105.00	45.67
<i>Centothea lappacea</i>	16.67	0.00	16.67	0.00	0.00	0.00	0.00	0.00	0.00	16.67	0.00	16.67
<i>Chenopodium album</i>	8.67	7.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	8.67	7.00	1.67
<i>Christella parasitica</i>	811.00	525.33	285.67	284.67	193.67	91.00	161.00	104.67	56.33	1256.67	823.67	433.00
<i>Chromolaena odorata</i>	7.67	7.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.67	7.67	0.00
<i>Cissampelos pareira</i>	1.67	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	1.67
<i>Colocasia esculenta</i>	1.67	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Crassocephalum crepidioides</i>	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
<i>Cuphea carthagenensis</i>	507.67	339.33	168.33	199.00	150.33	48.67	0.00	0.00	0.00	706.67	489.67	217.00
<i>Cyathula prostrata</i>	0.00	0.00	0.00	3.00	0.00	3.00	0.00	0.00	0.00	3.00	0.00	3.00
<i>Cynodon dactylon</i>	767.33	524.67	242.67	219.33	149.67	69.67	167.33	110.67	56.67	1154.00	785.00	369.00
<i>Cyperus compactus</i>	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00
<i>Cyperus compressus</i>	178.00	124.33	53.67	59.67	41.00	18.67	36.33	24.33	12.00	274.00	189.67	84.33
<i>Cyperus cyperoides</i>	12.00	11.00	1.00	4.33	3.67	0.67	0.00	0.00	0.00	16.33	14.67	1.67
<i>Cyperus difformis</i>	29.00	18.67	10.33	0.00	0.00	0.00	0.00	0.00	0.00	29.00	18.67	10.33
<i>Cyperus digitatus</i>	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00	0.00	8.00	8.00	0.00
<i>Cyperus distans</i>	99.33	58.67	40.67	34.33	17.67	16.67	0.00	0.00	0.00	133.67	76.33	57.33
<i>Cyperus eleusinoides</i>	0.00	0.00	0.00	0.67	0.67	0.00	0.00	0.00	0.00	0.67	0.67	0.00
<i>Cyperus imbricatus</i>	39.00	17.67	21.33	18.33	9.33	9.00	0.00	0.00	0.00	57.33	27.00	30.33
<i>Cyperus iria</i>	157.00	101.00	56.00	57.33	37.00	20.33	0.00	0.00	0.00	214.33	138.00	76.33
<i>Cyperus strigosus</i>	0.00	0.00	0.00	4.67	4.67	0.00	0.00	0.00	0.00	4.67	4.67	0.00
<i>Cyperus tenuispica</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.67	0.00	0.67	0.67	0.00
<i>Cyrtococcum oxyphyllum</i>	0.00	0.00	0.00	16.67	16.67	0.00	0.00	0.00	0.00	16.67	16.67	0.00
<i>Cyrtococcum patens</i>	23.67	19.00	4.67	10.67	8.67	2.00	0.00	0.00	0.00	34.33	27.67	6.67
<i>Dicranopteris linearis</i>	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00	1.00
<i>Digitaria ciliaris</i>	479.33	346.33	133.00	139.00	108.00	31.00	101.00	71.00	30.00	719.33	525.33	194.00
<i>Digitaria setigera</i>	24.67	24.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.67	24.67	0.00
<i>Digitaria violascens</i>	32.67	0.00	32.67	0.00	0.00	0.00	0.00	0.00	0.00	32.67	0.00	32.67
<i>Diplazium esculentum</i>	20.67	17.67	3.00	12.67	10.67	2.00	0.00	0.00	0.00	33.33	28.33	5.00
<i>Drymaria cordata</i>	0.00	0.00	0.00	3.33	3.33	0.00	0.00	0.00	0.00	3.33	3.33	0.00
<i>Duchesnea indica</i>	128.00	82.67	45.33	36.00	24.00	12.00	22.67	13.67	9.00	186.67	120.33	66.33
<i>Dysphania ambrosioides</i>	13.33	13.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.33	13.33	0.00
<i>Eclipta prostrata</i>	179.33	126.67	52.67	44.67	30.33	14.33	35.00	20.33	14.67	259.00	177.33	81.67
<i>Emilia sonchifolia</i>	5.33	5.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.33	5.33	0.00
<i>Erigeron bonariensis</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.33	0.33	0.00	0.33
<i>Ethulia conyzoides</i>	267.33	176.67	90.67	85.00	63.33	21.67	59.67	39.00	20.67	412.00	279.00	133.00
<i>Euphorbia heterophylla</i>	5.67	0.00	5.67	0.00	0.00	0.00	0.00	0.00	0.00	5.67	0.00	5.67
<i>Euphorbia hirta</i>	111.67	55.00	56.67	42.00	20.00	22.00	34.67	19.67	15.00	188.33	94.67	93.67
<i>Euphorbia hypericifolia</i>	189.67	189.67	0.00	55.00	55.00	0.00	25.33	25.33	0.00	270.00	270.00	0.00
<i>Euphorbia thymifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	4.67	0.00	4.67	4.67	0.00	4.67
<i>Flemingia lineata</i>	99.67	71.33	28.33	24.67	17.33	7.33	0.00	0.00	0.00	124.33	88.67	35.67
<i>Floscopa scandens</i>	0.00	0.00	0.00	0.33	0.00	0.33	0.00	0.00	0.00	0.33	0.00	0.33
<i>Glinus oppositifolius</i>	120.00	78.00	42.00	0.00	0.00	0.00	30.33	20.00	10.33	150.33	98.00	52.33
<i>Gnaphalium pensylvanicum</i>	69.67	53.00	16.67	29.67	18.67	11.00	0.00	0.00	0.00	99.33	71.67	27.67
<i>Grangea maderaspatana</i>	325.00	211.33	113.67	98.67	74.67	24.00	67.33	43.67	23.67	491.00	329.67	161.33
<i>Heliotropium indicum</i>	127.33	73.67	53.67	52.00	30.67	21.33	44.33	25.67	18.67	223.67	130.00	93.67
<i>Heliotropium ovalifolium</i>	14.00	0.00	14.00	0.00	0.00	0.00	0.00	0.00	0.00	14.00	0.00	14.00
<i>Hemarthria compressa</i>	629.67	442.00	187.67	181.00	127.33	53.67	143.00	94.67	48.33	953.67	664.00	289.67

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Houttuynia cordata</i>	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
<i>Hydrocotyle sibthorpioides</i>	28.00	7.00	21.00	0.00	0.00	0.00	0.00	0.00	0.00	28.00	7.00	21.00
<i>Hymenachne amplexicaulis</i>	7.67	6.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	7.67	6.00	1.67
<i>Hyptis suaveolens</i>	145.67	97.67	48.00	0.00	0.00	0.00	0.00	0.00	0.00	145.67	97.67	48.00
<i>Ichnanthus pallens</i>	0.00	0.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Impatiens tripetala</i>	3.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	3.00
<i>Imperata cylindrica</i>	756.67	493.67	263.00	287.00	217.33	69.67	182.00	110.33	71.67	1225.67	821.33	404.33
<i>Kyllinga brevifolia</i>	248.33	170.00	78.33	79.00	56.00	23.00	27.33	20.00	7.33	354.67	246.00	108.67
<i>Laphangium luteoalbum</i>	162.33	122.67	39.67	53.00	37.00	16.00	34.67	21.67	13.00	250.00	181.33	68.67
<i>Leersia hexandra</i>	18.00	18.00	0.00	5.67	5.67	0.00	0.00	0.00	0.00	23.67	23.67	0.00
<i>Leucas aspera</i>	81.33	47.67	33.67	0.00	0.00	0.00	0.00	0.00	0.00	81.33	47.67	33.67
<i>Leucostegia immersa</i>	1.67	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Lygodium flexuosum</i>	273.67	180.00	93.67	101.00	69.33	31.67	49.33	33.67	15.67	424.00	283.00	141.00
<i>Lygodium microphyllum</i>	24.00	15.33	8.67	0.00	0.00	0.00	0.00	0.00	0.00	24.00	15.33	8.67
<i>Merremia umbellata</i>	796.33	556.67	239.67	235.00	168.00	67.00	178.33	114.67	63.67	1209.67	839.33	370.33
<i>Mikania micrantha</i>	264.33	173.00	91.33	104.33	72.00	32.33	0.00	0.00	0.00	368.67	245.00	123.67
<i>Oldenlandia lineata</i>	0.00	0.00	0.00	4.67	0.00	4.67	0.00	0.00	0.00	4.67	0.00	4.67
<i>Oldenlandia tenelliflora</i>	0.00	0.00	0.00	4.67	0.00	4.67	0.00	0.00	0.00	4.67	0.00	4.67
<i>Onychium japonicum</i>	4.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	4.00
<i>Oplismenus burmanni</i>	204.67	146.00	58.67	75.00	55.67	19.33	43.33	30.00	13.33	323.00	231.67	91.33
<i>Oplismenus compositus</i>	82.67	82.67	0.00	32.67	32.67	0.00	0.00	0.00	0.00	115.33	115.33	0.00
<i>Ottocloa nodosa</i>	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00
<i>Oxalis corniculata</i>	511.67	322.67	189.00	167.67	111.67	56.00	115.00	72.00	43.00	794.33	506.33	288.00
<i>Panicum auritum</i>	9.67	9.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.67	9.67	0.00
<i>Panicum brevifolium</i>	33.33	0.00	33.33	7.33	0.00	7.33	0.00	0.00	0.00	40.67	0.00	40.67
<i>Panicum notatum</i>	207.00	117.67	89.33	68.33	40.67	27.67	0.00	0.00	0.00	275.33	158.33	117.00
<i>Parthenium hysterophorus</i>	50.33	29.00	21.33	26.33	15.67	10.67	0.00	0.00	0.00	76.67	44.67	32.00
<i>Paspalidium flavidum</i>	49.00	27.67	21.33	0.00	0.00	0.00	0.00	0.00	0.00	49.00	27.67	21.33
<i>Paspalum conjugatum</i>	549.00	387.33	161.67	175.67	131.00	44.67	121.33	84.33	37.00	846.00	602.67	243.33
<i>Paspalum dilatatum</i>	77.00	60.00	17.00	0.00	0.00	0.00	0.00	0.00	0.00	77.00	60.00	17.00
<i>Paspalum scrobiculatum</i>	33.00	33.00	0.00	9.00	9.00	0.00	0.00	0.00	0.00	42.00	42.00	0.00
<i>Persicaria barbata</i>	9.00	6.33	2.67	0.00	0.00	0.00	0.00	0.00	0.00	9.00	6.33	2.67
<i>Persicaria chinensis</i>	1.33	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33	1.33	0.00
<i>Persicaria hydropiper</i>	113.00	81.00	32.00	47.33	29.67	17.67	35.00	21.33	13.67	195.33	132.00	63.33
<i>Persicaria orientalis</i>	4.67	4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67	4.67	0.00
<i>Phyla nodiflora</i>	37.00	27.33	9.67	9.33	5.67	3.67	8.00	6.00	2.00	54.33	39.00	15.33
<i>Phyllanthus niruri</i>	871.00	583.33	287.67	314.00	214.00	100.00	189.33	124.67	64.67	1374.33	922.00	452.33
<i>Phyllanthus virgatus</i>	0.00	0.00	0.00	4.00	0.00	4.00	0.00	0.00	0.00	4.00	0.00	4.00
<i>Plantago major</i>	4.67	0.00	4.67	0.00	0.00	0.00	0.00	0.00	0.00	4.67	0.00	4.67
<i>Plectranthus sp.</i>	1.67	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Polycarpon prostratum</i>	435.00	292.67	142.33	109.67	76.33	33.33	69.67	47.00	22.67	614.33	416.00	198.33
<i>Polygonum plebeium</i>	641.00	438.33	202.67	202.00	138.00	64.00	125.00	81.00	44.00	968.00	657.33	310.67
<i>Polygonum posumbo</i>	20.33	20.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.33	20.33	0.00
<i>Pouzolzia zeylanica</i>	832.00	562.00	270.00	305.00	214.00	91.00	161.00	103.67	57.33	1298.00	879.67	418.33
<i>Rorippa indica</i>	522.00	341.33	180.67	175.67	130.00	45.67	101.67	64.00	37.67	799.33	535.33	264.00
<i>Rumex dentatus</i>	10.67	0.00	10.67	0.00	0.00	0.00	0.00	0.00	0.00	10.67	0.00	10.67
<i>Rungla pectinata</i>	53.33	31.67	21.67	13.67	6.33	7.33	12.67	8.67	4.00	79.67	46.67	33.00
<i>Rungia repens</i>	46.67	30.00	16.67	0.00	0.00	0.00	0.00	0.00	0.00	46.67	30.00	16.67
<i>Saccharum spp.</i>	454.67	275.67	179.00	233.33	163.33	70.00	114.33	78.33	36.00	802.33	517.33	285.00
<i>Scleria terrestris</i>	406.33	279.67	126.67	161.33	108.33	53.00	0.00	0.00	0.00	567.67	388.00	179.67
<i>Senna tora</i>	6.33	2.33	4.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33	2.33	4.00
<i>Setaria pumila</i>	504.33	343.33	161.00	167.33	117.67	49.67	108.33	74.67	33.67	780.00	535.67	244.33
<i>Sida acuta</i>	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Solanum viarum</i>	38.33	20.33	18.00	17.00	11.33	5.67	0.00	0.00	0.00	55.33	31.67	23.67
<i>Sonchus oleraceus</i>	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00
<i>Spermacoce pusilla</i>	7.00	5.67	1.33	3.33	2.67	0.67	0.00	0.00	0.00	10.33	8.33	2.00
<i>Sporobolus fertilis</i>	32.00	19.00	13.00	0.00	0.00	0.00	0.00	0.00	0.00	32.00	19.00	13.00
<i>Tetragstigma dubium</i>	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00
<i>Themeda spp.</i>	54.00	27.67	26.33	29.67	16.67	13.00	0.00	0.00	0.00	83.67	44.33	39.33
<i>Typhonium trilobatum</i>	0.67	0.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.00	0.67
<i>Urochloa panicoides</i>	7.00	7.00	0.00	4.00	4.00	0.00	0.00	0.00	0.00	11.00	11.00	0.00
<i>Verbena officinalis</i>	3.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.00	0.00
<i>Vicia sativa</i>	3.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.00	0.00
<i>Youngia japonica</i>	1.33	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33	1.33	0.00
UI 4	0.00	0.00	0.00	1.33	0.00	1.33	0.00	0.00	0.00	1.33	0.00	1.33
UI 5	90.00	58.00	32.00	26.00	16.33	9.67	0.00	0.00	0.00	116.00	74.33	41.67
UI 6	0.00	0.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	1.67	1.67	0.00
UI 7	0.00	0.00	0.00	0.00	0.00	0.00	1.33	1.33	0.00	1.33	1.33	0.00
UI 8	111.00	76.00	35.00	32.33	22.00	10.33	22.00	15.00	7.00	165.33	113.00	52.33
UI 10	34.67	21.00	13.67	15.00	11.67	3.33	8.67	6.33	2.33	58.33	39.00	19.33
UI 11	14.00	14.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.00	14.00	0.00
UI 14	6.67	0.00	6.67	0.00	0.00	0.00	0.00	0.00	0.00	6.67	0.00	6.67
UI 18	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	0.00
UI 19	3.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.00	0.00
UI 20	0.00	0.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	1.67	1.67	0.00
UI 21	19.00	19.00	0.00	5.67	5.67	0.00	0.00	0.00	0.00	24.67	24.67	0.00
UI 25	14.67	14.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.67	14.67	0.00
UI 26	8.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00	0.00
UI 28	2.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00
UK (premature mortality)	275.33	196.33	79.00	88.00	74.67	13.33	22.67	21.00	1.67	386.00	292.00	94.00

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.35. Overall and seasonal plant species mean seed abundances recorded from different soil layers of tall riverine alluvial grasslands soil seed bank during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Achyranthes aspera</i>	3.33±0.00	0.00	3.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00
<i>Acnema uliginosa</i>	11.75±2.24	15.33±3.39	8.17±1.84	3.04±0.79	4.08±1.34	2.00±0.59	0.00	0.00	0.00	14.79±2.72	19.42±3.84	10.17±2.35
<i>Acroceras zizanioides</i>	47.29±8.52	68.42±2.03	26.17±6.08	15.63±3.51	24.00±2.61	7.25±1.95	10.33±1.93	14.50±1.16	6.17±2.10	73.25±13.59	106.92±3.01	39.58±9.86
<i>Acroceras munroanum</i>	8.00±0.00	0.00	8.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00±0.00	0.00	8.00±0.00
<i>Adenostemma lavenia</i>	0.00	0.00	0.00	0.83±0.17	0.83±0.17	0.00	0.00	0.00	0.00	0.83±0.17	0.83±0.17	0.00
<i>Adiantum caudatum</i>	26.21±4.45	37.00±2.78	15.42±2.67	7.54±1.10	10.17±0.91	4.92±0.46	5.83±0.82	7.33±1.11	4.33±0.65	39.58±5.94	54.50±3.24	24.67±2.45
<i>Adiantum philippense</i>	16.33±0.00	16.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.33±0.00	16.33±0.00	0.00
<i>Adiantum capillus-veneris</i>	1.67±0.00	0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00
<i>Ageratum conyzoides</i>	23.33±4.80	34.08±5.37	12.58±1.31	7.96±1.47	10.75±2.02	5.17±0.88	5.46±0.94	7.75±0.74	3.17±0.22	36.75±6.93	52.58±7.27	20.92±1.99
<i>Alpinia nigra</i>	3.08±0.64	4.25±0.64	1.92±0.77	0.00	0.00	0.00	0.00	0.00	0.00	3.08±0.64	4.25±0.64	1.92±0.77
<i>Alternanthera pungens</i>	33.19±4.69	44.22±0.91	24.92±4.83	7.00±2.61	11.00±5.67	4.00±0.88	0.00	0.00	0.00	40.19±6.39	55.22±4.89	28.92±5.68
<i>Alternanthera sessilis</i>	54.67±8.28	74.33±7.04	35.00±3.55	17.75±4.05	26.00±5.44	9.50±1.22	10.13±1.89	14.25±1.77	6.00±1.47	82.54±13.93	114.58±13.51	50.50±6.21
<i>Amaranthus spinosus</i>	9.50±0.67	9.50±1.27	9.50±0.70	5.21±0.47	6.00±0.36	4.42±0.70	0.00	0.00	0.00	14.71±0.92	15.50±1.58	13.92±1.00
<i>Ampelopteris prolifera</i>	61.33±9.00	61.33±9.00	0.00	17.50±7.17	17.50±7.17	0.00	0.00	0.00	0.00	78.83±16.17	78.83±16.17	0.00
<i>Apluda mutica</i>	116.67±17.29	158.58±9.89	74.75±11.20	37.54±5.63	51.58±3.73	23.50±1.55	23.79±2.98	30.33±2.45	17.25±2.64	178.00±25.26	240.50±13.42	115.50±13.92

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Arenaria serpyllifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	1±0	0.00	1.00±0.00	1.00±0.00	0.00
<i>Aristida adscensionis</i>	34.33±0.00	34.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34.33±0.00	34.33±0.00	0.00
<i>Arundinella bengalensis</i>	31.00±3.92	31.00±3.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	31.00±3.92	31.00±3.92	0.00
<i>Azolla pinnata</i>	6.47±0.85	7.78±0.22	4.50±0.83	0.00	0.00	0.00	0.00	0.00	0.00	6.47±0.85	7.78±0.22	4.50±0.83
<i>Blumea lacera</i>	1.00±0.00	0.00	1.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00
<i>Boerhavia diffusa</i>	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00
<i>Brachiaria distachya</i>	32.33±11.33	32.33±11.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.33±11.33	32.33±11.33	0.00
<i>Brachiaria reptans</i>	11.00±0.00	11.00±0.00	0.00	5.00±0.00	5±0	0.00	0.00	0.00	0.00	16.00±0.00	16.00±0.00	0.00
<i>Cajanus scarabaeoides</i>	3.33±0.00	0.00	3.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00
<i>Capillipedium assimile</i>	12.17±1.83	0.00	12.17±1.83	0.00	0.00	0.00	0.00	0.00	0.00	12.17±1.83	0.00	12.17±1.83
<i>Capsella bursa-pastoris</i>	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Cardiospermum halicacabum</i>	24.33±0.67	24.33±0.67	0.00	6.17±1.50	6.17±1.50	0.00	0.00	0.00	0.00	30.50±2.17	30.50±2.17	0.00
<i>Centella asiatica</i>	18.83±3.10	26.25±2.33	11.42±1.62	0.00	0.00	0.00	0.00	0.00	0.00	18.83±3.10	26.25±2.33	11.42±1.62
<i>Centotheca lappacea</i>	16.67±0.00	0.00	16.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.67±0.00	0.00	16.67±0.00
<i>Chenopodium album</i>	2.89±0.62	3.50±0.17	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.89±0.62	3.50±0.17	1.67±0.00
<i>Christella parasitica</i>	101.38±14.27	131.33±13.29	71.42±13.22	35.58±5.56	48.42±5.54	22.75±1.89	20.13±3.41	26.17±4.83	14.08±2.59	157.08±22.59	205.92±22.85	108.25±16.44
<i>Chromolaena odorata</i>	3.83±0.83	3.83±0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.83±0.83	3.83±0.83	0.00
<i>Cissampelos pareira</i>	1.67±0.00	0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00
<i>Colocasia esculenta</i>	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Crassocephalum crepidioides</i>	1.00±0.00	0.00	1.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00
<i>Cuphea carthagenensis</i>	63.46±8.89	84.83±6.61	42.08±4.57	24.88±5.29	37.58±4.59	12.17±1.44	0.00	0.00	0.00	88.33±13.17	122.42±3.29	54.25±4.88
<i>Cyathula prostrata</i>	0.00	0.00	0.00	3.00±0.00	0.00	3.00±0.00	0.00	0.00	0.00	3.00±0.00	0.00	3.00±0.00
<i>Cynodon dactylon</i>	95.92±15.64	131.17±14.70	60.67±9.88	27.42±4.40	37.42±4.46	17.42±1.91	20.92±3.14	27.67±3.05	14.17±2.53	144.25±23.01	196.25±21.89	92.25±13.72
<i>Cyperus compactus</i>	5.00±0.00	5.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00±0.00	5.00±0.00	0.00
<i>Cyperus compressus</i>	44.50±11.17	62.17±8.83	26.83±6.83	14.92±3.76	20.50±0.83	9.33±4.67	9.08±2.21	12.17±1.17	6±3	68.50±16.74	94.83±9.17	42.17±14.50
<i>Cyperus cyperoides</i>	4.00±1.53	5.50±0.50	1.00±0.00	1.44±0.48	1.83±0.50	0.67±0.00	0.00	0.00	0.00	5.44±1.98	7.33±1.00	1.67±0.00
<i>Cyperus difformis</i>	9.67±4.53	18.67±0.00	5.17±0.83	0.00	0.00	0.00	0.00	0.00	0.00	9.67±4.53	18.67±0.00	5.17±0.83
<i>Cyperus digitatus</i>	0.00	0.00	0.00	0.00	0.00	0.00	4.00±0.33	4.00±0.33	0.00	4.00±0.33	4.00±0.33	0.00
<i>Cyperus distans</i>	19.87±4.45	29.33±4.67	13.56±2.99	6.87±1.56	8.83±0.50	5.56±2.42	0.00	0.00	0.00	26.73±5.76	38.17±5.17	19.11±5.40
<i>Cyperus eleusinoides</i>	0.00	0.00	0.00	0.67±0.00	0.67±0.00	0.00	0.00	0.00	0.00	0.67±0.00	0.67±0.00	0.00
<i>Cyperus imbricatus</i>	6.50±0.80	8.83±0.83	5.33±0.36	3.06±0.74	4.67±2.00	2.25±0.25	0.00	0.00	0.00	9.56±1.31	13.50±1.17	7.58±0.44
<i>Cyperus iria</i>	19.63±2.41	25.25±1.82	14.00±1.66	7.17±1.20	9.25±1.62	5.08±1.11	0.00	0.00	0.00	26.79±3.32	34.50±2.74	19.08±2.05
<i>Cyperus strigosus</i>	0.00	0.00	0.00	4.67±0.00	4.67±0.00	0.00	0.00	0.00	0.00	4.67±0.00	4.67±0.00	0.00
<i>Cyperus tenuispica</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.67±0.00	0.67±0	0.00	0.67±0.00	0.67±0.00	0.00
<i>Cyrtococcum oxyphyllum</i>	0.00	0.00	0.00	16.67±0.00	16.67±0.00	0.00	0.00	0.00	0.00	16.67±0.00	16.67±0.00	0.00
<i>Cyrtococcum patens</i>	7.89±1.83	9.50±1.50	4.67±0.00	3.56±0.80	4.33±0.33	2.00±0.00	0.00	0.00	0.00	11.44±2.61	13.83±1.83	6.67±0.00
<i>Dicranopteris linearis</i>	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00
<i>Digitaria ciliaris</i>	59.92±11.00	86.58±2.79	33.25±9.10	17.38±5.00	27.00±7.22	7.75±1.61	12.63±2.65	17.75±3.55	7.50±1.66	89.92±17.56	131.33±12.81	48.50±11.47
<i>Digitaria setigera</i>	24.67±0.00	24.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.67±0.00	24.67±0.00	0.00
<i>Digitaria violascens</i>	16.33±1.33	0.00	16.33±1.33	0.00	0.00	0.00	0.00	0.00	0.00	16.33±1.33	0.00	16.33±1.33
<i>Diplazium esculentum</i>	6.89±2.42	8.83±2.50	3.00±0.00	4.22±1.13	5.33±0.33	2.00±0.00	0.00	0.00	0.00	11.11±3.30	14.17±2.17	5.00±0.00
<i>Drymaria cordata</i>	0.00	0.00	0.00	3.33±0.00	3.33±0.00	0.00	0.00	0.00	0.00	3.33±0.00	3.33±0.00	0.00
<i>Duchesnea indica</i>	16.00±2.03	20.67±1.36	11.33±1.71	4.50±0.60	6.00±0.24	3.00±0.36	2.83±0.37	3.42±0.16	2.25±0.63	23.33±2.86	30.08±1.39	16.58±2.43
<i>Dysphania ambrosioides</i>	6.67±4.00	6.67±4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.67±4.00	6.67±4.00	0.00
<i>Eclipta prostrata</i>	22.42±3.71	31.67±2.17	13.17±1.53	5.58±1.13	7.58±1.77	3.58±0.34	4.38±0.35	5.08±0.25	3.67±0.43	32.38±4.59	44.33±1.21	20.42±1.24
<i>Emilia sonchifolia</i>	5.33±0.00	5.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.33±0.00	5.33±0.00	0.00
<i>Erigeron bonariensis</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.33±0.00	0.00	0.33±0.00	0.33±0.00	0.00	0.33±0.00
<i>Ethulia conyzoides</i>	33.42±4.90	44.17±3.56	22.67±4.72	10.63±2.02	15.83±0.87	5.42±0.53	7.46±1.00	9.75±0.69	5.17±0.84	51.50±7.64	69.75±4.51	33.25±5.45
<i>Euphorbia heterophylla</i>	5.67±0.00	0.00	5.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.67±0.00	0.00	5.67±0.00
<i>Euphorbia hirta</i>	18.61±3.52	27.50±4.17	14.17±2.89	7.00±1.06	10.00±1.67	5.50±0.32	5.78±1.42	9.83±0.50	3.75±0.93	31.39±5.79	47.33±6.33	23.42±3.67
<i>Euphorbia hypericifolia</i>	47.42±1.75	47.42±1.75	0.00	13.75±1.51	13.75±1.51	0.00	6.33±0.36	6.33±0.36	0.00	67.50±2.42	67.50±2.42	0.00
<i>Euphorbia thymifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	4.67±0.00	0.00	4.67±0.00	4.67±0.00	0.00	4.67±0.00
<i>Flemingia lineata</i>	14.24±2.60	17.83±3.63	9.44±0.87	3.52±0.67	4.33±0.71	2.44±1.06	0.00	0.00	0.00	17.76±2.80	22.17±3.31	11.89±1.72

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Floscopa scandens</i>	0.00	0.00	0.00	0.33±0.00	0.00	0.33±0.00	0.00	0.00	0.00	0.33±0.00	0.00	0.33±0.00
<i>Glinus oppositifolius</i>	30.00±6.02	39.00±6.67	21.00±3.33	0.00	0.00	0.00	7.58±2.14	10.00±3.67	5.17±1.50	37.58±7.86	49.00±10.33	26.17±1.83
<i>Gnaphalium pensylvanicum</i>	17.42±5.95	26.50±6.83	8.33±1.00	7.42±1.27	9.33±0.33	5.50±1.50	0.00	0.00	0.00	24.83±7.00	35.83±7.17	13.83±0.50
<i>Grangea maderaspatana</i>	40.63±5.09	52.83±2.01	28.42±4.17	12.33±2.68	18.67±2.44	6.00±0.93	8.42±1.17	10.92±1.44	5.92±0.34	61.38±8.31	82.42±1.88	40.33±4.86
<i>Heliotropium indicum</i>	15.92±1.80	18.42±1.86	13.42±2.73	6.50±0.84	7.67±0.76	5.33±1.34	5.54±0.66	6.42±0.37	4.67±1.18	27.96±3.06	32.50±2.13	23.42±5.04
<i>Heliotropium ovalifolium</i>	7.00±0.00	0.00	7.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00±0.00	0.00	7.00±0.00
<i>Hemarthria compressa</i>	78.71±13.50	110.50±8.94	46.92±9.80	22.63±4.73	31.83±6.07	13.42±3.33	17.88±2.49	23.67±1.86	12.08±1.73	119.21±20.20	166.00±15.41	72.42±14.39
<i>Houttuynia cordata</i>	1.00±0.00	0.00	1.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00
<i>Hydrocotyle sibthorpioides</i>	5.60±0.73	7.00±0.00	5.25±0.82	0.00	0.00	0.00	0.00	0.00	0.00	5.60±0.73	7.00±0.00	5.25±0.82
<i>Hymenachne amplexicaulis</i>	2.56±0.59	3.00±0.67	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.56±0.59	3.00±0.67	1.67±0.00
<i>Hyptis suaveolens</i>	20.81±2.55	24.42±2.10	16.00±4.06	0.00	0.00	0.00	0.00	0.00	0.00	20.81±2.55	24.42±2.10	16.00±4.06
<i>Ichnanthus pallens</i>	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Impatiens tripetala</i>	3.00±0.00	0.00	3.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00±0.00	0.00	3.00±0.00
<i>Imperata cylindrica</i>	94.58±12.14	123.42±4.37	65.75±10.72	35.88±7.53	54.33±6.01	17.42±1.07	22.75±2.99	27.58±4.69	17.92±2.02	153.21±21.48	205.33±14.23	101.08±11.83
<i>Kyllinga brevifolia</i>	31.04±4.89	42.50±3.20	19.58±3.73	9.88±1.77	14.00±1.57	5.75±0.90	3.42±0.71	5.00±0.71	1.83±0.40	44.33±7.17	61.50±4.78	27.17±4.52
<i>Laphangium luteoalbum</i>	20.29±4.02	30.67±1.22	9.92±1.41	6.63±1.34	9.25±1.61	4.00±1.11	4.33±0.65	5.42±0.55	3.25±0.96	31.25±5.51	45.33±0.98	17.17±2.89
<i>Leersia hexandra</i>	9.00±0.33	9.00±0.33	0.00	2.83±0.17	2.83±0.17	0.00	0.00	0.00	0.00	11.83±0.50	11.83±0.50	0.00
<i>Leucas aspera</i>	10.17±1.08	11.92±1.14	8.42±1.44	0.00	0.00	0.00	0.00	0.00	0.00	10.17±1.08	11.92±1.14	8.42±1.44
<i>Leucostegia immersa</i>	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Lygodium flexuosum</i>	34.21±5.86	45.00±7.89	23.42±4.49	12.63±2.22	17.33±2.77	7.92±0.75	6.17±1.25	8.42±1.87	3.92±0.66	53.00±8.76	70.75±10.97	35.25±5.25
<i>Lygodium microphyllum</i>	12.00±3.33	15.33±0.00	8.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00±3.33	15.33±0.00	8.67±0.00
<i>Merremia umbellata</i>	99.54±16.56	139.17±11.20	59.92±10.35	29.38±5.26	42.00±4.44	16.75±1.74	22.29±3.38	28.67±5.04	15.92±0.91	151.21±24.35	209.83±17.69	92.58±12.80
<i>Mikania micrantha</i>	33.04±5.81	43.25±5.80	22.83±7.36	13.04±2.46	18.00±2.61	8.08±2.22	0.00	0.00	0.00	46.08±7.71	61.25±6.98	30.92±8.67
<i>Oldenlandia lineata</i>	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00	0.00	0.00	0.00	2.33±0.00	0.00	2.33±0.00
<i>Oldenlandia tenelliflora</i>	0.00	0.00	0.00	4.67±0.00	0.00	4.67±0.00	0.00	0.00	0.00	4.67±0.00	0.00	4.67±0.00
<i>Onychium japonicum</i>	4.00±0.00	0.00	4.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00±0.00	0.00	4.00±0.00
<i>Opismenus burmanni</i>	40.93±5.16	48.67±3.76	29.33±0.00	15.00±2.60	18.56±2.56	9.67±0.67	8.67±0.86	10.00±0.51	6.67±0.00	64.60±8.31	77.22±5.57	45.67±0.67
<i>Opismenus compositus</i>	82.67±0.00	82.67±0.00	0.00	32.67±0.00	32.67±0.00	0.00	0.00	0.00	0.00	115.33±0.00	115.33±0.00	0.00
<i>Ottocloa nodosa</i>	0.00	0.00	0.00	1.00±0.00	1.00±0.00	0.00	0.00	0.00	0.00	1.00±0.00	1.00±0.00	0.00
<i>Oxalis corniculata</i>	63.96±7.21	80.67±2.67	47.25±7.01	20.96±3.09	27.92±2.92	14.00±1.98	14.38±1.73	18.00±1.25	10.75±1.89	99.29±11.69	126.58±5.74	72.00±10.43
<i>Panicum auritum</i>	9.67±0.00	9.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.67±0.00	9.67±0.00	0.00
<i>Panicum brevifolium</i>	33.33±0.00	0.00	33.33±0.00	7.33±0.00	0.00	7.33±0.00	0.00	0.00	0.00	40.67±0.00	0.00	40.67±0.00
<i>Panicum notatum</i>	34.50±8.30	58.83±9.17	22.33±3.22	11.39±3.47	20.33±7.33	6.92±1.04	0.00	0.00	0.00	45.89±11.64	79.17±16.50	29.25±4.03
<i>Parthenium hysterophorus</i>	6.29±0.74	7.25±0.95	5.33±1.01	3.29±0.35	3.92±0.52	2.67±0.24	0.00	0.00	0.00	9.58±0.97	11.17±1.29	8.00±1.04
<i>Paspalidium flavidum</i>	12.25±3.24	13.83±6.83	10.67±3.33	0.00	0.00	0.00	0.00	0.00	0.00	12.25±3.24	13.83±6.83	10.67±3.33
<i>Paspalum conjugatum</i>	68.63±11.17	96.83±0.35	40.42±7.18	21.96±5.09	32.75±5.92	11.17±2.89	15.17±2.56	21.08±1.75	9.25±2.04	105.75±18.08	150.67±7.09	60.83±11.4
<i>Paspalum dilatatum</i>	19.25±7.29	30.00±9.33	8.50±0.50	0.00	0.00	0.00	0.00	0.00	0.00	19.25±7.29	30.00±9.33	8.50±0.50
<i>Paspalum scrobiculatum</i>	33.00±0.00	33.00±0.00	0.00	9.00±0.00	9.00±0.00	0.00	0.00	0.00	0.00	42.00±0.00	42.00±0.00	0.00
<i>Persicaria barbata</i>	3.00±0.19	3.17±0.17	2.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00±0.19	3.17±0.17	2.67±0.00
<i>Persicaria chinensis</i>	1.33±0.00	1.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33±0.00	1.33±0.00	0.00
<i>Persicaria hydropiper</i>	14.13±2.62	20.25±2.56	8.00±0.72	5.92±0.77	7.42±0.63	4.42±0.94	4.38±0.51	5.33±0.59	3.42±0.48	24.42±3.45	33.00±2.17	15.83±1.29
<i>Persicaria orientalis</i>	2.33±0.67	2.33±0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.33±0.67	2.33±0.67	0.00
<i>Phyla nodiflora</i>	9.25±2.87	13.67±3.00	4.83±1.17	2.33±0.59	2.83±1.17	1.83±0.50	2.00±0.58	3±0	1.00±0.00	13.58±3.56	19.50±1.83	7.67±1.67
<i>Phyllanthus niruri</i>	108.88±15.38	145.83±7.22	71.92±11.85	39.25±5.91	53.50±4.29	25.00±3.08	23.67±3.11	31.17±2.12	16.17±1.81	171.79±24.20	230.50±12.99	113.08±16.36
<i>Phyllanthus virgatus</i>	0.00	0.00	0.00	4.00±0.00	0.00	4.00±0.00	0.00	0.00	0.00	4.00±0.00	0.00	4.00±0.00
<i>Plantago major</i>	4.67±0.00	0.00	4.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67±0.00	0.00	4.67±0.00
<i>Plectranthus sp.</i>	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Polycarpon prostratum</i>	54.38±8.44	73.17±7.84	35.58±5.94	13.71±2.60	19.08±3.38	8.33±0.96	8.71±1.56	11.75±1.46	5.67±1.77	76.79±12.02	104.00±11.29	49.58±7.26
<i>Polygonum plebeium</i>	80.13±12.70	109.58±11.37	50.67±6.75	25.25±4.64	34.50±6.37	16.00±1.73	15.63±2.40	20.25±3.34	11.00±1.21	121.00±19.48	164.33±21.01	77.67±8.87
<i>Polygonum posumbo</i>	10.17±2.83	10.17±2.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.17±2.83	10.17±2.83	0.00
<i>Pouzolzia zeylanica</i>	104.00±14.81	140.50±5.36	67.50±10.36	38.13±6.62	53.50±5.70	22.75±3.78	20.13±2.56	25.92±2.09	14.33±1.99	162.25±23.60	219.92±11.84	104.58±15.59
<i>Rorippa indica</i>	65.25±9.54	85.33±10.56	45.17±6.66	21.96±4.33	32.50±3.32	11.42±1.58	12.71±1.79	16.00±1.97	9.42±1.96	99.92±14.43	133.83±11.20	66.00±8.92
<i>Rumex dentatus</i>	2.67±0.43	0.00	2.67±0.43	0.00	0.00	0.00	0.00	0.00	0.00	2.67±0.43	0.00	2.67±0.43

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Rungia pectinata</i>	26.67±5.00	31.67±0.00	21.67±0.00	6.83±0.50	6.33±0.00	7.33±0.00	6.33±2.33	8.67±0.00	4.00±0.00	39.83±6.83	46.67±0.00	33.00±0.00
<i>Rungia repens</i>	11.67±4.35	15.00±9.33	8.33±2.00	0.00	0.00	0.00	0.00	0.00	0.00	11.67±4.35	15.00±9.33	8.33±2.00
<i>Saccharum spp.</i>	56.83±4.92	68.92±0.67	44.75±3.92	29.17±5.17	40.83±3.97	17.50±4.29	14.29±2.22	19.58±1.94	9.00±0.78	100.29±11.92	129.33±5.94	71.25±8.07
<i>Scleria terrestris</i>	50.79±8.38	69.92±6.67	31.67±6.25	20.17±3.40	27.08±3.86	13.25±2.68	0.00	0.00	0.00	70.96±10.72	97.00±6.51	44.92±6.46
<i>Senna tora</i>	2.11±0.40	2.33±0.00	2.00±0.67	0.00	0.00	0.00	0.00	0.00	0.00	2.11±0.40	2.33±0.00	2.00±0.67
<i>Setaria pumila</i>	63.04±9.31	85.83±5.35	40.25±5.43	20.92±3.80	29.42±3.39	12.42±2.76	13.54±2.24	18.67±1.74	8.42±1.67	97.50±15.14	133.92±10.10	61.08±9.12
<i>Sida acuta</i>	2.00±1.00	2.00±1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00±1.00	2.00±1.00	0.00
<i>Solanum viarum</i>	7.67±1.37	10.17±2.50	6.00±0.84	3.40±0.96	5.67±0.67	1.89±0.22	0.00	0.00	0.00	11.07±2.22	15.83±3.17	7.89±0.73
<i>Sonchus oleraceus</i>	1.00±0.00	1.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	1.00±0.00	0.00
<i>Spermacoce pusilla</i>	1.75±0.66	2.83±0.50	0.67±0.00	0.83±0.32	1.33±0.33	0.33±0.00	0.00	0.00	0.00	2.58±0.98	4.17±0.83	1.00±0.00
<i>Sporobolus fertilis</i>	8.00±2.28	9.50±4.83	6.50±1.83	0.00	0.00	0.00	0.00	0.00	0.00	8.00±2.28	9.50±4.83	6.50±1.83
<i>Tetastigma dubium</i>	4.00±0.00	4.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00
<i>Themeda spp.</i>	6.75±0.28	6.92±0.57	6.58±0.16	3.71±0.41	4.17±0.62	3.25±0.52	0.00	0.00	0.00	10.46±0.54	11.08±0.95	9.83±0.44
<i>Typhonium trilobatum</i>	0.67±0.00	0.00	0.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67±0.00	0.00	0.67±0.00
<i>Urochloa panicoides</i>	7.00±0.00	7.00±0.00	0.00	4.00±0.00	4.00±0.00	0.00	0.00	0.00	0.00	11.00±0.00	11.00±0.00	0.00
<i>Verbena officinalis</i>	3.00±0.00	3.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00±0.00	3.00±0.00	0.00
<i>Vicia sativa</i>	3.00±0.00	3.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00±0.00	3.00±0.00	0.00
<i>Youngia japonica</i>	1.33±0.00	1.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33±0.00	1.33±0.00	0.00
UI 4	0.00	0.00	0.00	1.33±0.00	0.00	1.33±0.00	0.00	0.00	0.00	1.33±0.00	0.00	1.33±0.00
UI 5	12.86±2.68	19.33±3.20	8.00±1.28	3.71±0.68	5.44±0.68	2.42±0.28	0.00	0.00	0.00	16.57±3.22	24.78±3.23	10.42±1.26
UI 6	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
UI 7	0.00	0.00	0.00	0.00	0.00	0.00	1.33±0.00	1.33±0.00	0.00	1.33±0.00	1.33±0.00	0.00
UI 8	18.50±3.43	25.33±2.00	11.67±2.85	5.39±1.13	7.33±1.17	3.44±1.11	3.67±0.71	5.00±0.51	2.33±0.69	27.56±4.83	37.67±2.14	17.44±3.11
UI 10	8.67±1.25	10.50±1.17	6.83±1.17	3.75±1.58	5.83±2.50	1.67±0.00	2.17±0.59	3.17±0.17	1.17±0.17	14.58±2.91	19.50±1.17	9.67±1.00
UI 11	7.00±1.00	7.00±1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00±1.00	7.00±1.00	0.00
UI 14	6.67±0.00	0.00	6.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.67±0.00	0.00	6.67±0.00
UI 18	2.00±0.00	2.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00±0.00	2.00±0.00	0.00
UI 19	3.00±0.00	3.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00±0.00	3.00±0.00	0.00
UI 20	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
UI 21	9.50±1.50	9.50±1.50	0.00	2.83±0.83	2.83±0.83	0.00	0.00	0.00	0.00	12.33±2.33	12.33±2.33	0.00
UI 25	14.67±0.00	14.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.67±0.00	14.67±0.00	0.00
UI 26	8.00±0.00	8.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00±0.00	8.00±0.00	0.00
UI 28	2.00±0.00	0.00	2.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00±0.00	0.00	2.00±0.00
UK (premature mortality)	34.42±6.97	49.08±7.77	19.75±4.80	11.00±3.21	18.67±2.79	3.33±1.06	3.78±1.11	5.25±0.95	0.83±0.50	48.25±10.01	73.00±5.93	23.50±4.86

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.36. Overall and seasonal plant species seed abundances and densities (m⁻²) recorded from different soil layers of tall riverine alluvial grasslands soil seed bank given natural treatment during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers															Total						
	Upper layer (0-5)					Middle layer (5-10)					Lower layer (10-15)											
	O		DS		WS	O		DS		WS	O		DS		WS	O		DS		WS		
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D		
<i>Achyranthes aspera</i>	10	3.93	0	0.00	10	7.86	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	1.31	0	0.00	10	2.62
<i>Acmella uliginosa</i>	214	84.14	144	113.23	70	55.04	73	28.70	49	38.53	24	18.87	0	0.00	0	0.00	287	37.61	193	50.59	94	24.64
<i>Acroceras zizanioides</i>	792	311.39	568	446.65	224	176.14	254	99.87	199	156.48	55	43.25	157	61.73	112	88.07	45	35.39	1203	157.66	879	230.40
<i>Acroceras munroanum</i>	24	9.44	0	0.00	24	18.87	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	24	3.15	0	0.00	24	6.29
<i>Adiantum caudatum</i>	464	182.43	340	267.36	124	97.51	124	48.75	85	66.84	39	30.67	100	39.32	65	51.11	35	27.52	688	90.17	490	128.44
<i>Adiantum philippense</i>	49	19.27	49	38.53	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	49	6.42	49	12.84	0	0.00
<i>Ageratum convyzoides</i>	452	177.71	335	263.43	117	92.00	144	56.62	99	77.85	45	35.39	95	37.35	68	53.47	27	21.23	691	90.56	502	131.58

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Alpinia nigra</i>	74	29.09	51	40.10	23	18.09	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	74	9.70	51	13.37	23	6.03
<i>Alternanthera pungens</i>	540	212.31	315	247.70	225	176.93	147	57.80	99	77.85	48	37.74	0	0.00	0	0.00	0	0.00	687	90.04	414	108.52	273	71.56
<i>Alternanthera sessilis</i>	831	326.73	574	451.36	257	202.09	271	106.55	207	162.77	64	50.33	160	62.91	113	88.86	47	36.96	1262	165.40	894	234.33	368	96.46
<i>Amaranthus spinosus</i>	142	55.83	73	57.40	69	54.26	85	33.42	47	36.96	38	29.88	0	0.00	0	0.00	0	0.00	227	29.75	120	31.45	107	28.05
<i>Ampelopteris prolifera</i>	258	101.44	258	202.88	0	0.00	78	30.67	78	61.34	0	0.00	0	0.00	0	0.00	0	0.00	336	44.04	336	88.07	0	0.00
<i>Apluda mutica</i>	1851	727.77	1266	995.52	585	460.01	573	225.29	422	331.84	151	118.74	314	123.46	213	167.49	101	79.42	2738	358.84	1901	498.28	837	219.39
<i>Aristida adscensionis</i>	76	29.88	76	59.76	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	76	9.96	76	19.92	0	0.00
<i>Arundinella bengalensis</i>	251	98.69	251	197.37	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	251	32.90	251	65.79	0	0.00
<i>Blumea lacera</i>	3	1.18	0	0.00	3	2.36	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.39	0	0.00	3	0.79
<i>Brachiaria distachya</i>	194	76.28	194	152.55	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	194	25.43	194	50.85	0	0.00
<i>Cajanus scarabaeoides</i>	10	3.93	0	0.00	10	7.86	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	1.31	0	0.00	10	2.62
<i>Capillipedium assimile</i>	54	21.23	0	0.00	54	42.46	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	54	7.08	0	0.00	54	14.15
<i>Cardiospermum halicacabum</i>	110	43.25	110	86.50	0	0.00	37	14.55	37	29.09	0	0.00	0	0.00	0	0.00	0	0.00	147	19.27	147	38.53	0	0.00
<i>Centella asiatica</i>	360	141.54	258	202.88	102	80.21	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	360	47.18	258	67.63	102	26.74
<i>Centothea lappacea</i>	37	14.55	0	0.00	37	29.09	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	37	4.85	0	0.00	37	9.70
<i>Chenopodium album</i>	26	10.22	21	16.51	5	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	26	3.41	21	5.50	5	1.31
<i>Christella parasitica</i>	1625	638.91	1039	817.02	586	460.80	546	214.67	390	306.68	156	122.67	260	102.23	172	135.25	88	69.20	2431	318.60	1601	419.65	830	217.56
<i>Chromolaena odorata</i>	23	9.04	23	18.09	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	23	3.01	23	6.03	0	0.00
<i>Cissampelos pareira</i>	5	1.97	0	0.00	5	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.66	0	0.00	5	1.31
<i>Colocasia esculenta</i>	5	1.97	5	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.66	5	1.31	0	0.00
<i>Crassocephalum crepidioides</i>	3	1.18	0	0.00	3	2.36	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.39	0	0.00	3	0.79
<i>Cuphea carthagenensis</i>	1015	399.07	676	531.57	339	266.57	458	180.07	350	275.22	108	84.93	0	0.00	0	0.00	0	0.00	1473	193.05	1026	268.93	447	117.17
<i>Cyathula prostrata</i>	0	0.00	0	0.00	0	0.00	9	3.54	0	0.00	9	7.08	0	0.00	0	0.00	0	0.00	9	1.18	0	0.00	9	2.36
<i>Cynodon dactylon</i>	1490	585.83	1021	802.86	469	368.80	354	139.18	268	210.74	86	67.63	272	106.94	186	146.26	86	67.63	2116	277.32	1475	386.62	641	168.02
<i>Cyperus compressus</i>	325	127.78	233	183.22	92	72.34	128	50.33	94	73.92	34	26.74	71	27.92	50	39.32	21	16.51	524	68.67	377	98.82	147	38.53
<i>Cyperus difformis</i>	87	34.21	56	44.04	31	24.38	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	87	11.40	56	14.68	31	8.13
<i>Cyperus digitatus</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	14	5.50	14	11.01	0	0.00	14	1.83	14	3.67	0	0.00
<i>Cyperus distans</i>	183	71.95	109	85.71	74	58.19	64	25.16	31	24.38	33	25.95	0	0.00	0	0.00	0	0.00	247	32.37	140	36.70	107	28.05
<i>Cyperus iria</i>	301	118.35	205	161.20	96	75.49	110	43.25	71	55.83	39	30.67	0	0.00	0	0.00	0	0.00	411	53.86	276	72.34	135	35.39
<i>Cyperus strigosus</i>	0	0.00	0	0.00	0	0.00	8	3.15	8	6.29	0	0.00	0	0.00	0	0.00	0	0.00	8	1.05	8	2.10	0	0.00
<i>Cyrtococcum oxyphyllum</i>	0	0.00	0	0.00	0	0.00	50	19.66	50	39.32	0	0.00	0	0.00	0	0.00	0	0.00	50	6.55	50	13.11	0	0.00
<i>Dicranopteris linearis</i>	0	0.00	0	0.00	0	0.00	3	1.18	0	0.00	3	2.36	0	0.00	0	0.00	0	0.00	3	0.39	0	0.00	3	0.79
<i>Digitaria ciliaris</i>	1046	411.26	745	585.83	301	236.69	279	109.70	227	178.50	52	40.89	207	81.39	146	114.81	61	47.97	1532	200.78	1118	293.05	414	108.52
<i>Digitaria setigera</i>	74	29.09	74	58.19	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	74	9.70	74	19.40	0	0.00
<i>Digitaria violascens</i>	98	38.53	0	0.00	98	77.06	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	98	12.84	0	0.00	98	25.69
<i>Diplazium esculentum</i>	62	24.38	53	41.68	9	7.08	38	14.94	32	25.16	6	4.72	0	0.00	0	0.00	0	0.00	100	13.11	85	22.28	15	3.93
<i>Duchesnea indica</i>	272	106.94	181	142.33	91	71.56	108	42.46	72	56.62	36	28.31	68	26.74	41	32.24	27	21.23	448	58.71	294	77.06	154	40.37
<i>Dysphania ambrosioides</i>	40	15.73	40	31.45	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	40	5.24	40	10.48	0	0.00
<i>Eclipta prostrata</i>	380	149.41	286	224.90	94	73.92	134	52.69	91	71.56	43	33.81	105	41.28	61	47.97	44	34.60	619	81.13	438	114.81	181	47.44
<i>Emilia sonchifolia</i>	16	6.29	16	12.58	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	16	2.10	16	4.19	0	0.00
<i>Erigeron bonariensis</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	0.39	0	0.00	1	0.79	1	0.13	0	0.00	1	0.26
<i>Ethulia conyzoides</i>	586	230.40	404	317.68	182	143.12	183	71.95	139	109.30	44	34.60	135	53.08	90	70.77	45	35.39	904	118.48	633	165.92	271	71.03
<i>Euphorbia heterophylla</i>	17	6.68	0	0.00	17	13.37	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	17	2.23	0	0.00	17	4.46
<i>Euphorbia hirta</i>	223	87.68	107	84.14	116	91.22	72	28.31	35	27.52	37	29.09	71	27.92	44	34.60	27	21.23	366	47.97	186	48.75	180	47.18
<i>Euphorbia hypericifolia</i>	438	172.21	438	344.42	0	0.00	165	64.87	165	129.75	0	0.00	76	29.88	76	59.76	0	0.00	679	88.99	679	177.98	0	0.00
<i>Euphorbia thymifolia</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	14	5.50	0	0.00	14	11.01	14	1.83	0	0.00	14	3.67
<i>Flemingia lineata</i>	299	117.56	214	168.28	85	66.84	74	29.09	52	40.89	22	17.30	0	0.00	0	0.00	0	0.00	373	48.88	266	69.72	107	28.05
<i>Floscopa scandens</i>	0	0.00	0	0.00	0	0.00	1	0.39	0	0.00	1	0.79	0	0.00	0	0.00	0	0.00	1	0.13	0	0.00	1	0.26
<i>Glinus oppositifolius</i>	242	95.15	164	128.96	78	61.34	0	0.0																

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Heliotropium ovalifolium</i>	42	16.51	0	0.00	42	33.03	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	42	5.50	0	0.00	42	11.01
<i>Hemarthria compressa</i>	1264	496.97	932	732.88	332	261.07	315	123.85	230	180.86	85	66.84	224	88.07	156	122.67	68	53.47	1803	236.30	1318	345.47	485	127.13
<i>Houttuynia cordata</i>	3	1.18	0	0.00	3	2.36	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.39	0	0.00	3	0.79
<i>Hydrocotyle sibthorpioides</i>	84	33.03	21	16.51	63	49.54	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	84	11.01	21	5.50	63	16.51
<i>Hymenachne amplexicaulis</i>	23	9.04	18	14.15	5	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	23	3.01	18	4.72	5	1.31
<i>Hyptis suaveolens</i>	437	171.82	293	230.40	144	113.23	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	437	57.27	293	76.80	144	37.74
<i>Impatiens tripetala</i>	9	3.54	0	0.00	9	7.08	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	9	1.18	0	0.00	9	2.36
<i>Imperata cylindrica</i>	1538	604.70	1001	787.14	537	422.27	586	230.40	470	369.58	116	91.22	324	127.39	210	165.13	114	89.64	2448	320.83	1681	440.62	767	201.04
<i>Kyllinga brevifolia</i>	502	197.37	359	282.30	143	112.45	164	64.48	122	95.93	42	33.03	82	32.24	60	47.18	22	17.30	748	98.03	541	141.80	207	54.26
<i>Laphangium luteoalbum</i>	487	191.48	368	289.38	119	93.58	159	62.51	111	87.28	48	37.74	104	40.89	65	51.11	39	30.67	750	98.29	544	142.59	206	54.00
<i>Leucas aspera</i>	169	66.45	102	80.21	67	52.69	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	169	22.15	102	26.74	67	17.56
<i>Leucostegia immersa</i>	5	1.97	5	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.66	5	1.31	0	0.00
<i>Lygodium flexuosum</i>	517	203.27	341	268.15	176	138.40	207	81.39	143	112.45	64	50.33	98	38.53	69	54.26	29	22.80	822	107.73	553	144.95	269	70.51
<i>Lygodium microphyllum</i>	72	28.31	46	36.17	26	20.45	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	72	9.44	46	12.06	26	6.82
<i>Merremia umbellata</i>	1725	678.23	1208	949.91	517	406.54	514	202.09	390	306.68	124	97.51	322	126.60	209	164.35	113	88.86	2561	335.64	1807	473.64	754	197.64
<i>Mikania micrantha</i>	560	220.18	361	283.87	199	156.48	246	96.72	168	132.11	78	61.34	0	0.00	0	0.00	0	0.00	806	105.63	529	138.66	277	72.61
<i>Oldenlandia lineata</i>	0	0.00	0	0.00	0	0.00	10	3.93	0	0.00	10	7.86	0	0.00	0	0.00	0	0.00	10	1.31	0	0.00	10	2.62
<i>Oldenlandia tenelliflora</i>	0	0.00	0	0.00	0	0.00	10	3.93	0	0.00	10	7.86	0	0.00	0	0.00	0	0.00	10	1.31	0	0.00	10	2.62
<i>Onychium japonicum</i>	12	4.72	0	0.00	12	9.44	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	12	1.57	0	0.00	12	3.15
<i>Opismenus burmanni</i>	426	167.49	308	242.20	118	92.79	154	60.55	118	92.79	36	28.31	93	36.57	63	49.54	30	23.59	673	88.20	489	128.17	184	48.23
<i>Opismenus compositus</i>	182	71.56	182	143.12	0	0.00	66	25.95	66	51.90	0	0.00	0	0.00	0	0.00	0	0.00	248	32.50	248	65.00	0	0.00
<i>Oxalis corniculata</i>	1008	396.32	636	500.12	372	292.52	319	125.42	222	174.57	97	76.28	222	87.28	141	110.88	81	63.69	1549	203.01	999	261.85	550	144.16
<i>Panicum auritum</i>	29	11.40	29	22.80	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	29	3.80	29	7.60	0	0.00
<i>Panicum brevifolium</i>	67	26.34	0	0.00	67	52.69	22	8.65	0	0.00	22	17.30	0	0.00	0	0.00	0	0.00	89	11.66	0	0.00	89	23.33
<i>Panicum notatum</i>	466	183.22	267	209.96	199	156.48	131	51.51	81	63.69	50	39.32	0	0.00	0	0.00	0	0.00	597	78.24	348	91.22	249	65.27
<i>Parthenium hysterophorus</i>	151	59.37	87	68.41	64	50.33	79	31.06	47	36.96	32	25.16	0	0.00	0	0.00	0	0.00	230	30.14	134	35.12	96	25.16
<i>Paspalidium flavidum</i>	147	57.80	83	65.27	64	50.33	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	147	19.27	83	21.76	64	16.78
<i>Paspalum conjugatum</i>	1210	475.74	863	678.62	347	272.86	351	138.00	269	211.53	82	64.48	252	99.08	182	143.12	70	55.04	1813	237.61	1314	344.42	499	130.80
<i>Paspalum dilatatum</i>	231	90.82	180	141.54	51	40.10	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	231	30.27	180	47.18	51	13.37
<i>Paspalum scrobiculatum</i>	99	38.92	99	77.85	0	0.00	27	10.62	27	21.23	0	0.00	0	0.00	0	0.00	0	0.00	126	16.51	126	33.03	0	0.00
<i>Persicaria hydropiper</i>	219	86.11	164	128.96	55	43.25	103	40.50	64	50.33	39	30.67	74	29.09	48	37.74	26	20.45	396	51.90	276	72.34	120	31.45
<i>Phyla nodiflora</i>	83	32.63	63	49.54	20	15.73	28	11.01	17	13.37	11	8.65	24	9.44	18	14.15	6	4.72	135	17.69	98	25.69	37	9.70
<i>Phyllanthus niruri</i>	1844	725.01	1235	971.14	609	478.89	680	267.36	477	375.09	203	159.63	388	152.55	253	198.95	135	106.16	2912	381.64	1965	515.06	947	248.22
<i>Phyllanthus virgatus</i>	0	0.00	0	0.00	0	0.00	12	4.72	0	0.00	12	9.44	0	0.00	0	0.00	0	0.00	12	1.57	0	0.00	12	3.15
<i>Plectranthus sp.</i>	5	1.97	5	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.66	5	1.31	0	0.00
<i>Polycarpon prostratum</i>	1012	397.89	701	551.23	311	244.55	235	92.40	176	138.40	59	46.39	159	62.51	110	86.50	49	38.53	1406	184.27	987	258.71	419	109.83
<i>Polygonum plebeium</i>	1358	533.93	954	750.18	404	317.68	406	159.63	281	220.96	125	98.29	238	93.58	152	119.53	86	67.63	2002	262.38	1387	363.56	615	161.20
<i>Pouzolzia zeylanica</i>	1803	708.89	1224	962.49	579	455.30	695	273.26	502	394.75	193	151.77	354	139.18	237	186.36	117	92.00	2852	373.78	1963	514.53	889	233.02
<i>Rorippa indica</i>	1113	437.60	738	580.33	375	294.88	384	150.98	291	228.83	93	73.13	224	88.07	143	112.45	81	63.69	1721	225.55	1172	307.20	549	143.90
<i>Rumex dentatus</i>	32	12.58	0	0.00	32	25.16	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	32	4.19	0	0.00	32	8.39
<i>Rungia pectinata</i>	99	38.92	59	46.39	40	31.45	41	16.12	19	14.94	22	17.30	29	11.40	20	15.73	9	7.08	169	22.15	98	25.69	71	18.61
<i>Rungia repens</i>	140	55.04	90	70.77	50	39.32	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	140	18.35	90	23.59	50	13.11
<i>Saccharum spp.</i>	888	349.14	515	404.97	373	293.31	511	200.91	359	282.30	152	119.53	196	77.06	136	106.94	60	47.18	1595	209.04	1010	264.74	585	153.34
<i>Scleria terrestris</i>	743	292.13	543	426.99	200	157.27	337	132.50	229	180.07	108	84.93	0	0.00	0	0.00	0	0.00	1080	141.54	772	202.35	308	80.73
<i>Senna tora</i>	19	7.47	7	5.50	12	9.44	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	19	2.49	7	1.83	12	3.15
<i>Setaria pumila</i>	1055	414.80	723	568.53	332	261.07	335	131.71	244	191.87	91	71.56	212	83.35	151	118.74	61	47.97	1602	209.96	1118	293.05	484	126.86
<i>Sida acuta</i>	12	4.72	12	9.44	0																			

Plant species	Soil layers																Total							
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Verbena officinalis</i>	9	3.54	9	7.08	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	9	1.18	9	2.36	0	0.00
<i>Vicia sativa</i>	9	3.54	9	7.08	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	9	1.18	9	2.36	0	0.00
<i>Youngia japonica</i>	4	1.57	4	3.15	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	4	0.52	4	1.05	0	0.00
UI4	0	0.00	0	0.00	0	0.00	4	1.57	0	0.00	4	3.15	0	0.00	0	0.00	0	0.00	4	0.52	0	0.00	4	1.05
UI5	201	79.03	136	106.94	65	51.11	45	17.69	29	22.80	16	12.58	0	0.00	0	0.00	0	0.00	246	32.24	165	43.25	81	21.23
UI6	0	0.00	0	0.00	0	0.00	5	1.97	5	3.93	0	0.00	0	0.00	0	0.00	0	0.00	5	0.66	5	1.31	0	0.00
UI7	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	4	1.57	4	3.15	0	0.00	4	0.52	4	1.05	0	0.00
UI8	258	101.44	180	141.54	78	61.34	67	26.34	48	37.74	19	14.94	48	18.87	33	25.95	15	11.80	373	48.88	261	68.41	112	29.36
UI10	104	40.89	63	49.54	41	32.24	45	17.69	35	27.52	10	7.86	26	10.22	19	14.94	7	5.50	175	22.94	117	30.67	58	15.20
UI11	42	16.51	42	33.03	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	42	5.50	42	11.01	0	0.00
UI14	20	7.86	0	0.00	20	15.73	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	20	2.62	0	0.00	20	5.24
UI18	6	2.36	6	4.72	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	6	0.79	6	1.57	0	0.00
UI19	9	3.54	9	7.08	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	9	1.18	9	2.36	0	0.00
UI20	0	0.00	0	0.00	0	0.00	5	1.97	5	3.93	0	0.00	0	0.00	0	0.00	0	0.00	5	0.66	5	1.31	0	0.00
UI21	42	16.51	42	33.03	0	0.00	12	4.72	12	9.44	0	0.00	0	0.00	0	0.00	0	0.00	54	7.08	54	14.15	0	0.00
UI25	44	17.30	44	34.60	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	44	5.77	44	11.53	0	0.00
UI26	24	9.44	24	18.87	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	24	3.15	24	6.29	0	0.00
UI28	6	2.36	0	0.00	6	4.72	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	6	0.79	0	0.00	6	1.57
UI (premature mortality)	639	251.24	460	361.72	179	140.76	219	86.11	182	143.12	37	29.09	48	18.87	43	33.81	5	3.93	906	118.74	685	179.55	221	57.93

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.37. Overall and seasonal plant species total seed abundances recorded from different soil layers of tall riverine alluvial grasslands soil seed bank given natural treatment during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Achyranthes aspera</i>	3.33	0.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	3.33	0.00	3.33
<i>Acmella uliginosa</i>	71.33	48.00	23.33	24.33	16.33	8.00	0.00	0.00	0.00	95.67	64.33	31.33
<i>Acroceras zizanioides</i>	264.00	189.33	74.67	84.67	66.33	18.33	52.33	37.33	15.00	401.00	293.00	108.00
<i>Acroceras munroanum</i>	8.00	0.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	0.00	8.00
<i>Adiantum caudatum</i>	154.67	113.33	41.33	41.33	28.33	13.00	33.33	21.67	11.67	229.33	163.33	66.00
<i>Adiantum philippense</i>	16.33	16.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.33	16.33	0.00
<i>Ageratum conyzoides</i>	150.67	111.67	39.00	48.00	33.00	15.00	31.67	22.67	9.00	230.33	167.33	63.00
<i>Alpinia nigra</i>	24.67	17.00	7.67	0.00	0.00	0.00	0.00	0.00	0.00	24.67	17.00	7.67
<i>Alternanthera pungens</i>	180.00	105.00	75.00	49.00	33.00	16.00	0.00	0.00	0.00	229.00	138.00	91.00
<i>Alternanthera sessilis</i>	277.00	191.33	85.67	90.33	69.00	21.33	53.33	37.67	15.67	420.67	298.00	122.67
<i>Amaranthus spinosus</i>	47.33	24.33	23.00	28.33	15.67	12.67	0.00	0.00	0.00	75.67	40.00	35.67
<i>Ampelopteris prolifera</i>	86.00	86.00	0.00	26.00	26.00	0.00	0.00	0.00	0.00	112.00	112.00	0.00
<i>Apluda mutica</i>	617.00	422.00	195.00	191.00	140.67	50.33	104.67	71.00	33.67	912.67	633.67	279.00
<i>Aristida adscensionis</i>	25.33	25.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.33	25.33	0.00
<i>Arundinella bengalensis</i>	83.67	83.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	83.67	83.67	0.00
<i>Blumea lacera</i>	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
<i>Brachiaria distachya</i>	64.67	64.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	64.67	64.67	0.00
<i>Cajanus scarabaeoides</i>	3.33	0.00	3.33	0.00	0.00	0.00	0.00	0.00	0.00	3.33	0.00	3.33
<i>Capillipedium assimile</i>	18.00	0.00	18.00	0.00	0.00	0.00	0.00	0.00	0.00	18.00	0.00	18.00
<i>Cardiospermum halicacabum</i>	36.67	36.67	0.00	12.33	12.33	0.00	0.00	0.00	0.00	49.00	49.00	0.00
<i>Centella asiatica</i>	120.00	86.00	34.00	0.00	0.00	0.00	0.00	0.00	0.00	120.00	86.00	34.00
<i>Centotheca lappacea</i>	12.33	0.00	12.33	0.00	0.00	0.00	0.00	0.00	0.00	12.33	0.00	12.33

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Chenopodium album</i>	8.67	7.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	8.67	7.00	1.67
<i>Christella parasitica</i>	541.67	346.33	195.33	182.00	130.00	52.00	86.67	57.33	29.33	810.33	533.67	276.67
<i>Chromolaena odorata</i>	7.67	7.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.67	7.67	0.00
<i>Cissampelos pareira</i>	1.67	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	1.67
<i>Colocasia esculenta</i>	1.67	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Crassocephalum crepidioides</i>	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
<i>Cuphea carthagenensis</i>	338.33	225.33	113.00	152.67	116.67	36.00	0.00	0.00	0.00	491.00	342.00	149.00
<i>Cyathula prostrata</i>	0.00	0.00	0.00	3.00	0.00	3.00	0.00	0.00	0.00	3.00	0.00	3.00
<i>Cynodon dactylon</i>	496.67	340.33	156.33	118.00	89.33	28.67	90.67	62.00	28.67	705.33	491.67	213.67
<i>Cyperus compressus</i>	108.33	77.67	30.67	42.67	31.33	11.33	23.67	16.67	7.00	174.67	125.67	49.00
<i>Cyperus difformis</i>	29.00	18.67	10.33	0.00	0.00	0.00	0.00	0.00	0.00	29.00	18.67	10.33
<i>Cyperus digitatus</i>	0.00	0.00	0.00	0.00	0.00	0.00	4.67	4.67	0.00	4.67	4.67	0.00
<i>Cyperus distans</i>	61.00	36.33	24.67	21.33	10.33	11.00	0.00	0.00	0.00	82.33	46.67	35.67
<i>Cyperus iria</i>	100.33	68.33	32.00	36.67	23.67	13.00	0.00	0.00	0.00	137.00	92.00	45.00
<i>Cyperus strigosus</i>	0.00	0.00	0.00	2.67	2.67	0.00	0.00	0.00	0.00	2.67	2.67	0.00
<i>Cyrtococcum oxyphyllum</i>	0.00	0.00	0.00	16.67	16.67	0.00	0.00	0.00	0.00	16.67	16.67	0.00
<i>Dicranopteris linearis</i>	0.00	0.00	0.00	1.00	0.00	1.00	0.00	0.00	0.00	1.00	0.00	1.00
<i>Digitaria ciliaris</i>	348.67	248.33	100.33	93.00	75.67	17.33	69.00	48.67	20.33	510.67	372.67	138.00
<i>Digitaria setigera</i>	24.67	24.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.67	24.67	0.00
<i>Digitaria violascens</i>	32.67	0.00	32.67	0.00	0.00	0.00	0.00	0.00	0.00	32.67	0.00	32.67
<i>Diplazium esculentum</i>	20.67	17.67	3.00	12.67	10.67	2.00	0.00	0.00	0.00	33.33	28.33	5.00
<i>Duchesnea indica</i>	90.67	60.33	30.33	36.00	24.00	12.00	22.67	13.67	9.00	149.33	98.00	51.33
<i>Dysphania ambrosioides</i>	13.33	13.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.33	13.33	0.00
<i>Eclipta prostrata</i>	126.67	95.33	31.33	44.67	30.33	14.33	35.00	20.33	14.67	206.33	146.00	60.33
<i>Emilia sonchifolia</i>	5.33	5.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.33	5.33	0.00
<i>Erigeron bonariensis</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.33	0.33	0.00	0.33
<i>Ethulia conyzoides</i>	195.33	134.67	60.67	61.00	46.33	14.67	45.00	30.00	15.00	301.33	211.00	90.33
<i>Euphorbia heterophylla</i>	5.67	0.00	5.67	0.00	0.00	0.00	0.00	0.00	0.00	5.67	0.00	5.67
<i>Euphorbia hirta</i>	74.33	35.67	38.67	24.00	11.67	12.33	23.67	14.67	9.00	122.00	62.00	60.00
<i>Euphorbia hypericifolia</i>	146.00	146.00	0.00	55.00	55.00	0.00	25.33	25.33	0.00	226.33	226.33	0.00
<i>Euphorbia thymifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	4.67	0.00	4.67	4.67	0.00	4.67
<i>Flemingia lineata</i>	99.67	71.33	28.33	24.67	17.33	7.33	0.00	0.00	0.00	124.33	88.67	35.67
<i>Floscopa scandens</i>	0.00	0.00	0.00	0.33	0.00	0.33	0.00	0.00	0.00	0.33	0.00	0.33
<i>Glinus oppositifolius</i>	80.67	54.67	26.00	0.00	0.00	0.00	19.67	13.33	6.33	100.33	68.00	32.33
<i>Gnaphalium pensylvanicum</i>	69.67	53.00	16.67	29.67	18.67	11.00	0.00	0.00	0.00	99.33	71.67	27.67
<i>Grangea maderaspatana</i>	227.67	148.33	79.33	66.67	51.67	15.00	44.00	30.00	14.00	338.33	230.00	108.33
<i>Heliotropium indicum</i>	85.33	49.33	36.00	37.00	20.67	16.33	31.00	18.00	13.00	153.33	88.00	65.33
<i>Heliotropium ovalifolium</i>	14.00	0.00	14.00	0.00	0.00	0.00	0.00	0.00	0.00	14.00	0.00	14.00
<i>Hemarthria compressa</i>	421.33	310.67	110.67	105.00	76.67	28.33	74.67	52.00	22.67	601.00	439.33	161.67
<i>Houttuynia cordata</i>	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.00
<i>Hydrocotyle sibthorpioides</i>	28.00	7.00	21.00	0.00	0.00	0.00	0.00	0.00	0.00	28.00	7.00	21.00
<i>Hymenachne amplexicaulis</i>	7.67	6.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	7.67	6.00	1.67
<i>Hyptis suaveolens</i>	145.67	97.67	48.00	0.00	0.00	0.00	0.00	0.00	0.00	145.67	97.67	48.00
<i>Impatiens tripetala</i>	3.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	3.00
<i>Imperata cylindrica</i>	512.67	333.67	179.00	195.33	156.67	38.67	108.00	70.00	38.00	816.00	560.33	255.67
<i>Kyllinga brevifolia</i>	167.33	119.67	47.67	54.67	40.67	14.00	27.33	20.00	7.33	249.33	180.33	69.00
<i>Laphangium luteoalbum</i>	162.33	122.67	39.67	53.00	37.00	16.00	34.67	21.67	13.00	250.00	181.33	68.67
<i>Leucas aspera</i>	56.33	34.00	22.33	0.00	0.00	0.00	0.00	0.00	0.00	56.33	34.00	22.33
<i>Leucostegia immersa</i>	1.67	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Lygodium flexuosum</i>	172.33	113.67	58.67	69.00	47.67	21.33	32.67	23.00	9.67	274.00	184.33	89.67
<i>Lygodium microphyllum</i>	24.00	15.33	8.67	0.00	0.00	0.00	0.00	0.00	0.00	24.00	15.33	8.67
<i>Merremia umbellata</i>	575.00	402.67	172.33	171.33	130.00	41.33	107.33	69.67	37.67	853.67	602.33	251.33
<i>Mikania micrantha</i>	186.67	120.33	66.33	82.00	56.00	26.00	0.00	0.00	0.00	268.67	176.33	92.33

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Oldenlandia lineata</i>	0.00	0.00	0.00	3.33	0.00	3.33	0.00	0.00	0.00	3.33	0.00	3.33
<i>Oldenlandia tenelliflora</i>	0.00	0.00	0.00	3.33	0.00	3.33	0.00	0.00	0.00	3.33	0.00	3.33
<i>Onychium japonicum</i>	4.00	0.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	0.00	4.00
<i>Oplismenus burmanni</i>	142.00	102.67	39.33	51.33	39.33	12.00	31.00	21.00	10.00	224.33	163.00	61.33
<i>Oplismenus compositus</i>	60.67	60.67	0.00	22.00	22.00	0.00	0.00	0.00	0.00	82.67	82.67	0.00
<i>Oxalis corniculata</i>	336.00	212.00	124.00	106.33	74.00	32.33	74.00	47.00	27.00	516.33	333.00	183.33
<i>Panicum auritum</i>	9.67	9.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.67	9.67	0.00
<i>Panicum brevifolium</i>	22.33	0.00	22.33	7.33	0.00	7.33	0.00	0.00	0.00	29.67	0.00	29.67
<i>Panicum notatum</i>	155.33	89.00	66.33	43.67	27.00	16.67	0.00	0.00	0.00	199.00	116.00	83.00
<i>Parthenium hysterophorus</i>	50.33	29.00	21.33	26.33	15.67	10.67	0.00	0.00	0.00	76.67	44.67	32.00
<i>Paspalidium flavidum</i>	49.00	27.67	21.33	0.00	0.00	0.00	0.00	0.00	0.00	49.00	27.67	21.33
<i>Paspalum conjugatum</i>	403.33	287.67	115.67	117.00	89.67	27.33	84.00	60.67	23.33	604.33	438.00	166.33
<i>Paspalum dilatatum</i>	77.00	60.00	17.00	0.00	0.00	0.00	0.00	0.00	0.00	77.00	60.00	17.00
<i>Paspalum scrobiculatum</i>	33.00	33.00	0.00	9.00	9.00	0.00	0.00	0.00	0.00	42.00	42.00	0.00
<i>Persicaria hydropiper</i>	73.00	54.67	18.33	34.33	21.33	13.00	24.67	16.00	8.67	132.00	92.00	40.00
<i>Phyla nodiflora</i>	27.67	21.00	6.67	9.33	5.67	3.67	8.00	6.00	2.00	45.00	32.67	12.33
<i>Phyllanthus niruri</i>	614.67	411.67	203.00	226.67	159.00	67.67	129.33	84.33	45.00	970.67	655.00	315.67
<i>Phyllanthus virgatus</i>	0.00	0.00	0.00	4.00	0.00	4.00	0.00	0.00	0.00	4.00	0.00	4.00
<i>Plectranthus sp.</i>	1.67	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Polycarpon prostratum</i>	337.33	233.67	103.67	78.33	58.67	19.67	53.00	36.67	16.33	468.67	329.00	139.67
<i>Polygonum plebeium</i>	452.67	318.00	134.67	135.33	93.67	41.67	79.33	50.67	28.67	667.33	462.33	205.00
<i>Pouzolzia zeylanica</i>	601.00	408.00	193.00	231.67	167.33	64.33	118.00	79.00	39.00	950.67	654.33	296.33
<i>Rorippa indica</i>	371.00	246.00	125.00	128.00	97.00	31.00	74.67	47.67	27.00	573.67	390.67	183.00
<i>Rumex dentatus</i>	10.67	0.00	10.67	0.00	0.00	0.00	0.00	0.00	0.00	10.67	0.00	10.67
<i>Rungia pectinata</i>	33.00	19.67	13.33	13.67	6.33	7.33	9.67	6.67	3.00	56.33	32.67	23.67
<i>Rungia repens</i>	46.67	30.00	16.67	0.00	0.00	0.00	0.00	0.00	0.00	46.67	30.00	16.67
<i>Saccharum spp.</i>	296.00	171.67	124.33	170.33	119.67	50.67	65.33	45.33	20.00	531.67	336.67	195.00
<i>Scleria terrestris</i>	247.67	181.00	66.67	112.33	76.33	36.00	0.00	0.00	0.00	360.00	257.33	102.67
<i>Senna tora</i>	6.33	2.33	4.00	0.00	0.00	0.00	0.00	0.00	0.00	6.33	2.33	4.00
<i>Setaria pumila</i>	351.67	241.00	110.67	111.67	81.33	30.33	70.67	50.33	20.33	534.00	372.67	161.33
<i>Sida acuta</i>	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00
<i>Solanum viarum</i>	38.33	20.33	18.00	17.00	11.33	5.67	0.00	0.00	0.00	55.33	31.67	23.67
<i>Sonchus oleraceus</i>	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00
<i>Sporobolus fertilis</i>	32.00	19.00	13.00	0.00	0.00	0.00	0.00	0.00	0.00	32.00	19.00	13.00
<i>Tetrastigma dubium</i>	4.00	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.00	0.00
<i>Themeda spp.</i>	54.00	27.67	26.33	29.67	16.67	13.00	0.00	0.00	0.00	83.67	44.33	39.33
<i>Verbena officinalis</i>	3.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.00	0.00
<i>Vicia sativa</i>	3.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.00	0.00
<i>Youngia japonica</i>	1.33	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33	1.33	0.00
UI 4	0.00	0.00	0.00	1.33	0.00	1.33	0.00	0.00	0.00	1.33	0.00	1.33
UI 5	67.00	45.33	21.67	15.00	9.67	5.33	0.00	0.00	0.00	82.00	55.00	27.00
UI 6	0.00	0.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	1.67	1.67	0.00
UI 7	0.00	0.00	0.00	0.00	0.00	0.00	1.33	1.33	0.00	1.33	1.33	0.00
UI 8	86.00	60.00	26.00	22.33	16.00	6.33	16.00	11.00	5.00	124.33	87.00	37.33
UI 10	34.67	21.00	13.67	15.00	11.67	3.33	8.67	6.33	2.33	58.33	39.00	19.33
UI 11	14.00	14.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.00	14.00	0.00
UI 14	6.67	0.00	6.67	0.00	0.00	0.00	0.00	0.00	0.00	6.67	0.00	6.67
UI 18	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	0.00
UI 19	3.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	3.00	0.00
UI 20	0.00	0.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	1.67	1.67	0.00
UI 21	14.00	14.00	0.00	4.00	4.00	0.00	0.00	0.00	0.00	18.00	18.00	0.00
UI 25	14.67	14.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.67	14.67	0.00
UI 26	8.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00	0.00

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
UI 28	2.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00
UK (premature mortality)	213.00	153.33	59.67	73.00	60.67	12.33	16.00	14.33	1.67	302.00	228.33	73.67

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.38. Overall and seasonal plant species mean seed abundances recorded from different soil layers tall riverine alluvial grasslands soil seed bank given natural treatment during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Achyranthes aspera</i>	3.33±0.00	0.00	3.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00
<i>Acmella uliginosa</i>	8.92±1.85	12.00±2.86	5.83±1.17	3.04±0.79	4.08±1.34	2.00±0.59	0.00	0.00	0.00	11.96±2.33	16.08±3.33	7.83±1.72
<i>Acroceras zizanioides</i>	33.00±5.84	47.33±2.51	18.67±3.97	10.58±2.57	16.58±2.01	4.58±1.66	6.54±1.35	9.33±1.19	3.75±1.36	50.13±9.39	73.25±2.78	27.00±6.85
<i>Acroceras munroanum</i>	8.00±0.00	0.00	8.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00±0.00	0.00	8.00±0.00
<i>Adiantum caudatum</i>	19.33±3.82	28.33±2.33	10.33±2.93	5.17±0.88	7.08±1.03	3.25±0.28	4.17±0.71	5.42±0.89	2.92±0.71	28.67±4.83	40.83±2.07	16.50±2.41
<i>Adiantum philippense</i>	16.33±0.00	16.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.33±0.00	16.33±0.00	0.00
<i>Ageratum conyzoides</i>	18.83±4.16	27.92±4.79	9.75±1.64	6.00±1.14	8.25±1.43	3.75±0.82	3.96±0.67	5.67±0.36	2.25±0.21	28.79±5.77	41.83±6.06	15.75±2.27
<i>Alpinia nigra</i>	3.08±0.64	4.25±0.64	1.92±0.77	0.00	0.00	0.00	0.00	0.00	0.00	3.08±0.64	4.25±0.64	1.92±0.77
<i>Alternanthera pungens</i>	25.71±4.33	35.00±4.04	18.75±4.46	7.00±2.61	11.00±5.67	4.00±0.88	0.00	0.00	0.00	32.71±5.53	46.00±1.84	22.75±5.31
<i>Alternanthera sessilis</i>	34.63±5.52	47.83±4.97	21.42±1.13	11.29±2.98	17.25±4.11	5.33±0.87	6.67±1.39	9.42±1.70	3.92±1.07	52.58±9.58	74.50±9.99	30.67±2.94
<i>Amaranthus spinosus</i>	5.92±0.50	6.08±0.70	5.75±0.81	3.54±0.34	3.92±0.28	3.17±0.62	0.00	0.00	0.00	9.46±0.60	10.00±0.97	8.92±0.74
<i>Ampelopteris prolifer</i>	43.00±8.67	43.00±8.67	0.00	13.00±5.33	13.00±5.33	0.00	0.00	0.00	0.00	56.00±14.00	56.00±14.00	0.00
<i>Apluda mutica</i>	77.13±12.04	105.50±9.17	48.75±7.47	23.88±4.58	35.17±3.15	12.58±1.72	13.08±2.03	17.75±1.05	8.42±1.89	114.08±18.05	158.42±11.62	69.75±8.64
<i>Aristida adscensionis</i>	25.33±0.00	25.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.33±0.00	25.33±0.00	0.00
<i>Arundinella bengalensis</i>	20.92±3.20	20.92±3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.92±3.20	20.92±3.20	0.00
<i>Blumea lacera</i>	1.00±0.00	0.00	1.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00
<i>Brachiaria distachya</i>	32.33±11.33	32.33±11.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.33±11.33	32.33±11.33	0.00
<i>Cajanus scarabaeoides</i>	3.33±0.00	0.00	3.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00
<i>Capillipedium assimile</i>	9.00±1.00	0.00	9.00±1.00	0.00	0.00	0.00	0.00	0.00	0.00	9.00±1.00	0.00	9.00±1.00
<i>Cardiospermum halicacabum</i>	18.33±1.00	18.33±1.00	0.00	6.17±1.50	6.17±1.50	0.00	0.00	0.00	0.00	24.50±2.50	24.50±2.50	0.00
<i>Centella asiatica</i>	15.00±2.74	21.50±2.20	8.50±1.45	0.00	0.00	0.00	0.00	0.00	0.00	15.00±2.74	21.50±2.20	8.50±1.45
<i>Centotheca lappacea</i>	12.33±0.00	0.00	12.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.33±0.00	0.00	12.33±0.00
<i>Chenopodium album</i>	2.89±0.62	3.50±0.17	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.89±0.62	3.50±0.17	1.67±0.00
<i>Christella parasitica</i>	67.71±10.15	86.58±12.17	48.83±9.77	22.75±4.44	32.50±5.13	13.00±1.46	10.83±2.43	14.33±3.70	7.33±2.41	101.29±16.39	133.42±20.21	69.17±12.56
<i>Chromolaena odorata</i>	3.83±0.83	3.83±0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.83±0.83	3.83±0.83	0.00
<i>Cissampelos pareira</i>	1.67±0.00	0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00
<i>Colocasia esculenta</i>	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Crassocephalum crepidioides</i>	1.00±0.00	0.00	1.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00
<i>Cuphea carthagenensis</i>	42.29±6.16	56.33±5.96	28.25±3.23	19.08±4.15	29.17±3.15	9.00±1.64	0.00	0.00	0.00	61.38±9.41	85.50±3.98	37.25±3.05
<i>Cyathula prostrata</i>	0.00	0.00	0.00	3.00±0.00	0.00	3.00±0.00	0.00	0.00	0.00	3.00±0.00	0.00	3.00±0.00
<i>Cynodon dactylon</i>	62.08±10.90	85.08±12.54	39.08±6.66	14.75±3.17	22.33±2.48	7.17±1.51	11.33±2.22	15.50±2.86	7.17±1.78	88.17±16.05	122.92±17.67	53.42±9.19
<i>Cyperus compressus</i>	27.08±7.40	38.83±6.83	15.33±2.33	10.67±3.24	15.67±1.33	5.67±3.33	5.92±1.67	8.33±1.67	3.50±1.50	43.67±12.13	62.83±9.83	24.50±7.17
<i>Cyperus difformis</i>	9.67±4.53	18.67±0.00	5.17±0.83	0.00	0.00	0.00	0.00	0.00	0.00	9.67±4.53	18.67±0.00	5.17±0.83
<i>Cyperus digitatus</i>	0.00	0.00	0.00	0.00	0.00	0.00	2.33±0.00	2.33±0.00	0.00	2.33±0.00	2.33±0.00	0.00
<i>Cyperus distans</i>	12.20±2.60	18.17±1.50	8.22±1.39	4.27±1.05	5.17±0.50	3.67±1.76	0.00	0.00	0.00	16.47±3.35	23.33±2.00	11.89±3.13
<i>Cyperus iria</i>	12.54±1.92	17.08±1.67	8.00±0.81	4.58±0.87	5.92±1.44	3.25±0.57	0.00	0.00	0.00	17.13±2.63	23.00±3.00	11.25±0.61
<i>Cyperus strigosus</i>	0.00	0.00	0.00	2.67±0.00	2.67±0.00	0.00	0.00	0.00	0.00	2.67±0.00	2.67±0.00	0.00
<i>Cyrtococcum oxyphyllum</i>	0.00	0.00	0.00	16.67±0.00	16.67±0.00	0.00	0.00	0.00	0.00	16.67±0.00	16.67±0.00	0.00
<i>Dicranopteris linearis</i>	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00
<i>Digitaria ciliaris</i>	43.58±7.87	62.08±3.06	25.08±7.19	11.63±3.96	18.92±6.02	4.33±1.27	8.63±1.89	12.17±2.59	5.08±1.25	63.83±12.78	93.17±10.34	34.50±9.04

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Digitaria setigera</i>	24.67±0.00	24.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.67±0.00	24.67±0.00	0.00
<i>Digitaria violascens</i>	16.33±1.33	0.00	16.33±1.33	0.00	0.00	0.00	0.00	0.00	0.00	16.33±1.33	0.00	16.33±1.33
<i>Diplazium esculentum</i>	6.89±2.42	8.83±2.50	3.00±0.00	4.22±1.13	5.33±0.33	2.00±0.00	0.00	0.00	0.00	11.11±3.30	14.17±2.17	5.00±0.00
<i>Duchesnea indica</i>	11.33±1.60	15.08±1.24	7.58±1.04	4.50±0.60	6.00±0.24	3.00±0.36	2.83±0.37	3.42±0.16	2.25±0.63	18.67±2.41	24.50±1.27	12.83±1.71
<i>Dysphania ambrosioides</i>	6.67±4.00	6.67±4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.67±4.00	6.67±4.00	0.00
<i>Eclipta prostrata</i>	15.83±3.35	23.83±2.89	7.83±1.10	5.58±1.13	7.58±1.77	3.58±0.34	4.38±0.35	5.08±0.25	3.67±0.43	25.79±4.13	36.50±1.75	15.08±0.53
<i>Emilia sonchifolia</i>	5.33±0.00	5.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.33±0.00	5.33±0.00	0.00
<i>Erigeron bonariensis</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.33±0.00	0.00	0.33±0.00	0.33±0.00	0.00	0.33±0.00
<i>Ethulia conyzoides</i>	24.42±4.28	33.67±3.58	15.17±3.97	7.63±1.57	11.58±0.69	3.67±0.79	5.63±0.85	7.50±0.65	3.75±0.76	37.67±6.31	52.75±3.72	22.58±4.52
<i>Euphorbia heterophylla</i>	5.67±0.00	0.00	5.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.67±0.00	0.00	5.67±0.00
<i>Euphorbia hirta</i>	12.39±2.34	17.83±4.17	9.67±1.83	4.00±0.78	5.83±1.17	3.08±0.67	3.94±1.11	7.33±0.33	2.25±0.46	20.33±3.84	31.00±5.00	15.00±2.05
<i>Euphorbia hypericifolia</i>	36.50±2.64	36.50±2.64	0.00	13.75±1.51	13.75±1.51	0.00	6.33±0.36	6.33±0.36	0.00	56.58±3.40	56.58±3.40	0.00
<i>Euphorbia thymifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	4.67±0.00	0.00	4.67±0.00	4.67±0.00	0.00	4.67±0.00
<i>Flemingia lineata</i>	14.24±2.60	17.83±3.63	9.44±0.87	3.52±0.67	4.33±0.71	2.44±1.06	0.00	0.00	0.00	17.76±2.80	22.17±3.31	11.89±1.72
<i>Floscopa scandens</i>	0.00	0.00	0.00	0.33±0.00	0.00	0.33±0.00	0.00	0.00	0.00	0.33±0.00	0.00	0.33±0.00
<i>Glinus oppositifolius</i>	20.17±4.94	27.33±5.00	13.00±4.33	0.00	0.00	0.00	4.92±1.56	6.67±2.67	3.17±1.17	25.08±6.16	34.00±7.67	16.17±3.17
<i>Gnaphalium pensylvanicum</i>	17.42±5.95	26.50±6.83	8.33±1.00	7.42±1.27	9.33±0.33	5.50±1.50	0.00	0.00	0.00	24.83±7.00	35.83±7.17	13.83±0.50
<i>Grangea maderaspatana</i>	28.46±3.63	37.08±1.97	19.83±2.84	8.33±2.06	12.92±2.34	3.75±0.50	5.50±0.93	7.50±1.02	3.50±0.59	42.29±6.03	57.50±2.74	27.08±2.81
<i>Heliotropium indicum</i>	10.67±1.02	12.33±0.71	9.00±1.57	4.63±0.59	5.17±0.40	4.08±1.12	3.88±0.49	4.50±0.40	3.25±0.83	19.17±1.77	22.00±0.71	16.33±2.95
<i>Heliotropium ovalifolium</i>	7.00±0.00	0.00	7.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00±0.00	0.00	7.00±0.00
<i>Hemarthria compressa</i>	52.67±10.41	77.67±5.96	27.67±7.31	13.13±3.60	19.17±5.46	7.08±2.53	9.33±1.68	13.00±1.34	5.67±1.55	75.13±14.96	109.83±10.71	40.42±11.25
<i>Houttuynia cordata</i>	1.00±0.00	0.00	1.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	0.00	1.00±0.00
<i>Hydrocotyle sibthorpioides</i>	5.60±0.73	7.00±0.00	5.25±0.82	0.00	0.00	0.00	0.00	0.00	0.00	5.60±0.73	7.00±0.00	5.25±0.82
<i>Hymenachne amplexicaulis</i>	2.56±0.59	3.00±0.67	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.56±0.59	3.00±0.67	1.67±0.00
<i>Hyptis suaveolens</i>	20.81±2.55	24.42±2.10	16.00±4.06	0.00	0.00	0.00	0.00	0.00	0.00	20.81±2.55	24.42±2.10	16.00±4.06
<i>Impatiens tripetala</i>	3.00±0.00	0.00	3.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00±0.00	0.00	3.00±0.00
<i>Imperata cylindrica</i>	64.08±8.35	83.42±4.30	44.75±7.59	24.42±5.95	39.17±4.43	9.67±0.79	13.50±2.22	17.50±3.24	9.50±1.36	102.00±15.76	140.08±11.61	63.92±7.57
<i>Kyllinga brevifolia</i>	20.92±3.64	29.92±1.79	11.92±2.14	6.83±1.51	10.17±1.62	3.50±0.78	3.42±0.71	5.00±0.71	1.83±0.40	31.17±5.60	45.08±3.18	17.25±2.70
<i>Laphangium luteoalbum</i>	20.29±4.02	30.67±1.22	9.92±1.41	6.63±1.34	9.25±1.61	4.00±1.11	4.33±0.65	5.42±0.55	3.25±0.96	31.25±5.51	45.33±0.98	17.17±2.89
<i>Leucas aspera</i>	7.04±0.75	8.50±0.84	5.58±0.72	0.00	0.00	0.00	0.00	0.00	0.00	7.04±0.75	8.50±0.84	5.58±0.72
<i>Leucostegia immersa</i>	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Lygodium flexuosum</i>	21.54±4.00	28.42±5.63	14.67±3.39	8.63±1.61	11.92±2.01	5.33±0.95	4.08±0.96	5.75±1.51	2.42±0.37	34.25±5.77	46.08±6.80	22.42±3.94
<i>Lygodium microphyllum</i>	12.00±3.33	15.33±0.00	8.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00±3.33	15.33±0.00	8.67±0.00
<i>Merremia umbellata</i>	71.88±12.53	100.67±10.15	43.08±8.80	21.42±4.73	32.50±4.40	10.33±1.81	13.42±2.29	17.42±3.57	9.42±1.08	106.71±18.80	150.58±15.60	62.83±11.11
<i>Mikania micrantha</i>	23.33±4.39	30.08±4.89	16.58±5.97	10.25±2.03	14.00±2.29	6.50±2.17	0.00	0.00	0.00	33.58±5.99	44.08±6.34	23.08±7.34
<i>Oldenlandia lineata</i>	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00
<i>Oldenlandia tenelliflora</i>	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00	0.00	0.00	0.00	3.33±0.00	0.00	3.33±0.00
<i>Onychium japonicum</i>	4.00±0.00	0.00	4.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00±0.00	0.00	4.00±0.00
<i>Oplismenus burmanni</i>	28.40±3.88	34.22±2.79	19.67±0.33	10.27±2.23	13.11±2.54	6.00±0.33	6.20±0.58	7.00±0.58	5.00±0.00	44.87±6.38	54.33±4.86	30.67±0.00
<i>Oplismenus compositus</i>	60.67±0.00	60.67±0.00	0.00	22.00±0.00	22.00±0.00	0.00	0.00	0.00	0.00	82.67±0.00	82.67±0.00	0.00
<i>Oxalis corniculata</i>	42.00±4.74	53.00±2.38	31.00±4.29	13.29±2.38	18.50±2.33	8.08±1.72	9.25±1.24	11.75±1.07	6.75±1.35	64.54±8.06	83.25±4.89	45.83±6.76
<i>Panicum auritum</i>	9.67±0.00	9.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.67±0.00	9.67±0.00	0.00
<i>Panicum brevifolium</i>	22.33±0.00	0.00	22.33±0.00	7.33±0.00	0.00	7.33±0.00	0.00	0.00	0.00	29.67±0.00	0.00	29.67±0.00
<i>Panicum notatum</i>	25.89±6.41	44.50±7.17	16.58±2.74	7.28±2.50	13.50±5.50	4.17±0.92	0.00	0.00	0.00	33.17±8.78	58.00±12.67	20.75±3.41
<i>Parthenium hysterophorus</i>	6.29±0.74	7.25±0.95	5.33±1.01	3.29±0.35	3.92±0.52	2.67±0.24	0.00	0.00	0.00	9.58±0.97	11.17±1.29	8.00±1.04
<i>Paspalidium flavidum</i>	12.25±3.24	13.83±6.83	10.67±3.33	0.00	0.00	0.00	0.00	0.00	0.00	12.25±3.24	13.83±6.83	10.67±3.33
<i>Paspalum conjugatum</i>	50.42±8.58	71.92±1.89	28.92±5.60	14.63±4.05	22.42±5.51	6.83±2.40	10.50±1.93	15.17±1.19	5.83±1.24	75.54±13.65	109.50±4.98	41.58±8.73
<i>Paspalum dilatatum</i>	19.25±7.29	30.00±9.33	8.50±0.50	0.00	0.00	0.00	0.00	0.00	0.00	19.25±7.29	30.00±9.33	8.50±0.50
<i>Paspalum scrobiculatum</i>	33.00±0.00	33.00±0.00	0.00	9.00±0.00	9.00±0.00	0.00	0.00	0.00	0.00	42.00±0.00	42.00±0.00	0.00
<i>Persicaria hydropiper</i>	9.13±1.97	13.67±1.92	4.58±0.81	4.29±0.53	5.33±0.14	3.25±0.76	3.08±0.44	4.00±0.49	2.17±0.35	16.50±2.69	23.00±2.12	10.00±1.00
<i>Phyla nodiflora</i>	6.92±2.69	10.50±4.17	3.33±0.67	2.33±0.59	2.83±1.17	1.83±0.50	2.00±0.58	3.00±0.00	1.00±0.00	11.25±3.22	16.33±3.00	6.17±1.17
<i>Phyllanthus niruri</i>	76.83±10.79	102.92±5.46	50.75±7.75	28.33±4.65	39.75±2.86	16.92±2.42	16.17±2.08	21.08±1.20	11.25±1.61	121.33±17.42	163.75±9.40	78.92±11.30
<i>Phyllanthus virgatus</i>	0.00	0.00	0.00	4.00±0.00	0.00	4.00±0.00	0.00	0.00	0.00	4.00±0.00	0.00	4.00±0.00

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Plectranthus</i> sp.	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Polycarpon prostratum</i>	42.17±7.14	58.42±6.07	25.92±5.03	9.79±2.49	14.67±3.57	4.92±0.53	6.63±1.26	9.17±1.31	4.08±1.16	58.58±10.26	82.25±9.48	34.92±5.34
<i>Polygonum plebeium</i>	56.58±10.04	79.50±9.87	33.67±4.75	16.92±3.55	23.42±5.22	10.42±1.86	9.92±1.51	12.67±2.19	7.17±0.91	83.42±14.77	115.58±17.11	51.25±5.95
<i>Pouzolzia zeylanica</i>	75.13±11.03	102.00±5.24	48.25±7.68	28.96±5.56	41.83±4.92	16.08±3.07	14.75±2.21	19.75±1.55	9.75±1.95	118.83±18.45	163.58±10.64	74.08±11.87
<i>Rorippa indica</i>	46.38±7.18	61.50±7.73	31.25±5.31	16.00±3.54	24.25±3.31	7.75±1.46	9.33±1.51	11.92±1.89	6.75±1.61	71.71±10.76	97.67±6.50	45.75±7.02
<i>Rumex dentatus</i>	2.67±0.43	0.00	2.67±0.43	0.00	0.00	0.00	0.00	0.00	0.00	2.67±0.43	0.00	2.67±0.43
<i>Rungia pectinata</i>	16.50±3.17	19.67±0.00	13.33±0.00	6.83±0.50	6.33±0.00	7.33±0.00	4.83±1.83	6.67±0.00	3.00±0.00	28.17±4.50	32.67±0.00	23.67±0.00
<i>Rungia repens</i>	11.67±4.35	15.00±9.33	8.33±2.00	0.00	0.00	0.00	0.00	0.00	0.00	11.67±4.35	15.00±9.33	8.33±2.00
<i>Saccharum</i> spp.	37.00±2.48	42.92±1.44	31.08±1.80	21.29±3.87	29.92±2.82	12.67±3.53	8.17±1.39	11.33±1.43	5.00±0.49	66.46±7.39	84.17±4.52	48.75±5.06
<i>Scleria terrestris</i>	30.96±6.46	45.25±5.80	16.67±5.00	14.04±2.59	19.08±3.31	9.00±1.82	0.00	0.00	0.00	45.00±8.16	64.33±6.44	25.67±4.49
<i>Senna tora</i>	2.11±0.40	2.33±0.00	2.00±0.67	0.00	0.00	0.00	0.00	0.00	0.00	2.11±0.40	2.33±0.00	2.00±0.67
<i>Setaria pumila</i>	43.96±6.76	60.25±4.79	27.67±3.63	13.96±2.90	20.33±2.61	7.58±2.28	8.83±1.59	12.58±1.01	5.08±1.20	66.75±11.10	93.17±8.23	40.33±6.50
<i>Sida acuta</i>	2.00±1.00	2.00±1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00±1.00	2.00±1.00	0.00
<i>Solanum viarum</i>	7.67±1.37	10.17±2.50	6.00±0.84	3.40±0.96	5.67±0.67	1.89±0.22	0.00	0.00	0.00	11.07±2.22	15.83±3.17	7.89±0.73
<i>Sonchus oleraceus</i>	1.00±0.00	1.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	1.00±0.00	0.00
<i>Sporobolus fertilis</i>	8.00±2.28	9.50±4.83	6.50±1.83	0.00	0.00	0.00	0.00	0.00	0.00	8.00±2.28	9.50±4.83	6.50±1.83
<i>Tetragstigma dubium</i>	4.00±0.00	4.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00±0.00	4.00±0.00	0.00
<i>Themeda</i> spp.	6.75±0.28	6.92±0.57	6.58±0.16	3.71±0.41	4.17±0.62	3.25±0.52	0.00	0.00	0.00	10.46±0.54	11.08±0.95	9.83±0.44
<i>Verbena officinalis</i>	3.00±0.00	3.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00±0.00	3.00±0.00	0.00
<i>Vicia sativa</i>	3.00±0.00	3.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00±0.00	3.00±0.00	0.00
<i>Youngia japonica</i>	1.33±0.00	1.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33±0.00	1.33±0.00	0.00
UI 4	0.00	0.00	0.00	1.33±0.00	0.00	1.33±0.00	0.00	0.00	0.00	1.33±0.00	0.00	1.33±0.00
UI 5	9.57±2.19	15.11±2.26	5.42±0.93	2.14±0.43	3.22±0.48	1.33±0.14	0.00	0.00	0.00	11.71±2.52	18.33±2.17	6.75±0.85
UI 6	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
UI 7	0.00	0.00	0.00	0.00	0.00	0.00	1.33±0.00	1.33±0.00	0.00	1.33±0.00	1.33±0.00	0.00
UI 8	14.33±2.81	20.00±1.86	8.67±2.01	3.72±1.00	5.33±1.35	2.11±0.78	2.67±0.51	3.67±0.19	1.67±0.51	20.72±3.87	29.00±1.45	12.44±2.02
UI 10	8.67±1.25	10.50±1.17	6.83±1.17	3.75±1.58	5.83±2.50	1.67±0.00	2.17±0.59	3.17±0.17	1.17±0.17	14.58±2.91	19.50±1.17	9.67±1.00
UI 11	7.00±1.00	7.00±1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00±1.00	7.00±1.00	0.00
UI 14	6.67±0.00	0.00	6.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.67±0.00	0.00	6.67±0.00
UI 18	2.00±0.00	2.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00±0.00	2.00±0.00	0.00
UI 19	3.00±0.00	3.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00±0.00	3.00±0.00	0.00
UI 20	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
UI 21	7.00±0.33	7.00±0.33	0.00	2.00±0.67	2.00±0.67	0.00	0.00	0.00	0.00	9.00±1.00	9.00±1.00	0.00
UI 25	14.67±0.00	14.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.67±0.00	14.67±0.00	0.00
UI 26	8.00±0.00	8.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.00±0.00	8.00±0.00	0.00
UI 28	2.00±0.00	0.00	2.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00±0.00	0.00	2.00±0.00
UK (premature mortality)	26.63±6.16	38.33±8.17	14.92±4.36	9.13±2.60	15.17±2.47	3.08±1.04	2.67±0.71	3.58±0.63	0.83±0.50	37.75±8.26	57.08±7.32	18.42±3.92

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.39. Overall and seasonal plant species seed abundances and densities (m⁻²) recorded from different soil layers of tall riverine alluvial grasslands soil seed bank given flooding treatment during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers															Total								
	Upper layer (0-5)					Middle layer (5-10)					Lower layer (10-15)													
	O		DS		WS	O		DS		WS	O		DS		WS	O		DS		WS				
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D				
<i>Acmella uliginosa</i>	68	26.74	40	31.45	28	22.02	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	68	8.91	40	10.48	28	7.34		
<i>Acroceras zizanioides</i>	343	134.86	253	198.95	90	70.77	121	47.57	89	69.99	32	25.16	91	35.78	62	48.75	29	22.80	555	72.74	404	105.89	151	39.58
<i>Adenostemma lavenia</i>	0	0.00	0	0.00	0	0.00	5	1.97	5	3.93	0	0.00	0	0.00	0	0.00	5	0.66	5	1.31	0	0.00	0	0.00
<i>Adiantum caudatum</i>	165	64.87	104	81.78	61	47.97	57	22.41	37	29.09	20	15.73	40	15.73	23	18.09	17	13.37	262	34.34	164	42.99	98	25.69

Plant species	Soil layers															Total								
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Adiantum capillus-veneris</i>	5	1.97	0	0.00	5	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.66	0	0.00	5	1.31
<i>Ageratum conyzoides</i>	108	42.46	74	58.19	34	26.74	47	18.48	30	23.59	17	13.37	36	14.15	25	19.66	11	8.65	191	25.03	129	33.81	62	16.25
<i>Alternanthera pungens</i>	157	61.73	83	65.27	74	58.19	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	157	20.58	83	21.76	74	19.40
<i>Alternanthera sessilis</i>	481	189.12	318	250.06	163	128.17	155	60.94	105	82.57	50	39.32	83	32.63	58	45.61	25	19.66	719	94.23	481	126.08	238	62.38
<i>Amaranthus spinosus</i>	86	33.81	41	32.24	45	35.39	40	15.73	25	19.66	15	11.80	0	0.00	0	0.00	0	0.00	126	16.51	66	17.30	60	15.73
<i>Ampelopteris prolifera</i>	110	43.25	110	86.50	0	0.00	27	10.62	27	21.23	0	0.00	0	0.00	0	0.00	0	0.00	137	17.95	137	35.91	0	0.00
<i>Apluda mutica</i>	949	373.12	637	500.90	312	245.34	328	128.96	197	154.91	131	103.01	257	101.05	151	118.74	106	83.35	1534	201.04	985	258.18	549	143.90
<i>Arenaria serpyllifolia</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	1.18	3	2.36	0	0.00	3	0.39	3	0.79	0	0.00
<i>Aristida adscensionis</i>	27	10.62	27	21.23	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	27	3.54	27	7.08	0	0.00
<i>Arundinella bengalensis</i>	121	47.57	121	95.15	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	121	15.86	121	31.72	0	0.00
<i>Azolla pinnata</i>	97	38.14	70	55.04	27	21.23	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	97	12.71	70	18.35	27	7.08
<i>Boerhavia diffusa</i>	0	0.00	0	0.00	0	0.00	5	1.97	0	0.00	5	3.93	0	0.00	0	0.00	0	0.00	5	0.66	0	0.00	5	1.31
<i>Brachiaria reptans</i>	33	12.97	33	25.95	0	0.00	15	5.90	15	11.80	0	0.00	0	0.00	0	0.00	0	0.00	48	6.29	48	12.58	0	0.00
<i>Capillipedium assimile</i>	19	7.47	0	0.00	19	14.94	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	19	2.49	0	0.00	19	4.98
<i>Capsella bursa-pastoris</i>	5	1.97	5	3.93	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	5	0.66	5	1.31	0	0.00
<i>Cardiospermum halicacabum</i>	36	14.15	36	28.31	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	36	4.72	36	9.44	0	0.00
<i>Centella asiatica</i>	92	36.17	57	44.82	35	27.52	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	92	12.06	57	14.94	35	9.17
<i>Centothea lappacea</i>	13	5.11	0	0.00	13	10.22	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	13	1.70	0	0.00	13	3.41
<i>Christella parasitica</i>	808	317.68	537	422.27	271	213.10	308	121.10	191	150.19	117	92.00	223	87.68	142	111.66	81	63.69	1339	175.49	870	228.04	469	122.93
<i>Cuphea carthagenensis</i>	508	199.73	342	268.93	166	130.53	139	54.65	101	79.42	38	29.88	0	0.00	0	0.00	0	0.00	647	84.79	443	116.12	204	53.47
<i>Cynodon dactylon</i>	812	319.26	553	434.85	259	203.66	304	119.53	181	142.33	123	96.72	230	90.43	146	114.81	84	66.05	1346	176.40	880	230.66	466	122.15
<i>Cyperus compactus</i>	15	5.90	15	11.80	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	15	1.97	15	3.93	0	0.00
<i>Cyperus compressus</i>	209	82.17	140	110.09	69	54.26	51	20.05	29	22.80	22	17.30	38	14.94	23	18.09	15	11.80	298	39.06	192	50.33	106	27.78
<i>Cyperus cyperoides</i>	36	14.15	33	25.95	3	2.36	13	5.11	11	8.65	2	1.57	0	0.00	0	0.00	0	0.00	49	6.42	44	11.53	5	1.31
<i>Cyperus digitatus</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	10	3.93	10	7.86	0	0.00	10	1.31	10	2.62	0	0.00
<i>Cyperus distans</i>	115	45.22	67	52.69	48	37.74	39	15.33	22	17.30	17	13.37	0	0.00	0	0.00	0	0.00	154	20.18	89	23.33	65	17.04
<i>Cyperus eleusinoides</i>	0	0.00	0	0.00	0	0.00	2	0.79	2	1.57	0	0.00	0	0.00	0	0.00	0	0.00	2	0.26	2	0.52	0	0.00
<i>Cyperus imbricatus</i>	117	46.00	53	41.68	64	50.33	55	21.62	28	22.02	27	21.23	0	0.00	0	0.00	0	0.00	172	22.54	81	21.23	91	23.85
<i>Cyperus iria</i>	170	66.84	98	77.06	72	56.62	62	24.38	40	31.45	22	17.30	0	0.00	0	0.00	0	0.00	232	30.41	138	36.17	94	24.64
<i>Cyperus strigosus</i>	0	0.00	0	0.00	0	0.00	6	2.36	6	4.72	0	0.00	0	0.00	0	0.00	0	0.00	6	0.79	6	1.57	0	0.00
<i>Cyperus tenuispica</i>	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	0.79	2	1.57	0	0.00	2	0.26	2	0.52	0	0.00
<i>Cyrtococcum patens</i>	71	27.92	57	44.82	14	11.01	32	12.58	26	20.45	6	4.72	0	0.00	0	0.00	0	0.00	103	13.50	83	21.76	20	5.24
<i>Digitaria ciliaris</i>	392	154.12	294	231.19	98	77.06	138	54.26	97	76.28	41	32.24	96	37.74	67	52.69	29	22.80	626	82.04	458	120.05	168	44.04
<i>Drymaria cordata</i>	0	0.00	0	0.00	0	0.00	10	3.93	10	7.86	0	0.00	0	0.00	0	0.00	0	0.00	10	1.31	10	2.62	0	0.00
<i>Duchesnea indica</i>	112	44.04	67	52.69	45	35.39	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	112	14.68	67	17.56	45	11.80
<i>Eclipta prostrata</i>	158	62.12	94	73.92	64	50.33	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	158	20.71	94	24.64	64	16.78
<i>Ethulia conyzoides</i>	216	84.93	126	99.08	90	70.77	72	28.31	51	40.10	21	16.51	44	17.30	27	21.23	17	13.37	332	43.51	204	53.47	128	33.55
<i>Euphorbia hirta</i>	112	44.04	58	45.61	54	42.46	54	21.23	25	19.66	29	22.80	33	12.97	15	11.80	18	14.15	199	26.08	98	25.69	101	26.47
<i>Euphorbia hypericifolia</i>	131	51.51	131	103.01	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	131	17.17	131	34.34	0	0.00
<i>Glinus oppositifolius</i>	118	46.39	70	55.04	48	37.74	0	0.00	0	0.00	0	0.00	32	12.58	20	15.73	12	9.44	150	19.66	90	23.59	60	15.73
<i>Grangea maderaspatana</i>	292	114.81	189	148.62	103	80.99	96	37.74	69	54.26	27	21.23	70	27.52	41	32.24	29	22.80	458	60.02	299	78.37	159	41.68
<i>Heliotropium indicum</i>	126	49.54	73	57.40	53	41.68	45	17.69	30	23.59	15	11.80	40	15.73	23	18.09	17	13.37	211	27.65	126	33.03	85	22.28
<i>Hemarthra compressa</i>	625	245.73	394	309.82	231	181.65	228	89.64	152	119.53	76	59.76	205	80.60	128	100.65	77	60.55	1058	138.66	674	176.67	384	100.65
<i>Ichnanthus pallens</i>	0	0.00	0	0.00	0	0.00	5	1.97	5	3.93	0	0.00	0	0.00	0	0.00	0	0.00	5	0.66	5	1.31	0	0.00
<i>Imperata cylindrica</i>	732	287.80	480	377.45	252	198.16	275	108.12	182	143.12	93	73.13	222	87.28	121	95.15	101	79.42	1229	161.07	783	205.24	446	116.90
<i>Kyllinga brevifolia</i>	243	95.54	151	118.74	92	72.34	73	28.70	46	36.17	27	21.23	0	0.00	0	0.00	0	0.00	316	41.41	197	51.64	119	31.19
<i>Leersia hexandra</i>	54	21.23	54	42.46	0	0.00	17	6.68	17	13.37	0	0.00	0	0.00	0	0.00	0	0.00	71	9.31	71	18.61	0	0.00
<i>Leucas aspera</i>	75	29.49	41	32.24	34	26.74	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	75	9.83	41	10.75	34	8.91
<i>Lygodium flexuosum</i>	304	119.53	199	156.48	105	82.57	96	37.74	65	51.11	31	24.38	50	19.66	32	25.16	18	14.15	450	58.98	296	77.59		

Plant species	Soil layers																		Total					
	Upper layer (0-5)						Middle layer (5-10)						Lower layer (10-15)											
	O		DS		WS		O		DS		WS		O		DS		WS		O		DS		WS	
	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D	A	D
<i>Oldenlandia tenelliflora</i>	0	0.00	0	0.00	0	0.00	4	1.57	0	0.00	4	3.15	0	0.00	0	0.00	0	0.00	4	0.52	0	0.00	4	1.05
<i>Oplismenus burmanni</i>	188	73.92	130	102.23	58	45.61	71	27.92	49	38.53	22	17.30	37	14.55	27	21.23	10	7.86	296	38.79	206	54.00	90	23.59
<i>Oplismenus compositus</i>	66	25.95	66	51.90	0	0.00	32	12.58	32	25.16	0	0.00	0	0.00	0	0.00	0	0.00	98	12.84	98	25.69	0	0.00
<i>Otochloa nodosa</i>	0	0.00	0	0.00	0	0.00	3	1.18	3	2.36	0	0.00	0	0.00	0	0.00	0	0.00	3	0.39	3	0.79	0	0.00
<i>Oxalis corniculata</i>	527	207.20	332	261.07	195	153.34	184	72.34	113	88.86	71	55.83	123	48.36	75	58.98	48	37.74	834	109.30	520	136.30	314	82.30
<i>Panicum brevifolium</i>	33	12.97	0	0.00	33	25.95	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	33	4.32	0	0.00	33	8.65
<i>Panicum notatum</i>	155	60.94	86	67.63	69	54.26	74	29.09	41	32.24	33	25.95	0	0.00	0	0.00	0	0.00	229	30.01	127	33.29	102	26.74
<i>Paspalum conjugatum</i>	437	171.82	299	235.12	138	108.52	176	69.20	124	97.51	52	40.89	112	44.04	71	55.83	41	32.24	725	95.02	494	129.49	231	60.55
<i>Persicaria barbata</i>	27	10.62	19	14.94	8	6.29	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	27	3.54	19	4.98	8	2.10
<i>Persicaria chinensis</i>	4	1.57	4	3.15	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	4	0.52	4	1.05	0	0.00
<i>Persicaria hydropiper</i>	120	47.18	79	62.12	41	32.24	39	15.33	25	19.66	14	11.01	31	12.19	16	12.58	15	11.80	190	24.90	120	31.45	70	18.35
<i>Persicaria orientalis</i>	14	5.50	14	11.01	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	14	1.83	14	3.67	0	0.00
<i>Phyla nodiflora</i>	28	11.01	19	14.94	9	7.08	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	28	3.67	19	4.98	9	2.36
<i>Phyllanthus niruri</i>	769	302.35	515	404.97	254	199.73	262	103.01	165	129.75	97	76.28	180	70.77	121	95.15	59	46.39	1211	158.71	801	209.96	410	107.47
<i>Plantago major</i>	14	5.50	0	0.00	14	11.01	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	14	1.83	0	0.00	14	3.67
<i>Polycarpon prostratum</i>	293	115.20	177	139.18	116	91.22	94	36.96	53	41.68	41	32.24	50	19.66	31	24.38	19	14.94	437	57.27	261	68.41	176	46.13
<i>Polygonum plebeium</i>	565	222.14	361	283.87	204	160.42	200	78.63	133	104.58	67	52.69	137	53.86	91	71.56	46	36.17	902	118.21	585	153.34	317	83.09
<i>Polygonum posumbo</i>	61	23.98	61	47.97	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	61	7.99	61	15.99	0	0.00
<i>Pouzolzia zeylanica</i>	693	272.47	462	363.29	231	181.65	220	86.50	140	110.09	80	62.91	129	50.72	74	58.19	55	43.25	1042	136.56	676	177.19	366	95.93
<i>Rorippa indica</i>	453	178.11	286	224.90	167	131.32	143	56.22	99	77.85	44	34.60	81	31.85	49	38.53	32	25.16	677	88.73	434	113.76	243	63.69
<i>Rungia pectinata</i>	61	23.98	36	28.31	25	19.66	0	0.00	0	0.00	0	0.00	9	3.54	6	4.72	3	2.36	70	9.17	42	11.01	28	7.34
<i>Saccharum spp.</i>	476	187.15	312	245.34	164	128.96	189	74.31	131	103.01	58	45.61	147	57.80	99	77.85	48	37.74	812	106.42	542	142.07	270	70.77
<i>Scleria terrestris</i>	476	187.15	296	232.76	180	141.54	147	57.80	96	75.49	51	40.10	0	0.00	0	0.00	0	0.00	623	81.65	392	102.75	231	60.55
<i>Setaria pumila</i>	458	180.07	307	241.41	151	118.74	167	65.66	109	85.71	58	45.61	113	44.43	73	57.40	40	31.45	738	96.72	489	128.17	249	65.27
<i>Spermacoce pusilla</i>	21	8.26	17	13.37	4	3.15	10	3.93	8	6.29	2	1.57	0	0.00	0	0.00	0	0.00	31	4.06	25	6.55	6	1.57
<i>Typhonium trilobatum</i>	2	0.79	0	0.00	2	1.57	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	0.26	0	0.00	2	0.52
<i>Urochloa panicoides</i>	21	8.26	21	16.51	0	0.00	12	4.72	12	9.44	0	0.00	0	0.00	0	0.00	0	0.00	33	4.32	33	8.65	0	0.00
UI 5	69	27.13	38	29.88	31	24.38	33	12.97	20	15.73	13	10.22	0	0.00	0	0.00	0	0.00	102	13.37	58	15.20	44	11.53
UI 8	75	29.49	48	37.74	27	21.23	30	11.80	18	14.15	12	9.44	18	7.08	12	9.44	6	4.72	123	16.12	78	20.45	45	11.80
UI 21	15	5.90	15	11.80	0	0.00	5	1.97	5	3.93	0	0.00	0	0.00	0	0.00	0	0.00	20	2.62	20	5.24	0	0.00
UI (premature mortality)	187	73.52	129	101.44	58	45.61	45	17.69	42	33.03	3	2.36	20	7.86	20	15.73	0	0.00	252	33.03	191	50.06	61	15.99

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.40. Overall and seasonal plant species total seed abundances recorded from different soil layers of tall riverine alluvial grasslands soil seed bank given flooding treatment during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Acmella uliginosa</i>	22.67	13.33	9.33	0.00	0.00	0.00	0.00	0.00	0.00	22.67	13.33	9.33
<i>Acroceras zizanioides</i>	114.33	84.33	30.00	40.33	29.67	10.67	30.33	20.67	9.67	185.00	134.67	50.33
<i>Adenostemma lavenia</i>	0.00	0.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Adiantum caudatum</i>	55.00	34.67	20.33	19.00	12.33	6.67	13.33	7.67	5.67	87.33	54.67	32.67
<i>Adiantum capillus-veneris</i>	1.67	0.00	1.67	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	1.67
<i>Ageratum conyzoides</i>	36.00	24.67	11.33	15.67	10.00	5.67	12.00	8.33	3.67	63.67	43.00	20.67
<i>Alternanthera pungens</i>	52.33	27.67	24.67	0.00	0.00	0.00	0.00	0.00	0.00	52.33	27.67	24.67
<i>Alternanthera sessilis</i>	160.33	106.00	54.33	51.67	35.00	16.67	27.67	19.33	8.33	239.67	160.33	79.33
<i>Amaranthus spinosus</i>	28.67	13.67	15.00	13.33	8.33	5.00	0.00	0.00	0.00	42.00	22.00	20.00
<i>Ampelopteris prolifera</i>	36.67	36.67	0.00	9.00	9.00	0.00	0.00	0.00	0.00	45.67	45.67	0.00

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Apluda mutica</i>	316.33	212.33	104.00	109.33	65.67	43.67	85.67	50.33	35.33	511.33	328.33	183.00
<i>Arenaria serpyllifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00
<i>Aristida adscensionis</i>	9.00	9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.00	9.00	0.00
<i>Arundinella bengalensis</i>	40.33	40.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.33	40.33	0.00
<i>Azolla pinnata</i>	32.33	23.33	9.00	0.00	0.00	0.00	0.00	0.00	0.00	32.33	23.33	9.00
<i>Boerhavia diffusa</i>	0.00	0.00	0.00	1.67	0.00	1.67	0.00	0.00	0.00	1.67	0.00	1.67
<i>Brachiaria reptans</i>	11.00	11.00	0.00	5.00	5.00	0.00	0.00	0.00	0.00	16.00	16.00	0.00
<i>Capillipedium assimile</i>	6.33	0.00	6.33	0.00	0.00	0.00	0.00	0.00	0.00	6.33	0.00	6.33
<i>Capsella bursa-pastoris</i>	1.67	1.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Cardiospermum halicacabum</i>	12.00	12.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	12.00	0.00
<i>Centella asiatica</i>	30.67	19.00	11.67	0.00	0.00	0.00	0.00	0.00	0.00	30.67	19.00	11.67
<i>Centotheca lappacea</i>	4.33	0.00	4.33	0.00	0.00	0.00	0.00	0.00	0.00	4.33	0.00	4.33
<i>Christella parasitica</i>	269.33	179.00	90.33	102.67	63.67	39.00	74.33	47.33	27.00	446.33	290.00	156.33
<i>Cuphea carthagenensis</i>	169.33	114.00	55.33	46.33	33.67	12.67	0.00	0.00	0.00	215.67	147.67	68.00
<i>Cynodon dactylon</i>	270.67	184.33	86.33	101.33	60.33	41.00	76.67	48.67	28.00	448.67	293.33	155.33
<i>Cyperus compactus</i>	5.00	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00	5.00	0.00
<i>Cyperus compressus</i>	69.67	46.67	23.00	17.00	9.67	7.33	12.67	7.67	5.00	99.33	64.00	35.33
<i>Cyperus cyperoides</i>	12.00	11.00	1.00	4.33	3.67	0.67	0.00	0.00	0.00	16.33	14.67	1.67
<i>Cyperus digitatus</i>	0.00	0.00	0.00	0.00	0.00	0.00	3.33	3.33	0.00	3.33	3.33	0.00
<i>Cyperus distans</i>	38.33	22.33	16.00	13.00	7.33	5.67	0.00	0.00	0.00	51.33	29.67	21.67
<i>Cyperus eleusinoides</i>	0.00	0.00	0.00	0.67	0.67	0.00	0.00	0.00	0.00	0.67	0.67	0.00
<i>Cyperus imbricatus</i>	39.00	17.67	21.33	18.33	9.33	9.00	0.00	0.00	0.00	57.33	27.00	30.33
<i>Cyperus iria</i>	56.67	32.67	24.00	20.67	13.33	7.33	0.00	0.00	0.00	77.33	46.00	31.33
<i>Cyperus strigosus</i>	0.00	0.00	0.00	2.00	2.00	0.00	0.00	0.00	0.00	2.00	2.00	0.00
<i>Cyperus tenuispica</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.67	0.00	0.67	0.67	0.00
<i>Cyrtococcum patens</i>	23.67	19.00	4.67	10.67	8.67	2.00	0.00	0.00	0.00	34.33	27.67	6.67
<i>Digitaria ciliaris</i>	130.67	98.00	32.67	46.00	32.33	13.67	32.00	22.33	9.67	208.67	152.67	56.00
<i>Drymaria cordata</i>	0.00	0.00	0.00	3.33	3.33	0.00	0.00	0.00	0.00	3.33	3.33	0.00
<i>Duchesnea indica</i>	37.33	22.33	15.00	0.00	0.00	0.00	0.00	0.00	0.00	37.33	22.33	15.00
<i>Eclipta prostrata</i>	52.67	31.33	21.33	0.00	0.00	0.00	0.00	0.00	0.00	52.67	31.33	21.33
<i>Ethulia conyzoides</i>	72.00	42.00	30.00	24.00	17.00	7.00	14.67	9.00	5.67	110.67	68.00	42.67
<i>Euphorbia hirta</i>	37.33	19.33	18.00	18.00	8.33	9.67	11.00	5.00	6.00	66.33	32.67	33.67
<i>Euphorbia hypericifolia</i>	43.67	43.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	43.67	43.67	0.00
<i>Glinus oppositifolius</i>	39.33	23.33	16.00	0.00	0.00	0.00	10.67	6.67	4.00	50.00	30.00	20.00
<i>Grangea maderaspatana</i>	97.33	63.00	34.33	32.00	23.00	9.00	23.33	13.67	9.67	152.67	99.67	53.00
<i>Heliotropium indicum</i>	42.00	24.33	17.67	15.00	10.00	5.00	13.33	7.67	5.67	70.33	42.00	28.33
<i>Hemarthria compressa</i>	208.33	131.33	77.00	76.00	50.67	25.33	68.33	42.67	25.67	352.67	224.67	128.00
<i>Ichnanthus pallens</i>	0.00	0.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	1.67	1.67	0.00
<i>Imperata cylindrica</i>	244.00	160.00	84.00	91.67	60.67	31.00	74.00	40.33	33.67	409.67	261.00	148.67
<i>Kyllinga brevifolia</i>	81.00	50.33	30.67	24.33	15.33	9.00	0.00	0.00	0.00	105.33	65.67	39.67
<i>Leersia hexandra</i>	18.00	18.00	0.00	5.67	5.67	0.00	0.00	0.00	0.00	23.67	23.67	0.00
<i>Leucas aspera</i>	25.00	13.67	11.33	0.00	0.00	0.00	0.00	0.00	0.00	25.00	13.67	11.33
<i>Lygodium flexuosum</i>	101.33	66.33	35.00	32.00	21.67	10.33	16.67	10.67	6.00	150.00	98.67	51.33
<i>Merremia umbellata</i>	221.33	154.00	67.33	63.67	38.00	25.67	71.00	45.00	26.00	356.00	237.00	119.00
<i>Mikania micrantha</i>	77.67	52.67	25.00	22.33	16.00	6.33	0.00	0.00	0.00	100.00	68.67	31.33
<i>Oldenlandia lineata</i>	0.00	0.00	0.00	1.33	0.00	1.33	0.00	0.00	0.00	1.33	0.00	1.33
<i>Oldenlandia tenelliflora</i>	0.00	0.00	0.00	1.33	0.00	1.33	0.00	0.00	0.00	1.33	0.00	1.33
<i>Oplismenus burmanni</i>	62.67	43.33	19.33	23.67	16.33	7.33	12.33	9.00	3.33	98.67	68.67	30.00
<i>Oplismenus compositus</i>	22.00	22.00	0.00	10.67	10.67	0.00	0.00	0.00	0.00	32.67	32.67	0.00
<i>Ottochloa nodosa</i>	0.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00
<i>Oxalis corniculata</i>	175.67	110.67	65.00	61.33	37.67	23.67	41.00	25.00	16.00	278.00	173.33	104.67
<i>Panicum brevifolium</i>	11.00	0.00	11.00	0.00	0.00	0.00	0.00	0.00	0.00	11.00	0.00	11.00
<i>Panicum notatum</i>	51.67	28.67	23.00	24.67	13.67	11.00	0.00	0.00	0.00	76.33	42.33	34.00

Plant species	Soil layers (Total)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Paspalum conjugatum</i>	145.67	99.67	46.00	58.67	41.33	17.33	37.33	23.67	13.67	241.67	164.67	77.00
<i>Persicaria barbata</i>	9.00	6.33	2.67	0.00	0.00	0.00	0.00	0.00	0.00	9.00	6.33	2.67
<i>Persicaria chinensis</i>	1.33	1.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33	1.33	0.00
<i>Persicaria hydropiper</i>	40.00	26.33	13.67	13.00	8.33	4.67	10.33	5.33	5.00	63.33	40.00	23.33
<i>Persicaria orientalis</i>	4.67	4.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67	4.67	0.00
<i>Phyla nodiflora</i>	9.33	6.33	3.00	0.00	0.00	0.00	0.00	0.00	0.00	9.33	6.33	3.00
<i>Phyllanthus niruri</i>	256.33	171.67	84.67	87.33	55.00	32.33	60.00	40.33	19.67	403.67	267.00	136.67
<i>Plantago major</i>	4.67	0.00	4.67	0.00	0.00	0.00	0.00	0.00	0.00	4.67	0.00	4.67
<i>Polycarpon prostratum</i>	97.67	59.00	38.67	31.33	17.67	13.67	16.67	10.33	6.33	145.67	87.00	58.67
<i>Polygonum plebeium</i>	188.33	120.33	68.00	66.67	44.33	22.33	45.67	30.33	15.33	300.67	195.00	105.67
<i>Polygonum posumbo</i>	20.33	20.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.33	20.33	0.00
<i>Pouzolzia zeylanica</i>	231.00	154.00	77.00	73.33	46.67	26.67	43.00	24.67	18.33	347.33	225.33	122.00
<i>Rorippa indica</i>	151.00	95.33	55.67	47.67	33.00	14.67	27.00	16.33	10.67	225.67	144.67	81.00
<i>Rungia pectinata</i>	20.33	12.00	8.33	0.00	0.00	0.00	3.00	2.00	1.00	23.33	14.00	9.33
<i>Saccharum spp.</i>	158.67	104.00	54.67	63.00	43.67	19.33	49.00	33.00	16.00	270.67	180.67	90.00
<i>Scleria terrestris</i>	158.67	98.67	60.00	49.00	32.00	17.00	0.00	0.00	0.00	207.67	130.67	77.00
<i>Setaria pumila</i>	152.67	102.33	50.33	55.67	36.33	19.33	37.67	24.33	13.33	246.00	163.00	83.00
<i>Spermacoce pusilla</i>	7.00	5.67	1.33	3.33	2.67	0.67	0.00	0.00	0.00	10.33	8.33	2.00
<i>Typhonium trilobatum</i>	0.67	0.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.67	0.00	0.67
<i>Urochloa panicoides</i>	7.00	7.00	0.00	4.00	4.00	0.00	0.00	0.00	0.00	11.00	11.00	0.00
UI 5	23.00	12.67	10.33	11.00	6.67	4.33	0.00	0.00	0.00	34.00	19.33	14.67
UI 8	25.00	16.00	9.00	10.00	6.00	4.00	6.00	4.00	2.00	41.00	26.00	15.00
UI 21	5.00	5.00	0.00	1.67	1.67	0.00	0.00	0.00	0.00	6.67	6.67	0.00
UK (premature mortality)	62.33	43.00	19.33	15.00	14.00	1.00	6.67	6.67	0.00	84.00	63.67	20.33

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.41. Overall and seasonal plant species mean seed abundances recorded from different soil layers of tall riverine alluvial grasslands soil seed bank given flooding treatment during 2014-15 in Kaziranga National Park, Assam, India.

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Acmella uliginosa</i>	2.83±0.50	3.33±0.71	2.33±0.69	0.00	0.00	0.00	0.00	0.00	0.00	2.83±0.50	3.33±0.71	2.33±0.69
<i>Acroceras zizanioides</i>	14.29±2.78	21.08±0.55	7.50±2.23	5.04±0.95	7.42±0.63	2.67±0.30	3.79±0.62	5.17±0.10	2.42±0.74	23.13±4.26	33.67±0.9	12.58±3.13
<i>Adenostemma lavenia</i>	0.00	0.00	0.00	0.83±0.17	0.83±0.17	0.00	0.00	0.00	0.00	0.83±0.17	0.83±0.17	0.00
<i>Adiantum caudatum</i>	6.88±0.81	8.67±0.78	5.08±0.53	2.38±0.40	3.08±0.55	1.67±0.30	1.67±0.24	1.92±0.46	1.42±0.08	10.92±1.18	13.67±1.18	8.17±0.35
<i>Adiantum capillus-veneris</i>	1.67±0.00	0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00
<i>Ageratum conyzoides</i>	4.50±1.06	6.17±1.78	2.83±0.52	1.96±0.36	2.50±0.62	1.42±0.16	1.50±0.31	2.08±0.44	0.92±0.21	7.96±1.38	10.75±1.87	5.17±0.44
<i>Alternanthera pungens</i>	7.48±1.40	9.22±3.19	6.17±0.67	0.00	0.00	0.00	0.00	0.00	0.00	7.48±1.40	9.22±3.19	6.17±0.67
<i>Alternanthera sessilis</i>	20.04±3.03	26.50±2.99	13.58±2.47	6.46±1.16	8.75±1.59	4.17±0.52	3.46±0.59	4.83±0.35	2.08±0.48	29.96±4.57	40.08±4.27	19.83±3.32
<i>Amaranthus spinosus</i>	3.58±0.45	3.42±0.80	3.75±0.53	1.67±0.20	2.08±0.21	1.25±0.16	0.00	0.00	0.00	5.25±0.48	5.50±0.83	5.00±0.59
<i>Ampelopteris prolifera</i>	18.33±0.33	18.33±0.33	0.00	4.50±1.83	4.50±1.83	0.00	0.00	0.00	0.00	22.83±2.17	22.83±2.17	0.00
<i>Apluda mutica</i>	39.54±5.45	53.08±0.95	26.00±3.94	13.67±1.32	16.42±1.62	10.92±0.71	10.71±1.10	12.58±1.46	8.83±1.09	63.92±7.41	82.08±2.64	45.75±5.39
<i>Arenaria serpyllifolia</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.00±0.00	1.00±0.00	0.00	1.00±0.00	1.00±0.00	0.00
<i>Aristida adscensionis</i>	9.00±0.00	9.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.00±0.00	9.00±0.00	0.00
<i>Arundinella bengalensis</i>	10.08±0.80	10.08±0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.08±0.80	10.08±0.80	0.00
<i>Azolla pinnata</i>	6.47±0.85	7.78±0.22	4.50±0.83	0.00	0.00	0.00	0.00	0.00	0.00	6.47±0.85	7.78±0.22	4.50±0.83
<i>Boerhavia diffusa</i>	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00	0.00	0.00	0.00	1.67±0.00	0.00	1.67±0.00
<i>Brachiaria reptans</i>	11.00±0.00	11.00±0.00	0.00	5.00±0.00	5.00±0.00	0.00	0.00	0.00	0.00	16.00±0.00	16.00±0.00	0.00
<i>Capillipedium assimile</i>	3.17±0.83	0.00	3.17±0.83	0.00	0.00	0.00	0.00	0.00	0.00	3.17±0.83	0.00	3.17±0.83

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Capsella bursa-pastoris</i>	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Cardiospermum halicacabum</i>	6.00±0.33	6.00±0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00±0.33	6.00±0.33	0.00
<i>Centella asiatica</i>	3.83±0.87	4.75±1.63	2.92±0.55	0.00	0.00	0.00	0.00	0.00	0.00	3.83±0.87	4.75±1.63	2.92±0.55
<i>Centothea lappacea</i>	4.33±0.00	0.00	4.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.33±0.00	0.00	4.33±0.00
<i>Christella parasitica</i>	33.67±4.59	44.75±1.55	22.58±3.77	12.83±1.36	15.92±1.42	9.75±0.53	9.29±1.17	11.83±1.40	6.75±0.37	55.79±6.83	72.50±3.40	39.08±4.47
<i>Cuphea carthagenensis</i>	21.17±3.08	28.50±2.20	13.83±1.93	5.79±1.21	8.42±1.47	3.17±0.35	0.00	0.00	0.00	26.96±3.92	36.92±1.38	17.00±1.91
<i>Cynodon dactylon</i>	33.83±5.05	46.08±2.50	21.58±3.57	12.67±1.33	15.08±2.02	10.25±0.48	9.58±1.09	12.17±0.75	7.00±0.76	56.08±7.18	73.33±4.43	38.83±4.72
<i>Cyperus compactus</i>	5.00±0.00	5.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.00±0.00	5.00±0.00	0.00
<i>Cyperus compressus</i>	17.42±3.96	23.33±2.00	11.50±4.50	4.25±1.09	4.83±2.17	3.67±1.33	3.17±0.75	3.83±0.50	2.50±1.50	24.83±5.11	32.00±0.67	17.67±7.33
<i>Cyperus cyperoides</i>	4.00±1.53	5.50±0.50	1.00±0.00	1.44±0.48	1.83±0.50	0.67±0.00	0.00	0.00	0.00	5.44±1.98	7.33±1.00	1.67±0.00
<i>Cyperus digitatus</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.67±0.33	1.67±0.33	0.00	1.67±0.33	1.67±0.33	0.00
<i>Cyperus distans</i>	7.67±1.96	11.17±3.17	5.33±1.64	2.60±0.57	3.67±0.00	1.89±0.68	0.00	0.00	0.00	10.27±2.47	14.83±3.17	7.22±2.31
<i>Cyperus eleusinoides</i>	0.00	0.00	0.00	0.67±0.00	0.67±0.00	0.00	0.00	0.00	0.00	0.67±0.00	0.67±0.00	0.00
<i>Cyperus imbricatus</i>	6.50±0.80	8.83±0.83	5.33±0.36	3.06±0.74	4.67±2.00	2.25±0.25	0.00	0.00	0.00	9.56±1.31	13.50±1.17	7.58±0.44
<i>Cyperus iria</i>	7.08±0.88	8.17±1.17	6.00±1.21	2.58±0.45	3.33±0.45	1.83±0.62	0.00	0.00	0.00	9.67±1.08	11.50±0.74	7.83±1.64
<i>Cyperus strigosus</i>	0.00	0.00	0.00	2.00±0.00	2.00±0.00	0.00	0.00	0.00	0.00	2.00±0.00	2.00±0.00	0.00
<i>Cyperus tenuispica</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.67±0.00	0.67±0.00	0.00	0.67±0.00	0.67±0.00	0.00
<i>Cyrtococcum patens</i>	7.89±1.83	9.50±1.50	4.67±0.00	3.56±0.80	4.33±0.33	2.00±0.00	0.00	0.00	0.00	11.44±2.61	13.83±1.83	6.67±0.00
<i>Digitaria ciliaris</i>	16.33±3.32	24.50±1.75	8.17±1.96	5.75±1.20	8.08±1.73	3.42±0.34	4.57±0.84	5.58±1.03	3.22±1.11	26.08±5.04	38.17±3.89	14.00±2.50
<i>Drymaria cordata</i>	0.00	0.00	0.00	3.33±0.00	3.33±0.00	0.00	0.00	0.00	0.00	3.33±0.00	3.33±0.00	0.00
<i>Duchesnea indica</i>	4.67±0.52	5.58±0.21	3.75±0.80	0.00	0.00	0.00	0.00	0.00	0.00	4.67±0.52	5.58±0.21	3.75±0.80
<i>Eclipta prostrata</i>	6.58±0.75	7.83±0.82	5.33±0.95	0.00	0.00	0.00	0.00	0.00	0.00	6.58±0.75	7.83±0.82	5.33±0.95
<i>Ethulia conyzoides</i>	9.00±1.02	10.50±1.58	7.50±0.91	3.00±0.53	4.25±0.46	1.75±0.28	1.83±0.22	2.25±0.21	1.42±0.25	13.83±1.48	17.00±1.61	10.67±0.98
<i>Euphorbia hirta</i>	6.22±1.29	9.67±0.00	4.50±1.10	3.00±0.49	4.17±0.50	2.42±0.46	1.83±0.43	2.50±0.83	1.50±0.48	11.06±2.01	16.33±1.33	8.42±1.70
<i>Euphorbia hypericifolia</i>	10.92±1.02	10.92±1.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.92±1.02	10.92±1.02	0.00
<i>Glinus oppositifolius</i>	9.83±1.32	11.67±1.67	8.00±1.00	0.00	0.00	0.00	2.67±0.58	3.33±1.00	2.00±0.33	12.50±1.89	15.00±2.67	10.00±1.33
<i>Grangea maderaspatana</i>	12.17±1.73	15.75±1.62	8.58±1.67	4.00±0.77	5.75±0.66	2.25±0.55	2.92±0.39	3.42±0.63	2.42±0.37	19.08±2.56	24.92±1.83	13.25±2.13
<i>Heliotropium indicum</i>	5.25±0.91	6.08±1.16	4.42±1.44	1.88±0.37	2.50±0.40	1.25±0.48	1.67±0.25	1.92±0.25	1.42±0.44	8.79±1.41	10.50±1.49	7.08±2.26
<i>Hemarthria compressa</i>	26.04±3.34	32.83±3.52	19.25±2.98	9.50±1.31	12.67±0.65	6.33±0.95	8.54±0.9	10.67±0.61	6.42±0.66	44.08±5.39	56.17±4.72	32.00±3.97
<i>Ichnanthus pallens</i>	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00	0.00	0.00	0.00	1.67±0.00	1.67±0.00	0.00
<i>Imperata cylindrica</i>	30.50±3.97	40.00±1.35	21.00±3.37	11.46±1.71	15.17±1.97	7.75±0.71	9.25±0.94	10.08±1.48	8.42±1.20	51.21±5.90	65.25±3.50	37.17±4.33
<i>Kyllinga brevifolia</i>	10.13±1.51	12.58±1.85	7.67±1.78	3.04±0.38	3.83±0.17	2.25±0.46	0.00	0.00	0.00	13.17±1.78	16.42±1.73	9.92±2.19
<i>Leersia hexandra</i>	9.00±0.33	9.00±0.33	0.00	2.83±0.17	2.83±0.17	0.00	0.00	0.00	0.00	11.83±0.50	11.83±0.50	0.00
<i>Leucas aspera</i>	3.13±0.46	3.42±0.63	2.83±0.74	0.00	0.00	0.00	0.00	0.00	0.00	3.13±0.46	3.42±0.63	2.83±0.74
<i>Lygodium flexuosum</i>	12.67±2.22	16.58±3.20	8.75±1.62	4.00±0.79	5.42±1.18	2.58±0.42	2.08±0.34	2.67±0.45	1.50±0.35	18.75±3.22	24.67±4.54	12.83±2.13
<i>Merremia umbellata</i>	27.67±4.51	38.50±2.91	16.83±2.84	7.96±0.87	9.50±1.31	6.42±0.46	8.88±1.24	11.25±1.55	6.50±0.99	44.50±6.07	59.25±3.96	29.75±3.31
<i>Mikania micrantha</i>	9.71±1.65	13.17±1.55	6.25±1.51	2.79±0.50	4.00±0.33	1.58±0.32	0.00	0.00	0.00	12.50±2.03	17.17±1.40	7.83±1.65
<i>Oldenlandia lineata</i>	0.00	0.00	0.00	0.67±0.00	0.00	0.67±0.00	0.00	0.00	0.00	0.67±0.00	0.00	0.67±0.00
<i>Oldenlandia tenelliflora</i>	0.00	0.00	0.00	1.33±0.00	0.00	1.33±0.00	0.00	0.00	0.00	1.33±0.00	0.00	1.33±0.00
<i>Oplismenus burmanni</i>	12.53±1.29	14.44±0.99	9.67±0.33	4.73±0.45	5.44±0.11	3.67±0.33	2.47±0.34	3.00±0.19	1.67±0.00	19.73±1.98	22.89±0.73	15.00±0.67
<i>Oplismenus compositus</i>	22.00±0.00	22.00±0.00	0.00	10.67±0.00	10.67±0.00	0.00	0.00	0.00	0.00	32.67±0.00	32.67±0.00	0.00
<i>Ottochloa nodosa</i>	0.00	0.00	0.00	1.00±0.00	1.00±0.00	0.00	0.00	0.00	0.00	1.00±0.00	1.00±0.00	0.00
<i>Oxalis corniculata</i>	21.96±2.61	27.67±1.13	16.25±2.98	7.67±0.75	9.42±0.63	5.92±0.44	5.13±0.52	6.25±0.21	4.00±0.59	34.75±3.74	43.33±1.41	26.17±3.77
<i>Panicum brevifolium</i>	11.00±0.00	0.00	11.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.00±0.00	0.00	11.00±0.00
<i>Panicum notatum</i>	8.61±1.94	14.33±2.00	5.75±0.72	4.11±1.06	6.83±1.83	2.75±0.63	0.00	0.00	0.00	12.72±2.96	21.17±3.83	8.50±1.29
<i>Paspalum conjugatum</i>	18.21±2.79	24.92±1.81	11.50±1.72	7.33±1.26	10.33±1.03	4.33±0.56	4.67±0.95	5.92±1.51	3.42±0.95	30.21±4.65	41.17±3.67	19.25±2.69
<i>Persicaria barbata</i>	3.00±0.19	3.17±0.17	2.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00±0.19	3.17±0.17	2.67±0.00
<i>Persicaria chinensis</i>	1.33±0.00	1.33±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.33±0.00	1.33±0.00	0.00
<i>Persicaria hydropiper</i>	5.00±0.73	6.58±0.89	3.42±0.16	1.86±0.38	2.78±0.40	1.17±0.22	1.48±0.18	1.78±0.22	1.25±0.21	7.92±0.91	10.00±0.94	5.83±0.35
<i>Persicaria orientalis</i>	2.33±0.67	2.33±0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.33±0.67	2.33±0.67	0.00
<i>Phyla nodiflora</i>	2.33±0.71	3.17±1.17	1.50±0.50	0.00	0.00	0.00	0.00	0.00	0.00	2.33±0.71	3.17±1.17	1.50±0.50
<i>Phyllanthus niruri</i>	32.04±4.68	42.92±2.48	21.17±4.18	10.92±1.35	13.75±1.51	8.08±0.94	7.50±1.11	10.08±1.03	4.92±0.44	50.46±6.80	66.75±3.64	34.17±5.08
<i>Plantago major</i>	4.67±0.00	0.00	4.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.67±0.00	0.00	4.67±0.00

Plant species	Soil layers (Mean±SE)									Total		
	Upper layer (0-5)			Middle layer (5-10)			Lower layer (10-15)					
	O	DS	WS	O	DS	WS	O	DS	WS	O	DS	WS
<i>Polycarpon prostratum</i>	12.21±1.56	14.75±1.99	9.67±1.74	3.92±0.38	4.42±0.28	3.42±0.64	2.38±0.26	2.58±0.28	2.11±0.48	18.21±2.09	21.75±1.91	14.67±2.90
<i>Polygonum plebeium</i>	23.54±3.28	30.08±4.08	17.00±2.26	8.33±1.23	11.08±1.17	5.58±0.83	5.71±0.95	7.58±1.31	3.83±0.35	37.58±5.20	48.75±5.85	26.42±2.95
<i>Polygonum posumbo</i>	10.17±2.83	10.17±2.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.17±2.83	10.17±2.83	0.00
<i>Pouzolzia zeylanica</i>	28.88±3.93	38.50±1.50	19.25±2.85	9.17±1.14	11.67±0.86	6.67±1.08	5.38±0.56	6.17±0.97	4.58±0.32	43.42±5.26	56.33±1.48	30.50±3.94
<i>Rorippa indica</i>	18.88±2.58	23.83±3.46	13.92±1.67	5.96±1.03	8.25±1.14	3.67±0.41	3.38±0.38	4.08±0.44	2.67±0.36	28.21±3.90	36.17±4.88	20.25±2.19
<i>Rungia pectinata</i>	10.17±1.83	12.00±0.00	8.33±0.00	0.00	0.00	0.00	1.50±0.50	2.00±0.00	1.00±0.00	11.67±2.33	14.00±0.00	9.33±0.00
<i>Saccharum spp.</i>	19.83±2.57	26.00±0.87	13.67±2.15	7.88±1.33	10.92±1.17	4.83±0.83	6.13±0.87	8.25±0.64	4.00±0.36	33.83±4.62	45.17±1.96	22.50±3.20
<i>Scleria terrestris</i>	19.83±2.33	24.67±2.00	15.00±2.39	6.13±0.89	8.00±0.76	4.25±0.86	0.00	0.00	0.00	25.96±3.02	32.67±2.00	19.25±2.95
<i>Setaria pumila</i>	19.08±2.63	25.58±0.91	12.58±1.84	6.96±0.95	9.08±0.89	4.83±0.62	4.71±0.69	6.08±0.83	3.33±0.49	30.75±4.10	40.75±2.07	20.75±2.77
<i>Spermacoce pusilla</i>	1.75±0.66	2.83±0.50	0.67±0.00	0.83±0.32	1.33±0.33	0.33±0.00	0.00	0.00	0.00	2.58±0.98	4.17±0.83	1.00±0.00
<i>Typhonium trilobatum</i>	0.67±0.00	0.00	0.67±0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.67±0.00	0.00	0.67±0.00
<i>Urochloa panicoides</i>	7.00±0.00	7.00±0.00	0.00	4.00±0.00	4.00±0.00	0.00	0.00	0.00	0.00	11.00±0.00	11.00±0.00	0.00
UI 5	3.29±0.56	4.22±0.95	2.58±0.52	1.57±0.26	2.22±0.22	1.08±0.16	0.00	0.00	0.00	4.86±0.76	6.44±1.06	3.67±0.59
UI 8	4.17±0.69	5.33±0.33	3.00±0.96	1.67±0.23	2.00±0.19	1.33±0.33	1.00±0.23	1.33±0.33	0.67±0.19	6.83±1.02	8.67±0.69	5.00±1.17
UI 21	2.50±1.17	2.50±1.17	0.00	0.83±0.17	0.83±0.17	0.00	0.00	0.00	0.00	3.33±1.33	3.33±1.33	0.00
UK (premature mortality)	7.79±1.38	10.75±0.67	4.83±1.62	2.50±1.05	3.50±1.32	0.50±0.17	1.67±0.59	1.67±0.59	0.00	10.50±2.48	15.92±2.52	5.08±1.69

O- overall, DS- dry season, WS- wet season, A- abundance, D- density (m⁻²) and UI- unidentified.

Appendix Table 3.42. Pairwise similarities (Bray-Curtis index) in species composition of experimental sites of riverine alluvial grasslands recorded during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Season	Soil layer			
		UL	ML	LL	Total
SG-TG	Overall	0.43	0.37	0.40	0.42
	Dry	0.45	0.39	0.42	0.43
	Wet	0.39	0.33	0.37	0.38
SGN-SGF	Overall	0.50	0.55	0.70	0.54
	Dry	0.46	0.50	0.64	0.49
	Wet	0.57	0.64	0.79	0.62
SGN-TGN	Overall	0.43	0.36	0.42	0.41
	Dry	0.45	0.38	0.43	0.43
	Wet	0.39	0.33	0.40	0.38
SGN-TGF	Overall	0.23	0.21	0.25	0.23
	Dry	0.24	0.21	0.25	0.23
	Wet	0.22	0.22	0.25	0.23
SGF-TGN	Overall	0.46	0.46	0.52	0.48
	Dry	0.41	0.44	0.53	0.45
	Wet	0.49	0.45	0.47	0.49
SGF-TGF	Overall	0.44	0.39	0.36	0.42
	Dry	0.45	0.41	0.39	0.43
	Wet	0.41	0.35	0.32	0.38
TGN-TGF	Overall	0.56	0.58	0.68	0.58
	Dry	0.55	0.53	0.65	0.56

Experimental sites	Season	Soil layer			
		UL	ML	LL	Total
	Wet	0.60	0.67	0.74	0.63

SG- short grassland, TG- tall grassland, SGN- short grassland natural treatment, SGF-short grassland flooding treatment, TGN- tall grassland natural treatment and TGF- tall grassland flooding treatment, UL- upper layer (0-5), ML- middle layer (5-10) and LL- lower layer (10-15).

Appendix Table 3.43. Similarities (Bray-Curtis index) in species composition of upper, middle and lower soil layers of experimental sites of riverine alluvial grasslands recorded during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Treatment	Season	Soil layer		
			UL-ML	UL-LL	ML-LL
Grassland	Natural	Overall	0.51	0.28	0.64
		Dry	0.52	0.28	0.61
		Wet	0.48	0.29	0.68
	Flooded	Overall	0.53	0.40	0.78
		Dry	0.53	0.38	0.75
		Wet	0.54	0.42	0.79
	Total	Overall	0.51	0.32	0.68
		Dry	0.52	0.31	0.66
		Wet	0.50	0.33	0.73
Short grassland	Natural	Overall	0.53	0.30	0.63
		Dry	0.53	0.29	0.61
		Wet	0.51	0.30	0.66
	Flooded	Overall	0.57	0.44	0.79
		Dry	0.56	0.43	0.77
		Wet	0.57	0.45	0.79
	Total	Overall	0.54	0.34	0.69
		Dry	0.54	0.33	0.66
		Wet	0.53	0.35	0.72
Tall grassland	Natural	Overall	0.47	0.26	0.65
		Dry	0.49	0.26	0.62
		Wet	0.42	0.27	0.72
	Flooded	Overall	0.48	0.32	0.73
		Dry	0.48	0.31	0.71
		Wet	0.49	0.35	0.77
	Total	Overall	0.47	0.28	0.68
		Dry	0.49	0.27	0.65
		Wet	0.44	0.30	0.74

UL- upper layer (0-5), ML- middle layer (5-10) and LL- lower layer (10-15).

APPENDIX 4: Plant species composition and structure of riverine alluvial grasslands

Appendix Table 4.1. GPS coordinates of the experimental sites in riverine alluvial grasslands of Kaziranga National Park, Assam, India.

Experimental sites	Habitat	Forest Range	GPS		Herbivores excluded (Body size)
			Latitude	Longitude	
HES & HIS	Short grassland	Agoratoli	26.682420	93.558358	Mega-herbivores- Greater one-horned rhino (1500-2000 kg), Asian elephant (3000-5,400 kg), Asiatic wild buffalo (250-1200 kg) and gaur (650-1000 kg); Meso-herbivores- swamp deer (140-200Kg), hog deer (40-55 kg), sambar (130-270 kg) & Indian red muntjac (20-28 kg)*
	Short grassland	Agoratoli	26.686278	93.534709	
	Short grassland	Kohora	26.626755	93.352688	
	Short grassland	Kohora	26.622815	93.395462	
	Short grassland	Bagori	26.597061	93.261278	
	Short grassland	Bagori	26.599421	93.298612	
HET & HIT	Tall grassland	Kohora	26.646797	93.387345	
	Tall grassland	Kohora	26.666488	93.372565	
	Tall grassland	Bagori	26.618702	93.264895	
	Tall grassland	Kohora	26.603581	93.355368	
HETB	Tall grassland	Kohora	26.628362	93.377586	
	Tall grassland	Kohora	26.646529	93.363593	
	Tall grassland	Bagori	26.618722	93.288278	
HETIR	Tall grassland	Kohora	26.608375	93.373972	
	Tall grassland	Bagori	26.598330	93.280541	

HES- herbivore exclusion in short grassland, HIS- herbivore inclusion in short grassland, HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal and *Menon (2014).

Appendix Table 4.2. Number of quadrates laid (vegetation sampling) and soil samples collected from riverine alluvial grasslands during 2014-15 in Kaziranga National Reserve, Assam, India.

Experimental sites	Sampling location (Inside/ Outside of enclosures)	Number of quadrates			Soil samples		
		Overall	Dry season	Wet season	Overall	Dry season	Wet season
HES	Inside	324	180	144	108	60	48
HIS	Outside	144	72	72	48	24	24
SG (Total)		468	252	216	156	84	72
HET	Inside	216	120	96	72	40	32
HIT	Outside	216	108	108	72	36	36
HETB	Inside	144	72	72	54	30	24
HETIR	Inside	108	60	48	36	20	16
TG (Total)		684	360	324	234	126	108
Total		1152	612	540	390	210	180

Overall indicates sampling from January 2014 to December 2015 (excluding August to October), dry season indicates sampling from November to March; wet season indicates sampling from April to July, SG- Short grasslands, TG- Tall grassland, HES- herbivore exclusion in short grassland, HIS- herbivore inclusion in short grassland, HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning and HETIR- herbivore exclusion in tall grassland invasive removal.

Appendix Table 4.3. Methods used to estimate soil nutrient parameters of riverine alluvial grasslands in Kaziranga National Park, Assam, India.

Soil nutrient parameters	Method/Instrument*
Organic carbon	Walkley-Black method
Nitrogen	Kjeldahl method
Phosphorous	UV Visible Spectrophotometer
Potassium	Flame Photometer

*Allen et al. (1974) and Chaturvedi and Sankar (2006).

Appendix Table 4.4. Formulae used to calculate vegetation characteristics of riverine alluvial grasslands in Kaziranga National Park, Assam, India.

Vegetation characteristics	Formula*
Density	$\frac{\text{Total number of individuals of a species in all quadrats}}{\text{Total number of quadrats studied}}$
Frequency (%)	$\frac{\text{Number of quadrats in which the species occurred}}{\text{Total number of quadrats studied}} \times 100$
Abundance	$\frac{\text{Total number of individuals of a species in all quadrats}}{\text{Total number of quadrats in which the species occurred}}$

%- in percentages and *Curtis and McIntosh (1950).

Appendix Table 4.5. List of plant species (with their abbreviations) recorded from riverine alluvial grasslands during 2014-15 in Kaziranga Tiger Reserve, Assam, India.

Plant species	Code	Family	Group	Class	Growth form	Life cycle
<i>Achyranthes aspera</i> L.	Aca	Amaranthaceae	An	Dicot	Herb	Annual
<i>Acmella uliginosa</i> (Sw.) Cass.	Acu	Compositae	An	Dicot	Herb	Annual
<i>Acroceras zizanioides</i> (Kunth) Dandy	Acz	Poaceae	An	Monocot	Grass	Perennial
<i>Adiantum philippense</i> L.	Adp	Adiantaceae	Pt	Fern	Fern	Perennial
<i>Ageratum conyzoides</i> (L.) L.	Agc	Compositae	An	Dicot	Herb	Annual
<i>Alpinia nigra</i> (Gaertn.) Burt	Aln	Zingiberaceae	An	Monocot	Herb	Perennial
<i>Alternanthera pungens</i> Kunth	Alp	Amaranthaceae	An	Dicot	Herb	Perennial
<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	Als	Amaranthaceae	An	Dicot	Herb	Perennial
<i>Amaranthus spinosus</i> L.	Ams	Amaranthaceae	An	Dicot	Herb	Annual
<i>Apluda mutica</i> L.	Alm	Poaceae	An	Monocot	Grass	Perennial
<i>Arenaria serpyllifolia</i> L.	Ars	Caryophyllaceae	An	Dicot	Herb	Annual
<i>Artemisia carvifolia</i> Buch.-Ham. ex Roxb.	Arc	Compositae	An	Dicot	Herb	Annual
<i>Axonopus compressus</i> (Sw.) P.Beauv.	Axc	Poaceae	An	Monocot	Grass	Perennial
<i>Bombax ceiba</i> L.	Boc	Malvaceae	An	Dicot	Tree	Deciduous
<i>Cajanus scarabaeoides</i> (L.) Thouars	Cas	Leguminosae	An	Dicot	Climber	Perennial
<i>Capillipedium assimile</i> (Steud.) A.Camus	Cpa	Poaceae	An	Monocot	Grass	Perennial
<i>Capsella bursa-pastoris</i> (L.) Medik.	Cab	Brassicaceae	An	Dicot	Herb	Annual
<i>Cardiospermum halicacabum</i> L.	Cah	Sapindaceae	An	Dicot	Climber	Perennial
<i>Carex vesicaria</i> L.	Cav	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Centella asiatica</i> (L.) Urb.	Cea	Apiaceae	An	Dicot	Herb	Perennial
<i>Centipeda minima</i> (L.) A.Braun & Asch.	Cem	Compositae	An	Dicot	Herb	Annual
<i>Chenopodium album</i> L.	Cha	Amaranthaceae	An	Dicot	Herb	Annual
<i>Christella parasitica</i> (L.) Holttum	Chp	Thelypteridaceae	Pt	Fern	Fern	Perennial
<i>Chromolaena odorata</i> (L.) R.M.King & H.Rob.	Euo	Compositae	An	Dicot	Shrub	Perennial
<i>Chrysopogon aciculatus</i> (Retz.) Trin.	Cra	Poaceae	An	Monocot	Grass	Perennial
<i>Cissampelos pareira</i> L.	Cip	Menispermaceae	An	Dicot	Climber	Perennial
<i>Clerodendrum indicum</i> (L.) Kuntze	Cli	Lamiaceae	An	Dicot	Shrub	Perennial
<i>Colocasia esculenta</i> (L.) Schott	Coe	Araceae	An	Monocot	Herb	Perennial
<i>Commelina benghalensis</i> L.	Cob	Commelinaceae	An	Monocot	Herb	Perennial
<i>Cotula hemisphaerica</i> Wall. ex Benth. & Hook.f.	Coh	Compositae	An	Dicot	Herb	Annual
<i>Crassocephalum crepidioides</i> (Benth.) S.Moore	Crc	Compositae	An	Dicot	Herb	Perennial
<i>Cuphea carthagenensis</i> (Jacq.) J.F.Macbr.	Cuc	Lythraceae	An	Dicot	Herb	Perennial
<i>Cyanthillium cinereum</i> (L.) H.Rob.	Cac	Compositae	An	Dicot	Shrub	Annual
<i>Cynodon dactylon</i> (L.) Pers.	Cyd	Poaceae	An	Monocot	Grass	Perennial
<i>Cyperus compressus</i> L.	Cyc	Cyperaceae	An	Monocot	Sedge	Annual
<i>Cyperus cyperoides</i> (L.) Kuntze	Cpc	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Cyperus eragrostis</i> Lam.	Cye	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Cyperus esculentus</i> L.	Cpe	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Cyperus iria</i> L.	Cyi	Cyperaceae	An	Monocot	Sedge	Annual
<i>Dactyloctenium aegyptium</i> (L.) Willd.	Dae	Poaceae	An	Monocot	Grass	Annual
<i>Desmodium heterocarpon</i> (L.) DC.	Deh	Leguminosae	An	Dicot	Shrub	Perennial

Plant species	Code	Family	Group	Class	Growth form	Life cycle
<i>Dichanthium annulatum</i> (Forssk.) Stapf	Dia	Poaceae	An	Monocot	Grass	Perennial
<i>Dichrocephala integrifolia</i> (L.f.) Kuntze	Din	Compositae	An	Dicot	Herb	Annual
<i>Digitaria ciliaris</i> (Retz.) Koeler	Dic	Poaceae	An	Monocot	Grass	Annual
<i>Drymaria cordata</i> (L.) Willd. ex Schult.	Drc	Caryophyllaceae	An	Dicot	Herb	Annual
<i>Duchesnea indica</i> (Andrews) Focke	Dui	Rosaceae	An	Dicot	Herb	Perennial
<i>Dysphania ambrosioides</i> (L.) Mosyakin & Clemants	Dya	Amaranthaceae	An	Dicot	Herb	Annual
<i>Echinochloa crus-galli</i> (L.) P.Beauv.	Ecr	Poaceae	An	Monocot	Grass	Annual
<i>Eclipta prostrata</i> (L.) L.	Ecp	Compositae	An	Dicot	Herb	Annual
<i>Eichhornia crassipes</i> (Mart.) Solms	Eic	Pontederiaceae	An	Monocot	Herb	Perennial
<i>Eleusine indica</i> (L.) Gaertn.	Eli	Poaceae	An	Monocot	Grass	Annual
<i>Enydra fluctuans</i> Lour.	Enf	Compositae	An	Dicot	Herb	Perennial
<i>Eragrostis riparia</i> (Willd.) Nees	Eri	Poaceae	An	Monocot	Grass	Annual
<i>Eryngium foetidum</i> L.	Erf	Apiaceae	An	Dicot	Herb	Perennial
<i>Ethulia conyzoides</i> L.f.	Etc	Compositae	An	Dicot	Herb	Annual
<i>Euphorbia hirta</i> L.	Euh	Euphorbiaceae	An	Dicot	Herb	Annual
<i>Euphorbia thymifolia</i> L.	Eut	Euphorbiaceae	An	Dicot	Herb	Annual
<i>Evolvulus nummularius</i> (L.) L.	Evn	Convolvulaceae	An	Dicot	Herb	Annual
<i>Fimbristylis aestivalis</i> Vahl	Fia	Cyperaceae	An	Monocot	Sedge	Annual
<i>Flemingia lineata</i> (L.) Aiton	Fli	Leguminosae	An	Dicot	Shrub	Perennial
<i>Floscopa scandens</i> Lour.	Fls	Commelinaceae	An	Monocot	Herb	Perennial
<i>Flueggea virosa</i> (Roxb. ex Willd.) Royle	Flv	Phyllanthaceae	An	Dicot	Shrub	Perennial
<i>Fuirena umbellata</i> Rottb.	Fum	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Glinus lotoides</i> L.	Glo	Molluginaceae	An	Dicot	Herb	Annual
<i>Glochidion multiloculare</i> (Rottler ex Willd.) Voigt	Glm	Phyllanthaceae	An	Dicot	Shrub	Perennial
<i>Gnaphalium pensylvanicum</i> Willd.	Gap	Compositae	An	Dicot	Herb	Annual
<i>Gonostegia pentandra</i> (Roxb.) Miq.	Gop	Urticaceae	An	Dicot	Herb	Perennial
<i>Grangea maderaspatana</i> (L.) Poir.	Grm	Compositae	An	Dicot	Herb	Annual
<i>Heliotropium indicum</i> L.	Hei	Boraginaceae	An	Dicot	Herb	Annual
<i>Heliotropium strigosum</i> Willd.	Hes	Boraginaceae	An	Dicot	Herb	Perennial
<i>Helminthostachys zeylanica</i> (L.) Hook.	Hez	Ophioglossaceae	Pt	Fern	Fern	Perennial
<i>Hemarthria compressa</i> (L.f.) R.Br.	Hec	Poaceae	An	Monocot	Grass	Perennial
<i>Hydrocotyle sibthorpioides</i> Lam.	Hds	Araliaceae	An	Dicot	Herb	Perennial
<i>Hyptis suaveolens</i> (L.) Poit.	Hys	Lamiaceae	An	Dicot	Herb	Annual
<i>Ichnocarpus frutescens</i> (L.) W.T.Aiton	Icf	Apocynaceae	An	Dicot	Climber	Perennial
<i>Imperata cylindrica</i> (L.) Raeusch.	Imc	Poaceae	An	Monocot	Grass	Perennial
<i>Ipomoea carnea</i> Jacq.	Ipc	Convolvulaceae	An	Dicot	Shrub	Perennial
<i>Isachne</i> spp.	Isp	Poaceae	An	Monocot	Grass	Perennial
<i>Isachne globosa</i> (Thunb.) Kuntze	Isg	Poaceae	An	Monocot	Grass	Perennial
<i>Kyllinga brevifolia</i> Rottb.	Kyb	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Laphangium luteoalbum</i> (L.) Tzvelev	Lal	Compositae	An	Dicot	Herb	Perennial
<i>Leersia hexandra</i> Sw.	Leh	Poaceae	An	Monocot	Grass	Perennial
<i>Leucas aspera</i> (Willd.) Link	Lea	Lamiaceae	An	Dicot	Herb	Annual
<i>Lindernia crustacea</i> (L.) F.Muell.	Lic	Linderniaceae	An	Dicot	Herb	Perennial
<i>Lippia alba</i> (Mill.) N.E.Br. ex Britton & P.Wilson	Lia	Verbenaceae	An	Dicot	Shrub	Perennial
<i>Litsea salicifolia</i> (Roxburgh ex Nees) Hook. f.	Lis	Lauraceae	An	Dicot	Shrub	Perennial
<i>Ludwigia adscendens</i> (L.) H. Hara	Lua	Onagraceae	An	Dicot	Herb	Perennial
<i>Lygodium flexuosum</i> (L.) Sw.	Lyf	Lygodiaceae	Pt	Fern	Fern	Perennial
<i>Mallotus nudiflorus</i> (L.) Kulju & Welzen	Man	Euphorbiaceae	An	Dicot	Tree	Deciduous
<i>Marsilea quadrifolia</i> L.	Maq	Marsileaceae	Pt	Fern	Fern	Perennial
<i>Mazus pumilus</i> (Burm.f.) Steenis	Map	Phrymaceae	An	Dicot	Herb	Annual
<i>Mecardonia procumbens</i> (Mill.) Small	Mep	Plantaginaceae	An	Dicot	Herb	Perennial
<i>Merremia</i> spp.	Mes	Convolvulaceae	An	Dicot	Climber	Perennial
<i>Merremia umbellata</i> (L.) Hallier f.	Meu	Convolvulaceae	An	Dicot	Climber	Perennial
<i>Mikania micrantha</i> Kunth	Mim	Compositae	An	Dicot	Climber	Perennial

Plant species	Code	Family	Group	Class	Growth form	Life cycle
<i>Mimosa</i> spp.	Mip	Leguminosae	An	Dicot	Shrub	Perennial
<i>Nelsonia canescens</i> (Lam.) Spreng.	Nec	Acanthaceae	An	Dicot	Herb	Annual
<i>Oenanthe javanica</i> (Blume) DC.	Oej	Apiaceae	An	Dicot	Herb	Perennial
<i>Onychium japonicum</i> (Thunb.) Kunze	Onj	Pteridaceae	Pt	Fern	Fern	Perennial
<i>Oxalis corniculata</i> L.	Oxc	Oxalidaceae	An	Dicot	Herb	Annual
<i>Panicum notatum</i> Retz.	Pan	Poaceae	An	Monocot	Grass	Perennial
<i>Paspalum conjugatum</i> P.J.Bergius	Pac	Poaceae	An	Monocot	Grass	Perennial
<i>Paspalum scrobiculatum</i> L.	Pao	Poaceae	An	Monocot	Grass	Annual
<i>Peperomia pellucida</i> (L.) Kunth	Pep	Piperaceae	An	Dicot	Herb	Annual
<i>Persicaria hydropiper</i> (L.) Delarbre	Poh	Polygonaceae	An	Dicot	Herb	Annual
<i>Persicaria lapathifolia</i> (L.) Delarbre	Pel	Polygonaceae	An	Dicot	Herb	Annual
<i>Persicaria orientalis</i> (L.) Spach	Por	Polygonaceae	An	Dicot	Herb	Annual
<i>Peucedanum</i> spp	Pes	Apiaceae	An	Dicot	Herb	Annual
<i>Phragmites karka</i> (Retz.) Trin. ex Steud.	Phk	Poaceae	An	Monocot	Grass	Perennial
<i>Phyllanthus niruri</i> L.	Phn	Phyllanthaceae	An	Dicot	Herb	Annual
<i>Physalis minima</i> L.	Phm	Solanaceae	An	Dicot	Herb	Annual
<i>Pimpinella</i> sp	Pis	Apiaceae	An	Dicot	Herb	Perennial
<i>Polycarpon prostratum</i> (Forssk.) Asch. & Schweinf.	Pop	Caryophyllaceae	An	Dicot	Herb	Annual
<i>Polygonum plebeium</i> R.Br.	Plp	Polygonaceae	An	Dicot	Herb	Annual
<i>Polygonum viscosum</i> Buch.-Ham. ex D. Don	Pov	Polygonaceae	An	Dicot	Herb	Annual
<i>Pouzolzia</i> spp.	Pos	Urticaceae	An	Dicot	Herb	Perennial
<i>Pouzolzia zeylanica</i> (L.) Benn. & R. Br.	Poz	Urticaceae	An	Dicot	Herb	Perennial
<i>Ranunculus sceleratus</i> L.	Ras	Ranunculaceae	An	Dicot	Herb	Annual
<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz	Rus	Apocynaceae	An	Dicot	Herb	Perennial
<i>Rorippa indica</i> (L.) Hiern	Roi	Brassicaceae	An	Dicot	Herb	Perennial
<i>Rungia pectinata</i> (L.) Nees	Rup	Acanthaceae	An	Dicot	Herb	Annual
<i>Rungia repens</i> (L.) Nees	Rur	Acanthaceae	An	Dicot	Herb	Annual
<i>Saccharum</i> spp	Sas	Poaceae	An	Monocot	Grass	Perennial
<i>Scleria terrestris</i> (L.) Fassett	Sct	Cyperaceae	An	Monocot	Sedge	Perennial
<i>Senna tora</i> (L.) Roxb.	Set	Leguminosae	An	Dicot	Herb	Perennial
<i>Setaria palmifolia</i> (J.Koenig) Stapf	Stp	Poaceae	An	Monocot	Grass	Perennial
<i>Setaria pumila</i> (Poir.) Roem. & Schult.	Nov	Poaceae	An	Monocot	Grass	Annual
<i>Solanum americanum</i> Mill.	Soa	Solanaceae	An	Dicot	Herb	Annual
<i>Solanum viarum</i> Dunal	Sov	Solanaceae	An	Dicot	Shrub	Perennial
<i>Sonchus oleraceus</i> (L.) L.	Sno	Compositae	An	Dicot	Herb	Annual
<i>Sporobolus diandrus</i> (Retz.) P.Beauv.	Spd	Poaceae	An	Monocot	Grass	Perennial
<i>Stachytarpheta indica</i> (L.) Vahl	Sti	Verbenaceae	An	Dicot	Shrub	Perennial
<i>Stellaria media</i> (L.) Vill.	Stm	Caryophyllaceae	An	Dicot	Herb	Annual
<i>Synedrella nodiflora</i> (L.) Gaertn.	Syn	Compositae	An	Dicot	Herb	Annual
<i>Tetragium dubium</i> (Lawson) Planch.	Ted	Vitaceae	An	Dicot	Climber	Perennial
<i>Themeda villosa</i> (Lam.) A.Camus	Thv	Poaceae	An	Monocot	Grass	Perennial
<i>Urena lobata</i> L.	Url	Malvaceae	An	Dicot	Shrub	Perennial
<i>Vicia sativa</i> L.	Vis	Leguminosae	An	Dicot	Herb	Annual
<i>Viola betonicifolia</i> Sm.	Vib	Violaceae	An	Dicot	Herb	Perennial
<i>Woodfordia fruticosa</i> (L.) Kurz	Wof	Lythraceae	An	Dicot	Shrub	Perennial
<i>Xanthium strumarium</i> L.	Xas	Compositae	An	Dicot	Herb	Annual
<i>Zephyranthes atamasco</i> (L.) Herb.	Zea	Amaryllidaceae	An	Dicot	Herb	Perennial

An-angiosperms and Pt-pteridophytes.

Appendix Table 4.6. Number of woody individuals recorded from experimental sites of riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Species	Overall					Dry season					Wet season				
		n	Density (m ⁻²)	F (%)	A	A/F	n	Density (m ⁻²)	F (%)	A	A/F	n	Density (m ⁻²)	F (%)	A	A/F
HES	<i>Lippia alba</i>	43	0.13	4.63	2.87	0.62	6	0.03	2.78	1.20	0.43	37	0.26	6.94	3.70	0.53
	<i>Solanum viarum</i>	18	0.06	1.54	3.60	2.33	15	0.08	2.22	3.75	1.69	3	0.02	0.69	3.00	4.32
	<i>Flemingia lineata</i>	9	0.03	0.31	9.00	29.16	0	0.00	0.00	0.00	0.00	9	0.06	0.69	9.00	12.96
	<i>Chromolaena odorata</i>	7	0.02	0.93	2.33	2.52	7	0.04	1.67	2.33	1.40	0	0.00	0.00	0.00	0.00
	<i>Ipomoea carnea</i>	2	0.01	0.31	2.00	6.48	2	0.01	0.56	2.00	3.60	0	0.00	0.00	0.00	0.00
	Total (HES)	79					30					49				
HIS	<i>Lippia alba</i>	26	0.18	8.33	2.17	0.26	17	0.24	11.11	2.13	0.19	9	0.13	5.56	2.25	0.41
	<i>Solanum viarum</i>	4	0.03	1.39	2.00	1.44	0	0.00	0.00	0.00	0.00	4	0.06	2.78	2.00	0.72
	<i>Urena lobata</i>	4	0.03	0.69	4.00	5.76	4	0.06	1.39	4.00	2.88	0	0.00	0.00	0.00	0.00
	Total (HIS)	34					21					13				
Total (SG)	<i>Lippia alba</i>	69	0.15	5.77	2.56	0.44	23	0.09	5.16	1.77	0.34	46	0.21	6.48	3.29	0.51
	<i>Solanum viarum</i>	22	0.05	1.50	3.14	2.10	15	0.06	1.59	3.75	2.36	7	0.03	1.39	2.33	1.68
	<i>Flemingia lineata</i>	9	0.02	0.21	9.00	42.12	0	0.00	0.00	0.00	0.00	9	0.04	0.46	9.00	19.44
	<i>Chromolaena odorata</i>	7	0.01	0.64	2.33	3.64	7	0.03	1.19	2.33	1.96	0	0.00	0.00	0.00	0.00
	<i>Urena lobata</i>	4	0.01	0.21	4.00	18.72	4	0.02	0.40	4.00	10.08	0	0.00	0.00	0.00	0.00
	<i>Ipomoea carnea</i>	2	0.00	0.21	2.00	9.36	2	0.01	0.40	2.00	5.04	0	0.00	0.00	0.00	0.00
	Total (SG)	113					51					62				
HET	<i>Mimosa</i> spp.	707	3.27	20.83	15.71	0.75	219	1.83	13.33	13.69	1.03	488	5.08	30.21	16.83	0.56
	<i>Flemingia lineata</i>	326	1.51	35.19	4.29	0.12	174	1.45	32.50	4.46	0.14	152	1.58	38.54	4.11	0.11
	<i>Litsea salicifolia</i>	134	0.62	14.35	4.32	0.30	59	0.49	11.67	4.21	0.36	75	0.78	17.71	4.41	0.25
	<i>Flueggea virosa</i>	99	0.46	15.28	3.00	0.20	47	0.39	11.67	3.36	0.29	52	0.54	19.79	2.74	0.14
	<i>Glochidion multiloculare</i>	50	0.23	8.33	2.78	0.33	17	0.14	5.00	2.83	0.57	33	0.34	12.50	2.75	0.22
	<i>Bombax ceiba</i>	29	0.13	5.56	2.42	0.44	7	0.06	2.50	2.33	0.93	22	0.23	9.38	2.44	0.26
	<i>Stachytarpheta indica</i>	20	0.09	2.31	4.00	1.73	4	0.03	1.67	2.00	1.20	16	0.17	3.13	5.33	1.71
	<i>Mallotus nudiflorus</i>	16	0.07	2.31	3.20	1.38	7	0.06	3.33	1.75	0.53	9	0.09	1.04	9.00	8.64
	<i>Lippia alba</i>	12	0.06	1.85	3.00	1.62	4	0.03	2.50	1.33	0.53	8	0.08	1.04	8.00	7.68
	<i>Woodfordia fruticosa</i>	8	0.04	0.93	4.00	4.32	0	0.00	0.00	0.00	0.00	8	0.08	2.08	4.00	1.92
	<i>Clerodendrum indicum</i>	6	0.03	1.39	2.00	1.44	4	0.03	1.67	2.00	1.20	2	0.02	1.04	2.00	1.92
	<i>Cyanthillium cinereum</i>	6	0.03	0.46	6.00	12.96	0	0.00	0.00	0.00	0.00	6	0.06	1.04	6.00	5.76
	<i>Urena lobata</i>	5	0.02	0.93	2.50	2.70	5	0.04	1.67	2.50	1.50	0	0.00	0.00	0.00	0.00
	Total (HET)	1418					547					871				
HIT	<i>Flemingia lineata</i>	313	1.45	29.17	4.97	0.17	138	1.28	24.07	5.31	0.22	175	1.62	162.04	4.73	0.03
	<i>Mimosa</i> spp.	217	1.00	9.72	10.33	1.06	40	0.37	4.63	8.00	1.73	177	1.64	163.89	11.06	0.07
	<i>Flueggea virosa</i>	55	0.25	7.41	3.44	0.46	7	0.06	2.78	2.33	0.84	48	0.44	44.44	3.69	0.08

Experimental sites	Species	Overall					Dry season					Wet season				
		n	Density (m ⁻²)	F (%)	A	A/F	n	Density (m ⁻²)	F (%)	A	A/F	n	Density (m ⁻²)	F (%)	A	A/F
	<i>Bombax ceiba</i>	47	0.22	7.41	2.94	0.40	16	0.15	5.56	2.67	0.48	31	0.29	28.70	3.10	0.11
	<i>Glochidion multiloculare</i>	47	0.22	5.56	3.92	0.71	18	0.17	3.70	4.50	1.22	29	0.27	26.85	3.63	0.14
	<i>Litsea salicifolia</i>	23	0.11	4.17	2.56	0.61	12	0.11	3.70	3.00	0.81	11	0.10	10.19	2.20	0.22
	<i>Desmodium heterocarpon</i>	13	0.06	0.93	6.50	7.02	0	0.00	0.00	0.00	0.00	13	0.12	12.04	6.50	0.54
	<i>Lippia alba</i>	12	0.06	1.85	3.00	1.62	12	0.11	3.70	3.00	0.81	0	0.00	0.00	0.00	0.00
	<i>Clerodendrum indicum</i>	6	0.03	1.39	2.00	1.44	2	0.02	0.93	2.00	2.16	4	0.04	3.70	2.00	0.54
	<i>Mallotus nudiflorus</i>	6	0.03	1.39	2.00	1.44	2	0.02	0.93	2.00	2.16	4	0.04	3.70	2.00	0.54
	<i>Woodfordia fruticosa</i>	6	0.03	0.93	3.00	3.24	0	0.00	0.00	0.00	0.00	6	0.06	5.56	3.00	0.54
	<i>Urena lobata</i>	4	0.02	0.46	4.00	8.64	0	0.00	0.00	0.00	0.00	4	0.04	3.70	4.00	1.08
	<i>Solanum viarum</i>	2	0.01	0.46	2.00	4.32	2	0.02	0.93	2.00	2.16	0	0.00	0.00	0.00	0.00
HETB	Total (HIT)	751					249					502				
	<i>Bombax ceiba</i>	144	1.00	19.44	5.14	0.26	47	0.65	19.44	3.36	0.17	97	1.35	19.44	6.93	0.36
	<i>Flemingia lineata</i>	51	0.35	8.33	4.25	0.51	34	0.47	8.33	5.67	0.68	17	0.24	8.33	2.83	0.34
	<i>Mimosa</i> spp.	24	0.17	2.08	8.00	3.84	24	0.33	4.17	8.00	1.92	0	0.00	0.00	0.00	0.00
	<i>Flueggea virosa</i>	16	0.11	2.08	5.33	2.56	3	0.04	1.39	3.00	2.16	13	0.18	2.78	6.50	2.34
	<i>Litsea salicifolia</i>	14	0.10	2.08	4.67	2.24	3	0.04	1.39	3.00	2.16	11	0.15	2.78	5.50	1.98
	<i>Desmodium heterocarpon</i>	2	0.01	0.69	2.00	2.88	0	0.00	0.00	0.00	0.00	2	0.03	1.39	2.00	1.44
	Total (HETB)	251					111					140				
HETIR	<i>Flemingia lineata</i>	221	2.05	35.19	5.82	0.17	159	2.65	40.00	6.63	0.17	62	1.29	29.17	4.43	0.15
	<i>Flueggea virosa</i>	52	0.48	11.11	4.33	0.39	11	0.18	6.67	2.75	0.41	41	0.85	16.67	5.13	0.31
	<i>Litsea salicifolia</i>	28	0.26	10.19	2.55	0.25	14	0.23	11.67	2.00	0.17	14	0.29	8.33	3.50	0.42
	<i>Glochidion multiloculare</i>	24	0.22	8.33	2.67	0.32	11	0.18	8.33	2.20	0.26	13	0.27	8.33	3.25	0.39
	<i>Stachytarpheta indica</i>	11	0.10	3.70	2.75	0.74	1	0.02	1.67	1.00	0.60	10	0.21	6.25	3.33	0.53
	Total (HETIR)	336					196					140				
Total (TG)	<i>Mimosa</i> spp.	948	1.39	10.09	13.74	1.36	283	0.79	6.67	11.79	1.77	665	2.05	13.89	14.78	1.06
	<i>Flemingia lineata</i>	911	1.33	27.63	4.82	0.17	505	1.40	26.39	5.32	0.20	406	1.25	29.01	4.32	0.15
	<i>Flueggea virosa</i>	222	0.32	9.36	3.47	0.37	68	0.19	6.11	3.09	0.51	154	0.48	12.96	3.67	0.28
	<i>Bombax ceiba</i>	220	0.32	8.19	3.93	0.48	70	0.19	6.39	3.04	0.48	150	0.46	10.19	4.55	0.45
	<i>Litsea salicifolia</i>	199	0.29	7.89	3.69	0.47	88	0.24	7.22	3.38	0.47	111	0.34	8.64	3.96	0.46
	<i>Glochidion multiloculare</i>	121	0.18	5.70	3.10	0.54	46	0.13	4.17	3.07	0.74	75	0.23	7.41	3.13	0.42
	<i>Stachytarpheta indica</i>	31	0.05	1.32	3.44	2.62	5	0.01	0.83	1.67	2.00	26	0.08	1.85	4.33	2.34
	<i>Lippia alba</i>	24	0.04	1.17	3.00	2.57	16	0.04	1.94	2.29	1.18	8	0.02	0.31	8.00	25.92
	<i>Mallotus nudiflorus</i>	22	0.03	1.17	2.75	2.35	9	0.03	1.39	1.80	1.30	13	0.04	0.93	4.33	4.68
	<i>Desmodium heterocarpon</i>	15	0.02	0.44	5.00	11.40	0	0.00	0.00	0.00	0.00	15	0.05	0.93	5.00	5.40
	<i>Woodfordia fruticosa</i>	14	0.02	0.58	3.50	5.99	0	0.00	0.00	0.00	0.00	14	0.04	1.23	3.50	2.84
	<i>Clerodendrum indicum</i>	12	0.02	0.88	2.00	2.28	6	0.02	0.83	2.00	2.40	6	0.02	0.93	2.00	2.16
	<i>Urena lobata</i>	9	0.01	0.44	3.00	6.84	5	0.01	0.56	2.50	4.50	4	0.01	0.31	4.00	12.96
	<i>Cyanthillium cinereum</i>	6	0.01	0.15	6.00	41.04	0	0.00	0.00	0.00	0.00	6	0.02	0.31	6.00	19.44
	<i>Solanum viarum</i>	2	0.00	0.15	2.00	13.68	2	0.01	0.28	2.00	7.20	0	0.00	0.00	0.00	0.00

Experimental sites	Species	Overall					Dry season					Wet season				
		n	Density (m ⁻²)	F (%)	A	A/F	n	Density (m ⁻²)	F (%)	A	A/F	n	Density (m ⁻²)	F (%)	A	A/F
Total (SG & TG)	Total (TG)	2756					1103					1653				
	<i>Mimosa</i> spp.	948	0.82	5.99	13.74	2.29	283	0.46	3.92	11.79	3.01	665	1.23	8.33	14.78	1.77
	<i>Flemingia lineata</i>	920	0.80	16.49	4.84	0.29	505	0.83	15.52	5.32	0.34	415	0.77	17.59	4.37	0.25
	<i>Flueggea virosa</i>	222	0.19	5.56	3.47	0.62	68	0.11	3.59	3.09	0.86	154	0.29	7.78	3.67	0.47
	<i>Bombax ceiba</i>	220	0.19	4.86	3.93	0.81	70	0.11	3.76	3.04	0.81	150	0.28	6.11	4.55	0.74
	<i>Litsea salicifolia</i>	199	0.17	4.69	3.69	0.79	88	0.14	4.25	3.38	0.80	111	0.21	5.19	3.96	0.76
	<i>Glochidion multiloculare</i>	121	0.11	3.39	3.10	0.92	46	0.08	2.45	3.07	1.25	75	0.14	4.44	3.13	0.70
	<i>Lippia alba</i>	93	0.08	3.04	2.66	0.87	39	0.06	3.27	1.95	0.60	54	0.10	2.78	3.60	1.30
	<i>Stachytarpheta indica</i>	31	0.03	0.78	3.44	4.41	5	0.01	0.49	1.67	3.40	26	0.05	1.11	4.33	3.90
	<i>Solanum viarum</i>	24	0.02	0.69	3.00	4.32	17	0.03	0.82	3.40	4.16	7	0.01	0.56	2.33	4.20
	<i>Mallotus nudiflorus</i>	22	0.02	0.69	2.75	3.96	9	0.01	0.82	1.80	2.20	13	0.02	0.56	4.33	7.80
	<i>Desmodium heterocarpon</i>	15	0.01	0.26	5.00	19.20	0	0.00	0.00	0.00	0.00	15	0.03	0.56	5.00	9.00
	<i>Woodfordia fruticosa</i>	14	0.01	0.35	3.50	10.08	0	0.00	0.00	0.00	0.00	14	0.03	0.74	3.50	4.73
	<i>Urena lobata</i>	13	0.01	0.35	3.25	9.36	9	0.01	0.49	3.00	6.12	4	0.01	0.19	4.00	21.60
	<i>Clerodendrum indicum</i>	12	0.01	0.52	2.00	3.84	6	0.01	0.49	2.00	4.08	6	0.01	0.56	2.00	3.60
	<i>Chromolaena odorata</i>	7	0.01	0.26	2.33	8.96	7	0.01	0.49	2.33	4.76	0	0.00	0.00	0.00	0.00
	<i>Cyanthillium cinereum</i>	6	0.01	0.09	6.00	69.12	0	0.00	0.00	0.00	0.00	6	0.01	0.19	6.00	32.40
	<i>Ipomoea carnea</i>	2	0.00	0.09	2.00	23.04	2	0.00	0.16	2.00	12.24	0	0.00	0.00	0.00	0.00
	Total	2869					1154					1715				

SG-short grassland, TG-tall grassland, HES- herbivore exclusion in short grassland, HIS- herbivore inclusion in short grassland, HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal, n-number of individual plant species, F (%) - frequency in percentages, A- abundance and A/F- Abundance to frequency ratio.

Appendix Table 4.7. Mann-Whitney significance test between dry and wet season's diversity indices and soil nutrient content, recorded from riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Diversity indices	<i>U</i>	<i>P</i>	Soil nutrient parameters	<i>U</i>	<i>P</i>
HES	Species richness	2.00	0.00*	Organic carbon	0.00	0.00*
	Species evenness	17.00	0.04*	Nitrogen	0.00	0.00*
	Shannon diversity	3.00	0.00*	Phosphorous	0.00	0.00*
	Simpson dominance	12.00	0.01*	Potassium	0.00	0.00*
HIS	Species richness	1.00	0.04*	Organic carbon	0.00	0.02*
	Species evenness	6.00	0.56	Nitrogen	0.00	0.02*
	Shannon diversity	2.00	0.08	Phosphorous	0.00	0.02*
	Simpson dominance	3.00	0.15	Potassium	0.00	0.02*
Total (SG)	Species richness	18.50	0.00*	Organic carbon	4.00	0.00*
	Species evenness	47.00	0.06	Nitrogen	6.00	0.00*
	Shannon diversity	17.00	0.00*	Phosphorous	4.00	0.00*
	Simpson dominance	29.00	0.00*	Potassium	3.00	0.00*

Experimental sites	Diversity indices	U	P	Soil nutrient parameters	U	P
HET	Species richness	0.00	0.00*	Organic carbon	0.00	0.00*
	Species evenness	28.00	0.29	Nitrogen	0.00	0.00*
	Shannon diversity	13.00	0.02*	Phosphorous	0.00	0.00*
	Simpson dominance	27.00	0.25	Potassium	0.00	0.00*
HIT	Species richness	0.00	0.02*	Organic carbon	0.00	0.02*
	Species evenness	5.00	0.39	Nitrogen	0.00	0.02*
	Shannon diversity	0.00	0.02*	Phosphorous	0.00	0.02*
	Simpson dominance	0.00	0.02*	Potassium	0.00	0.02*
HETB	Species richness	23.50	0.37	Organic carbon	0.00	0.00*
	Species evenness	6.00	0.01*	Nitrogen	0.00	0.00*
	Shannon diversity	17.00	0.12	Phosphorous	0.00	0.00*
	Simpson dominance	12.00	0.03*	Potassium	0.00	0.00*
HETIR	Species richness	5.00	0.00*	Organic carbon	0.00	0.00*
	Species evenness	10.50	0.01*	Nitrogen	0.00	0.00*
	Shannon diversity	27.00	0.25	Phosphorous	0.00	0.00*
	Simpson dominance	28.00	0.29	Potassium	0.00	0.00*
Total (TG)	Species richness	188.50	0.00*	Organic carbon	53.00	0.00*
	Species evenness	279.50	0.01*	Nitrogen	59.00	0.00*
	Shannon diversity	325.50	0.03*	Phosphorous	67.00	0.00*
	Simpson dominance	437.00	0.58	Potassium	102.00	0.00*
Total (SG & TG)	Species richness	322.00	0.00*	Organic carbon	391.00	0.00*
	Species evenness	569.00	0.00*	Nitrogen	391.00	0.00*
	Shannon diversity	526.50	0.00*	Phosphorous	314.00	0.00*
	Simpson dominance	736.00	0.06	Potassium	369.00	0.00*

SG- short grassland, TG- tall grassland, HES- herbivore exclusion in short grassland, HIS- herbivore inclusion in short grassland, HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal, U- Mann-Whitney test value, %- in percentages and *indicates significant result at $P < 0.05$.

Appendix Table 4.8. Overall and seasonal plant communities recorded from short grassland (SG) sites during 2014-15 in Kaziranga National Park, Assam, India.

Season	Plant community	Division level			Dominating species	Density (m ⁻²)	F (%)	A	A/F
		N	n	Eigen					
Overall	SG-PC1: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Grangea maderaspatana</i>	108	48	0.19	<i>Cynodon dactylon</i>	50.31	100.00	50.31	0.50
					<i>Hemarthria compressa</i>	44.60	95.37	46.77	0.49
					<i>Grangea maderaspatana</i>	2.31	27.78	8.30	0.30
	SG-PC2: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Rorippa indica</i>	57	36	0.19	<i>Cynodon dactylon</i>	55.68	100.00	55.68	0.56
					<i>Hemarthria compressa</i>	50.86	100.00	50.86	0.51
					<i>Rorippa indica</i>	4.93	56.14	8.78	0.16
		76	53	0.23	<i>Hemarthria compressa</i>	79.99	100.00	79.99	0.80

Season	Plant community	Division level			Dominating species	Density (m ⁻²)	F (%)	A	A/F
		N	n	Eigen					
	SG-PC3: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Setaria pumila</i>	79	55	0.23	<i>Cynodon dactylon</i>	38.39	100.00	38.39	0.38
					<i>Setaria pumila</i>	26.95	90.79	29.68	0.33
					<i>Cynodon dactylon</i>	67.34	100.00	67.34	0.67
	SG-PC4: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Polygonum plebeium</i>				<i>Hemarthria compressa</i>	52.38	100.00	52.38	0.52
					<i>Polygonum plebeium</i>	9.91	78.48	12.63	0.16
					<i>Hemarthria compressa</i>	78.56	100.00	78.56	0.79
	SG-PC5: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Paspalum conjugatum</i>				<i>Cynodon dactylon</i>	61.90	100.00	61.90	0.62
					<i>Paspalum conjugatum</i>	12.21	48.39	25.23	0.52
					<i>Carex vesicaria</i>	74.00	100.00	74.00	0.74
	SG-PC6: <i>Carex vesicaria</i> - <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i>				<i>Hemarthria compressa</i>	57.86	96.51	59.95	0.62
					<i>Cynodon dactylon</i>	10.84	31.40	34.52	1.10
Dry	SG-PC1: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Setaria pumila</i>	51	30	0.22	<i>Hemarthria compressa</i>	52.86	100.00	52.86	0.53
					<i>Cynodon dactylon</i>	38.20	100.00	38.20	0.38
					<i>Setaria pumila</i>	13.04	47.06	27.71	0.59
	SG-PC2: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Paspalum conjugatum</i>				<i>Hemarthria compressa</i>	42.92	95.50	44.94	0.47
					<i>Cynodon dactylon</i>	42.25	100.00	42.25	0.42
					<i>Paspalum conjugatum</i>	4.32	18.92	22.81	1.21
	SG-PC3: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Polygonum plebeium</i>				<i>Cynodon dactylon</i>	61.44	100.00	61.44	0.61
					<i>Hemarthria compressa</i>	54.17	100.00	54.17	0.54
					<i>Polygonum plebeium</i>	6.59	53.66	12.27	0.23
	SG-PC4: <i>Carex vesicaria</i> - <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i>				<i>Carex vesicaria</i>	55.51	100.00	55.51	0.56
					<i>Hemarthria compressa</i>	44.16	93.88	47.04	0.50
					<i>Cynodon dactylon</i>	13.41	42.86	31.29	0.73
Wet	SG-PC1: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Setaria pumila</i>	47	49	0.25	<i>Hemarthria compressa</i>	96.64	100.00	96.64	0.97
					<i>Cynodon dactylon</i>	44.06	100.00	44.06	0.44
					<i>Setaria pumila</i>	27.26	91.49	29.79	0.33
	SG-PC2: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Paspalum conjugatum</i>				<i>Hemarthria compressa</i>	93.07	100.00	93.07	0.93
					<i>Cynodon dactylon</i>	72.09	100.00	72.09	0.72
					<i>Paspalum conjugatum</i>	11.67	56.52	20.65	0.37
	SG-PC3: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Polygonum plebeium</i>				<i>Cynodon dactylon</i>	71.26	100.00	71.26	0.71
					<i>Hemarthria compressa</i>	50.28	100.00	50.28	0.50
					<i>Polygonum plebeium</i>	4.89	37.50	13.03	0.35
	SG-PC4: <i>Carex vesicaria</i> - <i>Hemarthria compressa</i> - <i>Lindernia crustacea</i>				<i>Carex vesicaria</i>	96.20	100.00	96.20	0.96
					<i>Hemarthria compressa</i>	76.77	100.00	76.77	0.77
					<i>Lindernia crustacea</i>	10.86	85.71	12.67	0.15

SG- short grassland, PC- plant community, F (%) - frequency in percentages, N-Number of plots, n-number of species, A-abundance and A/F- Abundance to frequency ratio.

Appendix Table 4.9. Overall and seasonal plant communities recorded from tall grassland (TG) sites during 2014-15 in Kaziranga National Park, Assam, India.

Season	Plant community	Division level			Dominating species	Density (m ⁻²)	F (%)	A	A/F
		N	n	Eigen					
Overall	TG-PC1: <i>Saccharum</i> spp.- <i>Scleria terrestris</i> - <i>Mikania micrantha</i>	131	67	0.22	<i>Saccharum</i> spp.	60.28	100.00	60.28	0.60
					<i>Scleria terrestris</i>	8.11	44.27	18.31	0.41
					<i>Mikania micrantha</i>	7.92	51.15	15.49	0.30
	TG-PC2: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Alpinia nigra</i>	183	73	0.17	<i>Saccharum</i> spp.	60.98	100.00	60.98	0.61
					<i>Merremia umbellata</i>	16.75	89.62	18.69	0.21
					<i>Alpinia nigra</i>	4.09	56.28	7.26	0.13
	TG-PC3: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Christella parasitica</i>	104	40	0.17	<i>Saccharum</i> spp.	46.93	100.00	46.93	0.47
					<i>Merremia umbellata</i>	15.33	96.15	15.94	0.17
					<i>Christella parasitica</i>	7.88	74.04	10.65	0.14
	TG-PC4: <i>Saccharum</i> spp.- <i>Christella parasitica</i> - <i>Alpinia nigra</i>	92	46	0.17	<i>Saccharum</i> spp.	48.70	100.00	48.70	0.49
					<i>Christella parasitica</i>	6.98	69.57	10.03	0.14
					<i>Alpinia nigra</i>	5.86	76.09	7.70	0.10
	TG-PC5: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Flemingia lineata</i>	66	40	0.17	<i>Saccharum</i> spp.	52.26	100.00	52.26	0.52
					<i>Merremia umbellata</i>	5.70	46.97	12.13	0.26
					<i>Flemingia lineata</i>	5.33	83.33	6.40	0.08
	TG-PC6: <i>Saccharum</i> spp.- <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i>	108	59	0.25	<i>Saccharum</i> spp.	64.89	100.00	64.89	0.65
					<i>Hemarthria compressa</i>	16.39	59.26	27.66	0.47
					<i>Cynodon dactylon</i>	13.91	69.44	20.03	0.29
Dry	TG-PC1: <i>Saccharum</i> spp.- <i>Mikania micrantha</i> - <i>Alpinia nigra</i>	84	38	0.27	<i>Saccharum</i> spp.	34.11	100.00	34.11	0.34
					<i>Mikania micrantha</i>	10.83	66.67	16.25	0.24
					<i>Alpinia nigra</i>	5.15	58.33	8.84	0.15
	TG-PC2: <i>Saccharum</i> spp.- <i>Christella parasitica</i> - <i>Alpinia nigra</i>	123	50	0.18	<i>Saccharum</i> spp.	37.24	100.00	37.24	0.37
					<i>Christella parasitica</i>	4.96	47.15	10.52	0.22
					<i>Alpinia nigra</i>	3.21	57.72	5.56	0.10
	TG-PC3: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Christella parasitica</i>	102	38	0.18	<i>Saccharum</i> spp.	38.66	100.00	38.66	0.39
					<i>Merremia umbellata</i>	16.20	97.06	16.69	0.17
					<i>Christella parasitica</i>	3.75	41.18	9.12	0.22
	TG-PC4: <i>Saccharum</i> spp.- <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i>	51	33	0.27	<i>Saccharum</i> spp.	45.02	100.00	45.02	0.45
					<i>Cynodon dactylon</i>	13.43	66.67	20.15	0.30
					<i>Hemarthria compressa</i>	11.94	52.94	22.56	0.43
Wet	TG-PC1: <i>Saccharum</i> spp.- <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i>	34	37	0.25	<i>Saccharum</i> spp.	67.32	100.00	67.32	0.67
					<i>Hemarthria compressa</i>	24.18	61.76	39.14	0.63
					<i>Cynodon dactylon</i>	19.74	82.35	23.96	0.29
	TG-PC2: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Alpinia nigra</i>	118	52	0.25	<i>Saccharum</i> spp.	77.01	100.00	77.01	0.77
					<i>Merremia umbellata</i>	17.24	80.51	21.41	0.27
					<i>Alpinia nigra</i>	5.74	70.34	8.16	0.12
	TG-PC3: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Paspalum conjugatum</i>	62	58	0.25	<i>Saccharum</i> spp.	71.23	100.00	71.23	0.71
					<i>Merremia umbellata</i>	14.02	83.87	16.71	0.20
					<i>Paspalum conjugatum</i>	12.92	54.84	23.56	0.43
		84	63	0.25	<i>Saccharum</i> spp.	80.50	100.00	80.50	0.81

Season	Plant community	Division level			Dominating species	Density (m ⁻²)	F (%)	A	A/F
		N	n	Eigen					
	TG-PC4: <i>Saccharum</i> spp.- <i>Scleria terrestris</i> - <i>Alpinia nigra</i>				<i>Scleria terrestris</i>	10.89	47.62	22.88	0.48
				<i>Alpinia nigra</i>	10.63	79.76	13.33	0.17	
	TG-PC5: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Apluda mutica</i>	26	27	0.25	<i>Saccharum</i> spp.	101.38	100.00	101.38	1.01
					<i>Merremia umbellata</i>	13.19	46.15	28.58	0.62
					<i>Apluda mutica</i>	9.08	42.31	21.45	0.51

TG- tall grassland, PC- plant community, F (%) - frequency in percentages, N-Number of plots, n-number of species, A-abundance and A/F- Abundance to frequency ratio.

Appendix Table 4.10. Seasonal Mann-Whitney significance test between experimental sites of riverine alluvial grasslands for diversity indices and soil nutrient content recorded during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Diversity indices								Soil nutrient parameters							
	Species richness		Species evenness		Shannon diversity		Simpson dominance		Organic carbon (%)		Nitrogen (%)		Phosphorous (%)		Potassium (%)	
	U	P	U	P	U	P	U	P	U	P	U	P	U	P	U	P
SG & TG	322.00	0.00*	569.00	0.00*	526.50	0.00*	736.00	0.06	391.00	0.00*	391.00	0.00*	314.00	0.00*	369.00	0.00*
Six sites (SG & TG)	322.00	0.00*	569.00	0.00*	526.50	0.00*	736.00	0.06	391.00	0.00*	391.00	0.00*	314.00	0.00*	369.00	0.00*
Four TG sites (HET, HIT, HETB & HETIR)	188.50	0.00*	279.50	0.01*	325.50	0.03*	437.00	0.58	53.00	0.00*	59.00	0.00*	67.00	0.00*	102.00	0.00*
HES - HIS (SG sites)	18.50	0.00*	47.00	0.06	17.00	0.00*	29.00	0.00*	4.00	0.00*	6.00	0.00*	4.00	0.00*	3.00	0.00*
HES - HET	9.00	0.00*	87.50	0.02*	36.00	0.00*	82.50	0.01*	58.00	0.00*	63.00	0.00*	41.00	0.00*	30.00	0.00*
HES - HIT	19.50	0.00*	55.50	0.14	10.00	0.00*	21.00	0.00*	15.00	0.00*	10.00	0.00*	0.00	0.00*	4.00	0.00*
HES - HETB	68.00	0.00*	81.00	0.01*	120.00	0.20	139.00	0.50	74.00	0.01*	70.00	0.00*	55.00	0.00*	70.00	0.00*
HES - HETIR	17.00	0.00*	59.50	0.00*	55.00	0.00*	131.50	0.36	63.00	0.00*	60.00	0.00*	52.00	0.00*	52.00	0.00*
HIS - HET	8.50	0.00*	58.50	0.19	27.00	0.00*	43.00	0.03*	36.00	0.01*	39.00	0.02*	26.00	0.00*	29.00	0.00*
HIS - HIT	3.50	0.00*	31.00	0.92	4.00	0.00*	8.00	0.01*	10.00	0.02*	8.00	0.01*	5.00	0.00*	7.00	0.01*
HIS - HETB	35.50	0.01*	57.00	0.16	76.00	0.68	83.00	0.96	40.00	0.02*	40.00	0.02*	32.00	0.01*	38.00	0.02*
HIS - HETIR	23.00	0.00*	45.50	0.05*	50.00	0.08	82.00	0.92	38.00	0.02*	36.00	0.01*	32.00	0.01*	34.00	0.01*
HET - HIT	15.50	0.00*	67.00	0.38	23.00	0.00*	41.00	0.03*	4.00	0.00*	4.00	0.00*	4.00	0.00*	5.00	0.00*
HET - HETB	71.50	0.00*	96.00	0.04*	135.00	0.43	158.00	0.95	15.00	0.00*	14.00	0.00*	16.00	0.00*	35.00	0.00*
HET - HETIR	18.00	0.00*	79.50	0.01*	75.50	0.01*	154.00	0.85	2.00	0.00*	14.00	0.00*	13.00	0.00*	12.00	0.00*
HIT - HETB	34.00	0.01*	62.00	0.26	72.00	0.54	79.00	0.80	21.00	0.00*	14.00	0.00*	14.00	0.00*	26.00	0.00*
HIT - HETIR	22.50	0.00*	53.50	0.12	42.00	0.03*	73.00	0.57	7.00	0.00*	13.00	0.00*	17.00	0.00*	16.00	0.00*
HETB - HETIR	84.00	0.02*	64.50	0.00*	152.00	0.80	126.00	0.28	4.00	0.00*	0.00	0.00*	3.00	0.00*	8.00	0.00*

HET-herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal, U- Mann-Whitney test value and *indicates significant result at $P > 0.05$.

Appendix Table 4.11. Mann-Whitney significance test between experimental sites of riverine alluvial grasslands for diversity indices and soil nutrient content recorded during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites		Season	Diversity indices								Soil nutrient parameters (%)							
Site 1	Site 2		Species richness		Species evenness		Shannon diversity		Simpson dominance		Organic carbon		Nitrogen		Phosphorous		Potassium	
			U	P	U	P	U	P	U	P	U	P	U	P	U	P	U	P
HES	HIS	Overall	34.50	0.16	34.00	1.00	49.00	1.00	60.00	1.00	47.00	1.00	42.00	1.00	44.00	1.00	48.00	1.00
		Dry	10.00	1.00	12.00	1.00	13.00	1.00	15.00	1.00	2.00	0.15	0.00	1.00	8.00	1.00	5.00	1.00
		Wet	0.00	0.01	4.00	1.00	8.00	1.00	13.00	1.00	9.00	1.00	8.00	1.00	0.00	1.00	6.00	0.77
HES	HET	Overall	139.00	1.00	159.50	1.00	159.50	1.00	129.50	1.00	22.00	0.00*	17.00	0.00*	56.00	0.03	50.00	0.01
		Dry	47.50	1.00	48.00	1.00	43.50	1.00	38.00	1.00	0.00	0.00*	0.00	0.00*	17.00	0.56	0.00	0.00*
		Wet	18.50	1.00	28.00	1.00	27.00	1.00	24.00	1.00	0.00	0.00*	0.00	0.00*	0.00	0.00*	0.00	0.00*
HES	HIT	Overall	38.00	0.31	42.00	1.00	48.00	1.00	48.00	1.00	19.00	0.01	22.00	0.51	44.00	1.00	36.00	1.00
		Dry	10.50	0.69	18.50	1.00	8.00	1.00	5.00	0.45	0.00	0.00*	0.00	0.30	12.00	1.00	1.00	0.38
		Wet	5.00	0.05	3.00	1.00	7.00	1.00	10.00	1.00	2.00	0.03	0.00	0.01	0.00	0.00*	7.00	0.36
HES	HETB	Overall	62.00	0.00*	87.00	0.05	28.00	0.00*	17.00	0.00*	6.00	0.00*	10.00	0.00*	34.00	0.00*	10.00	0.00*
		Dry	22.50	0.37	32.00	1.00	18.00	0.30	9.00	0.03	0.00	0.00*	0.00	0.00*	9.00	0.00*	0.00	0.00*
		Wet	2.00	0.00*	9.00	0.02	0.00	0.00*	1.00	0.00*	0.00	0.00*	0.00	0.00*	0.00	0.00*	0.00	0.00*
HES	HETIR	Overall	159.50	1.00	105.50	0.87	155.00	1.00	98.50	0.44	17.00	0.00*	20.00	0.00*	39.00	0.00*	29.00	0.00*
		Dry	43.00	1.00	34.50	1.00	36.00	1.00	48.00	1.00	0.00	0.00*	0.00	0.00*	11.00	0.00*	1.00	0.00*
		Wet	25.50	1.00	13.00	0.93	14.00	0.95	6.00	0.11	0.00	0.00*	0.00	0.00*	0.00	0.00*	0.00	0.00*
HIS	HET	Overall	39.00	0.79	39.50	1.00	49.00	1.00	72.00	1.00	4.00	0.00*	1.00	0.00*	15.00	0.05	11.00	0.01
		Dry	6.50	1.00	12.00	1.00	9.00	1.00	14.00	1.00	0.00	0.00*	0.00	0.00*	1.00	0.38	0.00	0.00*
		Wet	0.00	0.24	7.00	1.00	8.00	1.00	13.00	1.00	0.00	0.00*	0.00	0.00*	0.00	0.00*	0.00	0.00*
HIS	HIT	Overall	27.50	1.00	23.00	1.00	30.00	1.00	26.00	1.00	6.00	0.00*	8.00	0.16	11.00	1.00	9.00	0.33
		Dry	8.00	1.00	4.00	1.00	6.00	1.00	4.00	1.00	0.00	0.00*	0.00	0.03	0.00	1.00	0.00	0.05
		Wet	6.00	1.00	7.00	1.00	6.00	1.00	7.00	1.00	0.00	0.00*	0.00	0.00*	0.00	0.00*	0.00	0.01
HIS	HETB	Overall	49.50	1.00	21.00	0.00*	25.00	0.07	14.00	0.00*	0.00	0.00*	0.00	0.00*	8.00	0.00*	2.00	0.00*
		Dry	15.50	1.00	8.00	1.00	14.00	1.00	9.00	1.00	0.00	0.00*	0.00	0.00*	0.00	0.01	0.00	0.00*
		Wet	12.00	1.00	2.00	0.00*	2.00	0.00*	1.00	0.00*	0.00	0.00*	0.00	0.00*	0.00	0.00*	0.00	0.00*
HIS	HETIR	Overall	30.00	0.09	18.00	0.07	47.00	1.00	57.00	1.00	2.00	0.00*	4.00	0.00*	8.00	0.00*	6.00	0.00*
		Dry	7.00	0.14	5.00	1.00	7.00	0.46	15.00	1.00	0.00	0.00*	0.00	0.00*	0.00	0.01	0.00	0.00*
		Wet	0.00	0.03	2.00	0.04	13.00	1.00	5.00	1.00	0.00	0.00*	0.00	0.00*	0.00	0.00*	0.00	0.00*
HET	HIT	Overall	31.50	1.00	43.00	1.00	48.00	1.00	61.00	1.00	42.00	1.00	44.00	1.00	52.00	1.00	49.00	1.00
		Dry	0.50	0.78	18.00	1.00	4.00	0.32	10.00	0.98	1.00	0.23	0.00	0.55	12.00	1.00	8.00	1.00
		Wet	6.50	0.98	3.00	1.00	14.00	1.00	15.00	1.00	5.00	0.88	8.00	1.00	4.00	0.06	6.00	0.38
HET	HETB	Overall	40.50	0.04	91.00	0.07	21.00	0.00*	28.00	0.00*	76.00	0.11	94.00	0.05	96.00	0.06	54.00	0.00*
		Dry	3.50	0.44	34.00	1.00	10.00	0.06	15.00	0.10	10.00	0.00*	28.00	0.62	32.00	0.89	9.00	0.00*
		Wet	5.00	0.00*	9.00	0.01	2.00	0.00*	2.00	0.00*	1.00	0.01	0.00	0.00*	0.00	0.00*	0.00	0.00*
HET	HETIR	Overall	128.00	1.00	111.00	1.00	161.50	1.00	118.00	1.00	125.00	1.00	107.00	0.25	102.00	0.63	96.00	0.19
		Dry	40.00	1.00	41.50	1.00	40.00	1.00	48.00	1.00	32.00	1.00	41.00	1.00	31.00	1.00	28.00	1.00
		Wet	21.00	1.00	12.50	0.59	22.00	1.00	13.00	1.00	15.00	1.00	0.00	0.00*	4.00	0.00*	0.00	0.00*
HIT	HETB	Overall	49.50	1.00	22.00	0.01	28.00	0.06	24.00	0.00*	19.00	0.01	26.00	0.01	31.00	0.02	14.00	0.00*
		Dry	14.00	1.00	11.00	1.00	15.00	1.00	16.00	1.00	0.00	0.00*	0.00	0.01	5.00	0.21	0.00	0.00*

Experimental sites		Season	Diversity indices								Soil nutrient parameters (%)							
Site 1	Site 2		Species richness		Species evenness		Shannon diversity		Simpson dominance		Organic carbon		Nitrogen		Phosphorous		Potassium	
			<i>U</i>	<i>P</i>	<i>U</i>	<i>P</i>	<i>U</i>	<i>P</i>	<i>U</i>	<i>P</i>	<i>U</i>	<i>P</i>	<i>U</i>	<i>P</i>	<i>U</i>	<i>P</i>	<i>U</i>	<i>P</i>
		Wet	9.00	1.00	0.00	0.00*	2.00	0.00*	1.00	0.00*	0.00	0.00*	0.00	0.00*	0.00	0.00*	0.00	0.00*
HIT	HETIR	Overall	29.50	0.17	17.00	0.19	46.50	1.00	71.00	1.00	34.00	0.42	32.00	0.05	28.00	0.14	29.00	0.07
		Dry	2.00	0.08	9.00	1.00	4.00	0.10	8.00	1.00	0.00	0.02	5.00	0.05	5.00	0.24	5.00	0.29
		Wet	5.00	0.15	0.00	0.03	14.50	1.00	4.00	1.00	1.00	0.02	0.00	0.00*	0.00	0.00*	0.00	0.00*
HETB	HETIR	Overall	33.00	0.00*	127.00	1.00	23.50	0.00*	42.00	0.00*	112.00	1.00	141.00	1.00	134.00	1.00	101.00	0.37
		Dry	7.00	0.02	34.00	1.00	9.50	0.01	14.00	0.12	20.00	0.05	40.00	1.00	49.00	1.00	27.00	0.10
		Wet	1.50	0.00*	19.00	1.00	4.00	0.00*	6.00	0.00*	16.00	1.00	21.00	1.00	8.00	0.01	2.00	0.01

SG- short grassland, TG-tall grassland, HES- herbivore exclusion in short grassland, HIS- herbivore inclusion in short grassland, HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB-herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal, *U*- Mann-Whitney test value, and *indicates significant result at $P < 0.01$ (corrected with Bonferroni correction).

Appendix Table 4.12. Overall and seasonal plant communities recorded from herbivore exclusion in short grassland (HES) sites during 2014-15 in Kaziranga National Park, Assam, India.

Season	Plant community	Division level			Dominating species	Density (m ⁻²)	F (%)	A	A/F
		N	n	Eigen					
Overall	HES-PC1: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Setaria pumila</i>	51	41	0.24	<i>Hemarthria compressa</i>	94.71	100.00	94.71	0.95
					<i>Cynodon dactylon</i>	38.53	100.00	38.53	0.39
					<i>Setaria pumila</i>	30.16	98.04	30.76	0.31
	HES-PC2: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Paspalum conjugatum</i>	50	56	0.22	<i>Hemarthria compressa</i>	91.34	98.00	93.20	0.95
					<i>Cynodon dactylon</i>	62.54	98.00	63.82	0.65
					<i>Paspalum conjugatum</i>	16.90	72.00	23.47	0.33
	HES-PC3: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Polygonum plebeium</i>	93	54	0.18	<i>Cynodon dactylon</i>	62.03	100.00	62.03	0.62
					<i>Hemarthria compressa</i>	52.86	100.00	52.86	0.53
					<i>Polygonum plebeium</i>	6.74	53.76	12.54	0.23
	HES-PC4: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Grangea maderaspatana</i>	74	46	0.18	<i>Cynodon dactylon</i>	67.88	100.00	67.88	0.68
					<i>Hemarthria compressa</i>	55.22	100.00	55.22	0.55
					<i>Grangea maderaspatana</i>	4.01	48.65	8.25	0.17
	HES-PC5: <i>Carex vesicaria</i> - <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i>	56	37	0.34	<i>Carex vesicaria</i>	86.77	100.00	86.77	0.87
					<i>Hemarthria compressa</i>	69.07	100.00	69.07	0.69
					<i>Cynodon dactylon</i>	9.34	26.79	34.87	1.30
Dry	HES-PC1: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Setaria pumila</i>	71	34	0.24	<i>Hemarthria compressa</i>	55.56	100.00	55.56	0.56
					<i>Cynodon dactylon</i>	43.83	100.00	43.83	0.44
					<i>Setaria pumila</i>	9.75	35.21	27.68	0.79
	HES-PC2: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Polygonum plebeium</i>	78	38	0.24	<i>Cynodon dactylon</i>	53.17	100.00	53.17	0.53
					<i>Hemarthria compressa</i>	51.53	100.00	51.53	0.52
					<i>Polygonum plebeium</i>	4.78	39.74	12.03	0.30
		31	20	0.34	<i>Carex vesicaria</i>	69.48	100.00	69.48	0.69

Season	Plant community	Division level			Dominating species	Density (m ⁻²)	F (%)	A	A/F
		N	n	Eigen					
	HES-PC3: <i>Carex vesicaria</i> - <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i>				<i>Hemarthria compressa</i>	54.26	100.00	54.26	0.54
					<i>Cynodon dactylon</i>	9.68	29.03	33.33	1.15
Wet	HES-PC1: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Setaria pumila</i>	34	43	0.27	<i>Hemarthria compressa</i>	117.24	100.00	117.24	1.17
					<i>Cynodon dactylon</i>	45.32	100.00	45.32	0.45
					<i>Setaria pumila</i>	28.53	94.12	30.31	0.32
					<i>Hemarthria compressa</i>	105.06	100.00	105.06	1.05
	HES-PC2: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Paspalum conjugatum</i>	35	47	0.28	<i>Cynodon dactylon</i>	79.57	100.00	79.57	0.80
					<i>Paspalum conjugatum</i>	14.37	68.57	20.96	0.31
					<i>Cynodon dactylon</i>	86.16	100.00	86.16	0.86
	HES-PC3: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Polygonum plebeium</i>	51	46	0.28	<i>Hemarthria compressa</i>	56.92	100.00	56.92	0.57
					<i>Polygonum plebeium</i>	6.14	50.98	12.04	0.24
					<i>Carex vesicaria</i>	112.5	100.00	112.5	1.13
	HES-PC4: <i>Carex vesicaria</i> - <i>Hemarthria compressa</i> - <i>Lindernia crustacea</i>	24	32	0.35	<i>Hemarthria compressa</i>	89.04	100.00	89.04	0.89
					<i>Lindernia crustacea</i>	13.00	83.33	15.60	0.19

HES- herbivore exclusion in short grassland, PC- plant community, F (%) - frequency in percentages, N-Number of plots, n-number of species, A- abundance and A/F- Abundance to frequency ratio.

Appendix Table 4.13. Overall and seasonal plant communities recorded from herbivore inclusion in short grassland (HIS) sites during 2014-15 in Kaziranga National Park, Assam, India.

Season	Plant community	Division level			Dominating species	Density (m ⁻²)	F (%)	A	A/F
		N	n	Eigen					
Overall	HIS-PC1: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Setaria pumila</i>	20	18	0.25	<i>Cynodon dactylon</i>	49.15	100.00	49.15	0.49
					<i>Hemarthria compressa</i>	39.60	100.00	39.6	0.40
					<i>Setaria pumila</i>	14.20	35.00	40.57	1.16
	HIS-PC2: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Heliotropium indicum</i>	22	26	0.25	<i>Hemarthria compressa</i>	58.09	100.00	58.09	1.72
					<i>Cynodon dactylon</i>	42.68	100.00	42.68	2.34
					<i>Heliotropium indicum</i>	6.09	90.91	6.70	13.57
	HIS-PC3: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Alternanthera sessilis</i>	76	34	0.22	<i>Cynodon dactylon</i>	39.12	100.00	39.12	0.39
					<i>Hemarthria compressa</i>	30.87	90.79	34.00	0.37
					<i>Alternanthera sessilis</i>	1.50	27.63	5.43	0.20
	HIS-PC4: <i>Carex vesicaria</i> - <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i>	26	18	0.38	<i>Carex vesicaria</i>	55.96	100.00	55.96	0.56
					<i>Hemarthria compressa</i>	39.04	96.15	40.60	0.42
					<i>Cynodon dactylon</i>	10.35	30.77	33.63	1.09
Dry	HIS-PC1: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Lindernia crustacea</i>	53	29	0.34	<i>Cynodon dactylon</i>	33.38	96.23	34.69	0.36
					<i>Hemarthria compressa</i>	32.38	94.34	34.32	0.36
					<i>Lindernia crustacea</i>	1.43	18.87	7.60	0.40
	HIS-PC2: <i>Carex vesicaria</i> - <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i>	19	12	0.34	<i>Carex vesicaria</i>	36.16	100.00	36.16	0.36
					<i>Hemarthria compressa</i>	28.47	84.21	33.81	0.40
					<i>Cynodon dactylon</i>	22.58	68.42	33.00	0.48

Season	Plant community	Division level			Dominating species	Density (m ⁻²)	F (%)	A	A/F
		N	n	Eigen					
Wet	HIS-PC1: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Setaria pumila</i>	16	20	0.29	<i>Cynodon dactylon</i>	47.69	100.00	47.69	0.48
					<i>Hemarthria compressa</i>	41.31	100.00	41.31	0.41
					<i>Setaria pumila</i>	22.56	68.75	32.82	0.48
	HIS-PC2: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Grangea maderaspatana</i>	44	36	0.29	<i>Cynodon dactylon</i>	48.77	100.00	48.77	0.49
					<i>Hemarthria compressa</i>	44.66	100	44.66	0.45
					<i>Grangea maderaspatana</i>	2.52	38.64	6.53	0.17
	HIS-PC3: <i>Carex vesicaria</i> - <i>Hemarthria compressa</i> - <i>Lindernia crustacea</i>	12	12	0.44	<i>Carex vesicaria</i>	68.75	100.00	68.75	0.69
					<i>Hemarthria compressa</i>	50.50	100.00	50.50	0.51
					<i>Lindernia crustacea</i>	5.67	83.33	6.80	0.08

HIS- herbivore inclusion in short grassland, PC- plant community, F (%) - frequency in percentages, N-Number of plots, n-number of species, A- abundance and A/F- Abundance to frequency ratio.

Appendix Table 4.14. Overall and seasonal plant communities recorded from herbivore exclusion in tall grassland (HET) sites during 2014-15 in Kaziranga National Park, Assam, India.

Season	Plant community	Division level			Dominating species	Density (m ⁻²)	F (%)	A	A/F
		N	n	Eigen					
Overall	HET-PC1: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Christella parasitica</i>	73	27	0.22	<i>Saccharum</i> spp.	53.70	100.00	53.70	0.54
					<i>Merremia umbellata</i>	10.27	75.34	13.64	0.18
					<i>Christella parasitica</i>	7.23	64.38	11.23	0.17
	HET-PC2: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Alpinia nigra</i>	42	37	0.22	<i>Saccharum</i> spp.	65.48	100.00	65.48	0.65
					<i>Merremia umbellata</i>	17.79	92.86	19.15	0.21
					<i>Alpinia nigra</i>	6.81	80.95	8.41	0.10
	HET-PC3: <i>Saccharum</i> spp.- <i>Mikania micrantha</i> - <i>Merremia umbellata</i>	31	31	0.24	<i>Saccharum</i> spp.	34.61	100.00	34.61	0.35
					<i>Mikania micrantha</i>	18.23	93.55	19.48	0.21
					<i>Merremia umbellata</i>	6.13	41.94	14.62	0.35
	HET-PC4: <i>Saccharum</i> spp.- <i>Mimosa</i> spp.- <i>Paspalum conjugatum</i>	41	45	0.24	<i>Saccharum</i> spp.	43.00	100.00	43.00	0.43
					<i>Mimosa</i> spp.	11.37	63.41	17.92	0.28
					<i>Paspalum conjugatum</i>	9.10	41.46	21.94	0.53
	HET-PC5: <i>Saccharum</i> spp.- <i>Paspalum conjugatum</i> - <i>Hemarthria compressa</i>	29	35	0.27	<i>Saccharum</i> spp.	44.00	100.00	44.00	0.44
					<i>Paspalum conjugatum</i>	19.55	65.52	29.84	0.46
					<i>Hemarthria compressa</i>	14.31	37.93	37.73	0.99
Dry	HET-PC1: <i>Saccharum</i> spp.- <i>Mikania micrantha</i> - <i>Christella parasitica</i>	27	24	0.26	<i>Saccharum</i> spp.	28.00	100.00	28.00	0.28
					<i>Mikania micrantha</i>	15.22	92.59	16.44	0.18
					<i>Christella parasitica</i>	4.26	48.15	8.85	0.18
	HET-PC2: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Christella parasitica</i>	73	32	0.26	<i>Saccharum</i> spp.	38.25	100.00	38.25	0.38
					<i>Merremia umbellata</i>	9.88	80.82	12.22	0.15
					<i>Christella parasitica</i>	5.45	56.16	9.71	0.17
	HET-PC3: <i>Saccharum</i> spp.- <i>Paspalum conjugatum</i> - <i>Mimosa</i> spp.	20	24	0.28	<i>Saccharum</i> spp.	30.90	100.00	30.90	0.31
					<i>Paspalum conjugatum</i>	15.20	65.00	23.38	0.36

Season	Plant community	Division level			Dominating species	Density (m-2)	F (%)	A	A/F
		N	n	Eigen					
Wet	HET-PC1: <i>Saccharum</i> spp.- <i>Mikania micrantha</i> - <i>Merremia umbellata</i>	17	38	0.24	<i>Mimosa</i> spp.	6.60	50.00	13.20	0.26
					<i>Saccharum</i> spp.	45.41	100.00	45.41	0.45
					<i>Mikania micrantha</i>	13.76	64.71	21.27	0.33
					<i>Merremia umbellata</i>	12.41	76.47	16.23	0.21
	HET-PC2: <i>Saccharum</i> spp.- <i>Mimosa</i> spp.- <i>Christella parasitica</i>	28	40	0.24	<i>Saccharum</i> spp.	59.04	100.00	59.04	0.59
					<i>Mimosa</i> spp.	12.00	53.57	22.40	0.42
					<i>Christella parasitica</i>	10.71	75.00	14.29	0.19
	HET-PC3: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Alpinia nigra</i>	38	32	0.35	<i>Saccharum</i> spp.	90.89	100.00	90.89	0.91
					<i>Merremia umbellata</i>	18.11	86.84	20.85	0.24
					<i>Alpinia nigra</i>	5.71	65.79	8.68	0.13
	HET-PC4: <i>Saccharum</i> spp.- <i>Hemarthria compressa</i> - <i>Paspalum conjugatum</i>	13	25	0.35	<i>Saccharum</i> spp.	57.62	100.00	57.62	0.58
					<i>Hemarthria compressa</i>	30.62	61.54	49.75	0.81
					<i>Paspalum conjugatum</i>	17.69	53.85	32.86	0.61

HET- herbivore exclusion in tall grassland, PC- plant community, F (%) - frequency in percentages, N-Number of plots, n-number of species, A- abundance and A/F- Abundance to frequency ratio.

Appendix Table 4.15. Overall and seasonal plant communities recorded from herbivore inclusion in tall grassland (HIT) sites during 2014-15 in Kaziranga National Park, Assam, India.

Season	Plant community	Division level			Dominating species	Density (m-2)	F (%)	A	A/F
		N	n	Eigen					
Overall	HIT-PC1: <i>Saccharum</i> spp.- <i>Alpinia nigra</i> - <i>Lygodium flexuosum</i>	19	16	0.27	<i>Saccharum</i> spp.	34.11	100.00	34.11	0.34
					<i>Alpinia nigra</i>	3.63	84.21	4.31	0.05
					<i>Lygodium flexuosum</i>	4.84	52.63	9.20	0.17
	HIT-PC2: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Mikania micrantha</i>	29	19	0.27	<i>Saccharum</i> spp.	35.21	100.00	35.21	0.35
					<i>Merremia umbellata</i>	19.45	100.00	19.45	0.19
					<i>Mikania micrantha</i>	4.24	37.93	11.18	0.29
	HIT-PC3: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Christella parasitica</i>	77	36	0.21	<i>Saccharum</i> spp.	36.57	100.00	36.57	0.37
					<i>Merremia umbellata</i>	10.71	58.44	18.33	0.31
					<i>Christella parasitica</i>	5.16	63.64	8.10	0.13
	HIT-PC4: <i>Saccharum</i> spp.- <i>Scleria terrestris</i> - <i>Alpinia nigra</i>	45	39	0.28	<i>Saccharum</i> spp.	45.47	100.00	45.47	0.45
					<i>Scleria terrestris</i>	13.89	55.56	25.00	0.45
					<i>Alpinia nigra</i>	4.73	68.89	6.87	0.10
	HIT-PC5: <i>Saccharum</i> spp.- <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i>	46	31	0.28	<i>Saccharum</i> spp.	33.20	93.48	35.51	0.38
					<i>Cynodon dactylon</i>	19.59	76.09	25.74	0.34
					<i>Hemarthria compressa</i>	17.07	50.00	34.13	0.68
Dry	HIT-PC1: <i>Saccharum</i> spp.- <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i>	15	12	0.34	<i>Saccharum</i> spp.	34.33	100.00	34.33	0.34
					<i>Hemarthria compressa</i>	15.20	60.00	25.33	0.42
					<i>Cynodon dactylon</i>	14.53	73.33	19.82	0.27
		40	24	0.34	<i>Saccharum</i> spp.	31.45	100.00	31.45	0.31

Season	Plant community	Division level			Dominating species	Density (m-2)	F (%)	A	A/F	
		N	n	Eigen						
	HIT-PC2: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Cynodon dactylon</i>				<i>Merremia umbellata</i>	15.28	87.50	17.46	0.20	
				<i>Cynodon dactylon</i>	2.18	12.50	17.40	1.39		
	HIT-PC3: <i>Saccharum</i> spp.- <i>Mikania micrantha</i> - <i>Christella parasitica</i>	26	23	0.30	<i>Saccharum</i> spp.	29.65	100.00	29.65	0.30	
					<i>Mikania micrantha</i>	6.85	61.54	11.13	0.18	
					<i>Christella parasitica</i>	4.46	57.69	7.73	0.13	
	HITPC4: <i>Saccharum</i> spp.- <i>Alpinia nigra</i> - <i>Christella parasitica</i>	27	21	0.30	<i>Saccharum</i> spp.	26.96	100.00	26.96	0.27	
					<i>Alpinia nigra</i>	3.30	85.19	3.87	0.05	
					<i>Christella parasitica</i>	2.89	37.04	7.80	0.21	
	Wet	HIT-PC1: <i>Saccharum</i> spp.- <i>Scleria terrestris</i> - <i>Setaria pumila</i>	30	38	0.29	<i>Saccharum</i> spp.	56.30	100.00	56.30	0.56
						<i>Scleria terrestris</i>	16.70	60.00	27.83	0.46
						<i>Setaria pumila</i>	8.37	36.67	22.82	0.62
		HIT-PC2: <i>Saccharum</i> spp.- <i>Scleria terrestris</i> - <i>Christella parasitica</i>	21	24	0.29	<i>Saccharum</i> spp.	40.43	100.00	40.43	0.40
<i>Scleria terrestris</i>						10.62	33.33	31.86	0.96	
<i>Christella parasitica</i>						8.90	76.19	11.69	0.15	
HIT-PC3: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Alpinia nigra</i>		41	23	0.33	<i>Saccharum</i> spp.	41.29	100.00	41.29	0.41	
					<i>Merremia umbellata</i>	21.22	92.68	22.89	0.25	
					<i>Alpinia nigra</i>	4.49	80.49	5.58	0.07	
HIT-PC4: <i>Saccharum</i> spp.- <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i>		16	15	0.33	<i>Saccharum</i> spp.	38.63	100.00	38.63	0.39	
					<i>Cynodon dactylon</i>	28.13	87.50	32.14	0.37	
					<i>Hemarthria compressa</i>	24.00	56.25	42.67	0.76	

HIT- herbivore inclusion in tall grassland, PC- plant community, F (%) - frequency in percentages, N-Number of plots, n-number of species, A- abundance and A/F- Abundance to frequency ratio.

Appendix Table 4.16. Overall and seasonal plant communities recorded from herbivore exclusion in tall grassland burning (HETB) sites during 2014-15 in Kaziranga National Park, Assam, India.

Season	Plant community	Division level			Dominating species	Density (m-2)	F (%)	A	A/F
		N	n	Eigen					
Overall	HETB-PC1: <i>Saccharum</i> spp.- <i>Hemarthria compressa</i> - <i>Merremia umbellata</i>	16	18	0.25	<i>Saccharum</i> spp.	116.06	100.00	116.06	1.16
					<i>Hemarthria compressa</i>	21.69	56.25	38.56	0.69
					<i>Merremia umbellata</i>	16.25	62.50	26.00	0.42
	HETB-PC2: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Alpinia nigra</i>	56	33	0.25	<i>Saccharum</i> spp.	66.66	100.00	66.66	0.67
					<i>Merremia umbellata</i>	15.18	75.00	20.24	0.27
					<i>Alpinia nigra</i>	6.46	66.07	9.78	0.15
	HETB-PC3: <i>Saccharum</i> spp.- <i>Alpinia nigra</i> - <i>Mikania micrantha</i>	44	29	0.34	<i>Saccharum</i> spp.	84.41	100.00	84.41	0.84
					<i>Alpinia nigra</i>	15.30	84.09	18.19	0.22
					<i>Mikania micrantha</i>	8.25	50.00	16.50	0.33
	HETB-PC4: <i>Saccharum</i> spp.- <i>Apluda mutica</i> - <i>Scleria terrestris</i>	28	31	0.34	<i>Saccharum</i> spp.	76.07	100.00	76.07	0.76
					<i>Apluda mutica</i>	7.82	32.14	24.33	0.76
					<i>Scleria terrestris</i>	3.50	32.14	10.89	0.34

Season	Plant community	Division level			Dominating species	Density (m-2)	F (%)	A	A/F
		N	n	Eigen					
Dry	HETB-PC1: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Christella parasitica</i>	29	18	0.33	<i>Saccharum</i> spp.	41.97	100.00	41.97	0.42
					<i>Merremia umbellata</i>	18.00	93.10	19.33	0.21
					<i>Christella parasitica</i>	6.66	48.28	13.79	0.29
	HETB-PC2: <i>Saccharum</i> spp.- <i>Mikania micrantha</i> - <i>Alpinia nigra</i>	43	23	0.33	<i>Saccharum</i> spp.	47.14	100.00	47.14	0.47
					<i>Mikania micrantha</i>	8.23	48.84	16.86	0.35
					<i>Alpinia nigra</i>	6.81	48.84	13.95	0.29
Wet	HETB-PC1: <i>Saccharum</i> spp.- <i>Alpinia nigra</i> - <i>Scleria terrestris</i>	36	41	0.35	<i>Saccharum</i> spp.	116.78	100.00	116.78	1.17
					<i>Alpinia nigra</i>	11.58	63.89	18.13	0.28
					<i>Scleria terrestris</i>	9.25	58.33	15.86	0.27
	HETB-PC2: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Hemarthria compressa</i>	36	28	0.35	<i>Saccharum</i> spp.	110.72	100.00	110.72	1.11
					<i>Merremia umbellata</i>	15.94	66.67	23.92	0.36
					<i>Hemarthria compressa</i>	8.75	22.22	39.38	1.77

HETB- herbivore exclusion in tall grassland burning, PC- plant community, F (%) - frequency in percentages, N-Number of plots, n-number of species, A- abundance and A/F- Abundance to frequency ratio.

Appendix Table 4.17. Overall and seasonal plant communities recorded from herbivore exclusion in tall grassland invasive removal (HETIR) sites during 2014-15 in Kaziranga National Park, Assam, India.

Season	Plant community	Division level			Dominating species	Density (m-2)	F (%)	A	A/F
		N	n	Eigen					
Overall	HETIR-PC1: <i>Saccharum</i> spp.- <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i>	32	26	0.28	<i>Saccharum</i> spp.	73.66	100.00	73.66	0.74
					<i>Cynodon dactylon</i>	15.38	62.50	24.60	0.39
					<i>Hemarthria compressa</i>	13.63	68.75	19.82	0.29
	HETIR-PC2: <i>Saccharum</i> spp.- <i>Alpinia nigra</i> - <i>Christella parasitica</i>	48	35	0.28	<i>Saccharum</i> spp.	69.44	100.00	69.44	0.69
					<i>Alpinia nigra</i>	8.48	85.42	9.93	0.12
					<i>Christella parasitica</i>	7.08	68.75	10.30	0.15
	HETIR-PC3: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Paspalum conjugatum</i>	28	43	0.28	<i>Saccharum</i> spp.	101.29	100.00	101.29	1.01
					<i>Merremia umbellata</i>	17.04	89.29	19.08	0.21
					<i>Paspalum conjugatum</i>	16.75	75.00	22.33	0.30
Dry	HETIR-PC1: <i>Saccharum</i> spp.- <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i>	28	27	0.30	<i>Saccharum</i> spp.	55.68	100.00	55.68	0.56
					<i>Cynodon dactylon</i>	16.32	75.00	21.76	0.29
					<i>Hemarthria compressa</i>	9.43	50.00	18.86	0.38
	HETIR-PC2: <i>Saccharum</i> spp.- <i>Christella parasitica</i> - <i>Alpinia nigra</i>	32	23	0.30	<i>Saccharum</i> spp.	45.13	100.00	45.13	0.45
					<i>Christella parasitica</i>	6.41	59.38	10.79	0.18
					<i>Alpinia nigra</i>	5.63	81.25	6.92	0.09
Wet	HETIR-PC1: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Paspalum conjugatum</i>	20	38	0.32	<i>Saccharum</i> spp.	114.50	100.00	114.50	1.15
					<i>Merremia umbellata</i>	19.15	95.00	20.16	0.21
					<i>Paspalum conjugatum</i>	17.05	75.00	22.73	0.30
		28	30	0.32	<i>Saccharum</i> spp.	115.46	100.00	115.46	1.15

Season	Plant community	Division level			Dominating species	Density (m-2)	F (%)	A	A/F
		N	n	Eigen					
	HETIR-PC2: <i>Saccharum</i> spp.- <i>Alpinia nigra</i> - <i>Hemarthria compressa</i>				<i>Alpinia nigra</i>	9.29	75.00	12.38	0.17
					<i>Hemarthria compressa</i>	8.86	39.29	22.55	0.57

HETIR- herbivore exclusion in tall grassland invasive removal, PC- plant community, F (%) - frequency in percentages, N-Number of plots, n-number of species, A-abundance and A/F- Abundance to frequency ratio.

Appendix Table 4.18. Kruskal-Wallis significance test among tall grassland experimental sites (HET, HIT, HETB and HETIR) for diversity indices and soil nutrient content recorded during 2014-15 in Kaziranga National Park, Assam, India.

Diversity indices	Season	χ^2	df	P	Soil nutrient parameters (%)	Season	χ^2	df	P
Species richness	Overall	21.30	3	0.00*	Organic carbon	Overall	13.30	3	0.00*
	Dry	17.60	3	0.00*		Dry	18.54	3	0.00*
	Wet	14.66	3	0.00*		Wet	16.85	3	0.00*
Species evenness	Overall	11.55	3	0.01*	Nitrogen	Overall	10.58	3	0.01*
	Dry	1.87	3	0.59		Dry	10.67	3	0.01*
	Wet	15.02	3	0.00*		Wet	20.66	3	0.00*
Shannon diversity	Overall	23.90	3	0.00*	Phosphorous	Overall	10.25	3	0.02*
	Dry	13.21	3	0.00*		Dry	6.75	3	0.08
	Wet	14.02	3	0.00*		Wet	21.72	3	0.00*
Simpson dominance	Overall	19.92	3	0.00*	Potassium	Overall	18.98	3	0.00*
	Dry	8.13	3	0.04*		Dry	15.50	3	0.00*
	Wet	16.51	3	0.00*		Wet	23.74	3	0.00*

χ^2 -chi square value, df- degree of freedom, %-in percentages and *indicates significant result at $P>0.05$.

Appendix Table 4.19. Pairwise similarities (Bray-Curtis index) in species composition of experimental sites of riverine alluvial grasslands recorded during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Overall	Dry season	Wet season
SG-TG	0.12	0.10	0.13
HES-HIS	0.41	0.39	0.42
HES-HET	0.08	0.05	0.09
HES-HIT	0.07	0.05	0.08
HES- HETB	0.03	0.01	0.04
HES- HETIR	0.08	0.09	0.07
HIS- HET	0.10	0.06	0.12
HIS- HIT	0.15	0.14	0.15
HIS- HETB	0.06	0.03	0.07
HIS- HETIR	0.13	0.17	0.10

HET- HIT	0.79	0.76	0.78
HET- HETB	0.79	0.75	0.73
HET- HETIR	0.76	0.69	0.77
HIT- HETB	0.74	0.82	0.67
HIT- HETIR	0.82	0.81	0.75
HETB- HETIR	0.74	0.73	0.73

SG-short grassland, TG- tall grassland, HES- herbivore exclusion in short grassland, HIS- herbivore inclusion in short grassland, HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning and HETIR- herbivore exclusion in tall grassland invasive removal.

Appendix Table 4.20. Constrained and unconstrained summary statistics of the first two canonical correspondence ordination axes to define plant species distribution in riverine alluvial grasslands along environmental variables.

Season	Axes	CCA1						CCA2						Total inertia
		Eigen values	Inertia	χ^2	df	F	Pr(>F)	Eigen values	Inertia	χ^2	df	F	Pr(>F)	
Overall	Constrained	0.41	1.17	0.41	1	4.07	0.01*	0.19	7.77	0.19	1	1.93	0.13	8.94
	Unconstrained	0.45						0.37						
Dry	Constrained	0.41	1.40	0.41	1	2.87	0.01*	0.27	5.38	0.27	1	1.91	0.14	6.78
	Unconstrained	0.44						0.36						
Wet	Constrained	0.44	1.49	0.44	1	2.86	0.01*	0.25	4.91	0.25	1	1.63	0.97	6.40
	Unconstrained	0.42						0.36						

CCA1- Canonical correspondence axes 1, CCA2- Canonical correspondence axes 2, χ^2 -chi square value, df- degree of freedom, F-F statistic, Pr(>F)- probability of significance level for F and *indicates significant result at <0.05 (corrected with Bonferroni correction).

Appendix Table 4.21. Summary statistics of canonical correlation co-efficient between environmental variables and the first two canonical correspondence ordination axes defining plant species distribution in riverine alluvial grasslands.

Environment variables	Overall						Dry season						Wet season					
	CCA1	CCA2	χ^2	df	F	Pr(>F)	CCA1	CCA2	χ^2	df	F	Pr(>F)	CCA1	CCA2	χ^2	df	F	Pr(>F)
Nitrogen	0.11	0.67	0.17	1	1.73	0.01*	-0.33	-0.66	0.23	1	1.63	0.01*	0.08	-0.74	1	0.21	1.37	0.11
Carbon	-0.41	0.59	0.35	1	3.55	0.01*	0.42	-0.76	0.35	1	2.49	0.01*	0.52	-0.62	1	0.42	2.73	0.01*
Phosphorous	0.27	0.52	0.16	1	1.58	0.04*	0.10	-0.14	0.15	1	1.08	1.00	-0.22	-0.65	1	0.16	1.04	1.00
Potassium	-0.02	0.57	0.14	1	1.37	0.29	-0.12	-0.77	0.15	1	1.08	1.00	0.14	-0.62	1	0.19	1.25	0.76
Maximum temperature	0.05	0.14	0.13	1	1.27	0.84	0.19	-0.37	0.16	1	1.10	1.00	0.09	0.31	1	0.15	0.10	1.00
Minimum temperature	0.02	0.72	0.13	1	1.32	0.20	0.32	0.17	0.16	1	1.15	1.00	0.01	-0.84	1	0.18	1.19	0.95
Rainfall	0.07	0.48	0.10	1	0.96	1.00	0.16	0.57	0.19	1	1.37	0.43	-0.10	-0.35	1	0.17	1.10	1.00

CCA1- Canonical correspondence axes 1, CCA2- Canonical correspondence axes 2, χ^2 -chi square value, df- degree of freedom, F-F statistic, Pr(>F)-probability of significance level for F and *indicates significant result at <0.05 (corrected with Bonferroni correction).

APPENDIX 5: Biomass productivity of riverine alluvial grasslands

Appendix Table 5.1. Mann-Whitney significance test between dry and wet season's aboveground biomass productivity (g m^{-2}) in terms of classes, growth forms and life cycles recorded from riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

ES	Mann-Whitney	Aboveground biomass productivity (g m^{-2})													
		Total biomass	Classes			Growth forms							Life cycles		
			Mon	Dic	Fer	Gra	Sed	Cli	Her	Fer	Shr	Tre	Ann	Per	Deci
HES	U	0.00	0.00	3.00	34.00	0.00	10.00	30.00	2.00	34.00	16.00	40.00	0.00	0.00	40.00
	P	0.00*	0.00*	0.00*	0.41	0.00*	0.01*	0.31	0.00*	0.41	0.03*	1.00	0.00*	0.00*	1.00
HIS	U	0.00	1.00	0.00	6.00	1.00	1.00	6.00	0.00	6.00	5.00	8.00	0.00	1.00	8.00
	P	0.02*	0.04*	0.02*	0.32	0.04*	0.04*	0.32	0.02*	0.32	0.39	1.00	0.02*	0.04*	1.00
Total (SG)	U	26.00	27.00	7.00	68.50	28.00	31.00	65.50	7.00	68.50	53.00	84.00	1.00	27.00	84.00
	P	0.00*	0.00*	0.00*	0.20	0.00*	0.01*	0.24	0.00*	0.20	0.11	1.00	0.00*	0.00*	1.00
HET	U	0.00	0.00	25.00	29.00	0.00	28.00	32.00	17.00	29.00	36.00	25.00	7.00	0.00	31.50
	P	0.00*	0.00*	0.18	0.33	0.00*	0.26	0.48	0.04*	0.33	0.72	0.17	0.00*	0.00*	0.44
HIT	U	0.00	0.00	0.00	3.00	0.00	1.00	2.00	0.00	3.00	2.00	5.00	2.00	0.00	5.00
	P	0.02*	0.02*	0.02*	0.15	0.02*	0.04*	0.08	0.02*	0.15	0.08	0.39	0.08	0.02*	0.39
HETB	U	0.00	0.00	21.00	28.00	0.00	10.00	20.00	27.00	28.00	25.00	31.00	12.50	0.00	31.00
	P	0.00*	0.00*	0.25	0.67	0.00*	0.02*	0.21	0.60	0.67	0.46	0.92	0.04*	0.00*	0.92
HETIR	U	0.00	0.00	14.00	37.00	0.00	25.00	5.00	17.00	37.00	39.00	40.00	20.00	0.00	40.00
	P	0.00*	0.00*	0.02*	0.79	0.00*	0.17	0.00*	0.04*	0.79	0.93	1.00	0.07	0.00*	1.00
Total (TG)	U	172.00	174.00	340.00	406.00	172.00	235.00	333.50	285.00	406.00	445.00	392.00	171.00	173.00	407.00
	P	0.00*	0.00*	0.11	0.53	0.00*	0.00*	0.09	0.02*	0.53	0.96	0.37	0.00*	0.00*	0.52
Total (SG & TG)	U	487.00	478.00	689.00	891.00	496.00	638.00	769.00	612.00	891.00	848.00	830.00	444.00	494.00	851.00
	P	0.00*	0.00*	0.05*	0.80	0.00*	0.01*	0.19	0.01*	0.80	0.53	0.35	0.00*	0.00*	0.48

ES- experimental sites, SG- short grassland, TG- tall grassland, HES- herbivore exclusion in short grassland, HIS- herbivore inclusion in short grassland, HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal, Mon- monocots, Dic- dicots, Fer- ferns, Gra- grasses, Sed- sedges, Cli-climbers, Her- herbs, Shr- shrubs, Tre- trees, Ann- annuals, Per- perennials, Deci- deciduous, U- Mann-Whitney test value and *indicates significant result at $P < 0.05$

Appendix Table 5.2. Mann-Whitney and Kruskal Wallis significance test between aboveground biomass productivity (g m^{-2}) of classes, growth forms and life cycles recorded from experimental sites in riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Seasons	Tests		Aboveground biomass productivity (g m^{-2})		
				Classes	Growth forms	Life cycles
HES	Overall	Kruskal-Wallis	χ^2	48.16	109.28	48.93

Experimental sites	Seasons	Tests	Aboveground biomass productivity (g m ⁻²)				
			Classes	Growth forms	Life cycles		
			<i>df</i>				
	Dry	Mann-Whitney	<i>P</i>	0.00*	0.00*		
			χ^2	26.51	61.85		
			<i>df</i>	2	6		
			<i>P</i>	0.00*	0.00*		
			χ^2	20.80	49.00		
			<i>df</i>	2	6		
	Wet		<i>P</i>	0.00*	0.00*		
			<i>U</i>	277.00	1610.00		
			<i>P</i>	0.14	0.08		
			χ^2	20.99	50.29		
			<i>df</i>	2	6		
			<i>P</i>	0.00*	0.00*		
HIS	Overall		Kruskal-Wallis	χ^2	10.20	25.36	
				<i>df</i>	2	6	
				<i>P</i>	0.01*	0.00*	
				χ^2	9.99	25.35	
				<i>df</i>	2	6	
				<i>P</i>	0.01*	0.01*	
	Dry	<i>U</i>		55.00	332.00		
		<i>P</i>		0.32	0.31		
		χ^2		69.51	158.07		
		<i>df</i>		2	6		
		<i>P</i>		0.00*	0.00*		
		χ^2		37.57	86.48		
Wet	Kruskal-Wallis	<i>df</i>		2	6		
		<i>P</i>		0.00*	0.00*		
		χ^2		31.62	73.76		
		<i>df</i>		2	6		
		<i>P</i>		0.00*	0.00*		
		χ^2		601.50	3470.00		
Total (SG)		Overall	Mann-Whitney	<i>P</i>	0.12	0.06	
				χ^2	46.27	93.46	
				<i>df</i>	2	6	
				<i>P</i>	0.00*	0.00*	
				χ^2	25.81	50.37	
				<i>df</i>	2	6	
		Dry		Kruskal-Wallis	<i>P</i>	0.00*	0.00*
					χ^2	2	6
					<i>df</i>	2	6
					<i>P</i>	0.00*	0.00*
					χ^2	2	6
					<i>P</i>	0.00*	0.00*
Wet	Kruskal-Wallis	χ^2			2	6	
		<i>df</i>			2	6	
		<i>P</i>			0.00*	0.00*	
		χ^2			2	6	
		<i>df</i>			2	6	
		<i>P</i>			0.00*	0.00*	

Experimental sites	Seasons	Tests		Aboveground biomass productivity (g m ⁻²)		
				Classes	Growth forms	Life cycles
	Between dry & wet	Mann-Whitney	U	310.00	1722.50	243.00
HIT	Overall	Kruskal-Wallis	P	0.38	0.24	0.04*
			χ ²	20.48	42.98	17.27
	P		0.00*	0.00*	0.00*	
	χ ²		9.85	23.02	8.19	
	df		2	6	2	
	P		0.01*	0.00*	0.02*	
	χ ²		9.85	23.55	8.35	
	df		2	6	2	
	P		0.01*	0.00*	0.02*	
	Wet		Mann-Whitney	U	51.00	265.00
		P		0.23	0.04*	0.18
	HETB	Overall	Kruskal-Wallis	χ ²	38.65	71.71
df				2	6	2
P		0.00*		0.00*	0.00*	
χ ²		20.48		42.08	17.32	
df		2		6	2	
P		0.00*		0.00*	0.00*	
χ ²		17.78		34.15	15.88	
df		2		6	2	
P		0.00*		0.00*	0.00*	
Between dry & wet		Mann-Whitney		U	282.00	1546.00
			P	0.90	0.90	0.34
HETIR		Overall	Kruskal-Wallis	χ ²	45.31	102.81
	df			2	6	2
	P	0.00*		0.00*	0.00*	
	χ ²	23.91		58.74	24.50	
	df	2		6	2	
	P	0.00*		0.00*	0.00*	
	χ ²	20.48		48.27	21.26	
	df	2		6	2	
	P	0.00*		0.00*	0.00*	
	Between dry & wet	Mann-Whitney		U	296.00	1689.00
			P	0.27	0.18	0.20
	Total (TG)	Overall	Kruskal-Wallis	χ ²	152.00	280.78
df				2	6	2
P		0.00*		0.00*	0.00*	
χ ²		82.65		155.27	65.41	
df		2		6	2	
P		0.00*		0.00*	0.00*	

Experimental sites	Seasons	Tests	Aboveground biomass productivity (g m ⁻²)		
			Classes	Growth forms	Life cycles
Total (SG & TG)	Wet		χ^2	69.74	129.88
			<i>df</i>	2	6
			<i>P</i>	0.00*	0.00*
	Between dry & wet	Mann-Whitney	<i>U</i>	3695.00	19726.00
			<i>P</i>	0.33	0.07
			χ^2	208.51	308.88
	Overall		<i>df</i>	2	6
			<i>P</i>	0.00*	0.00*
			χ^2	109.00	160.61
	Dry	Kruskal-Wallis	<i>df</i>	2	6
			<i>P</i>	0.00*	0.00*
			χ^2	100.19	153.82
Total (SG & TG)	Wet		<i>df</i>	2	6
			<i>P</i>	0.00*	0.00*
			χ^2	7430.00	39802.00
	Between dry & wet	Mann-Whitney	<i>U</i>	7430.00	39802.00
			<i>P</i>	0.15	0.01*
			χ^2	208.51	308.88
	Overall		<i>df</i>	2	6
			<i>P</i>	0.00*	0.00*
			χ^2	109.00	160.61
	Dry	Kruskal-Wallis	<i>df</i>	2	6
			<i>P</i>	0.00*	0.00*
			χ^2	100.19	153.82

SG- short grassland, TG- tall grassland, HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal, U- Mann-Whitney test value, χ^2 - chi square value, *df*- degree of freedom and *indicates significant result at $P < 0.05$

Appendix Table 5.3. Mann-Whitney significance test for multiple comparisons between classes, growth forms and life cycles aboveground biomass productivity (g m⁻²) recorded from short (SG) and tall (TG) riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Types	Multiple comparisons	Mann-Whitney	Aboveground biomass productivity (g m ⁻²)								
			Grassland			Short grassland			Tall grassland		
			O	D	W	O	D	W	O	D	W
Classes	Mon-Dic	U	254.00	70.00	31.00	5.00	0.00	0.00	45.00	6.00	4.00
		<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Mon-Fer	U	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Dic-Fer	U	412.00	161.00	56.00	0.00	0.00	0.00	119.00	16.00	41.00
		<i>P</i>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Growth Forms	Gra-Sed	U	451.00	117.00	88.00	316.00	83.00	70.00	0.00	0.00	0.00
		<i>P</i>	0.00*	0.00*	0.00*	1.00	1.00	1.00	0.00*	0.00*	0.00*
	Gra-Cli	U	138.00	34.00	19.00	0.00	0.00	0.00	23.00	2.00	2.00
		<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Gra-Her	U	356.00	105.00	49.00	7.00	0.00	1.00	65.00	19.00	4.00
		<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Gra-Fer	U	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*

Types	Multiple comparisons	Mann-Whitney	Aboveground biomass productivity (g m ⁻²)								
			Grassland			Short grassland			Tall grassland		
			O	D	W	O	D	W	O	D	W
		<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		<i>U</i>	95.00	27.00	11.00	10.00	0.00	2.00	8.00	0.00	0.00
	Gra-Shr	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		<i>U</i>	71.00	10.00	15.00	0.00	0.00	0.00	14.00	0.00	1.00
	Gra-Tre	<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
		<i>U</i>	3459.00	924.00	799.00	3.00	0.00	0.00	309.00	54.00	80.00
	Sed-Cli	<i>P</i>	1.00	1.00	1.00	0.00*	0.00*	0.00*	1.00	1.00	1.00
		<i>U</i>	2107.00	553.00	484.00	44.00	10.00	2.00	43.00	1.00	11.00
	Sed-Her	<i>P</i>	1.00	1.00	1.00	0.00*	0.00*	0.00*	1.00	1.00	1.00
		<i>U</i>	2662.00	951.00	418.00	0.00	0.00	0.00	1248.00	196.00	383.00
	Sed-Fer	<i>P</i>	1.00	1.00	1.00	0.00*	0.00*	0.00*	1.00	1.00	1.00
		<i>U</i>	3288.00	819.00	781.00	24.00	4.00	3.00	667.00	118.00	211.00
	Sed-Shr	<i>P</i>	1.00	1.00	1.00	0.00*	0.00*	0.00*	1.00	1.00	1.00
		<i>U</i>	2078.00	657.00	375.00	0.00	0.00	0.00	1754.00	493.00	338.00
	Sed-Tre	<i>P</i>	1.00	1.00	1.00	0.00*	0.00*	0.00*	1.00	1.00	1.00
		<i>U</i>	2333.00	704.00	469.00	33.00	3.00	10.00	1060.00	309.00	209.00
	Cli-Her	<i>P</i>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		<i>U</i>	2098.00	657.00	400.00	275.00	82.50	55.50	378.00	129.00	59.50
	Cli-Fer	<i>P</i>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		<i>U</i>	3555.00	1053.00	736.00	85.00	23.00	17.00	1347.00	425.50	258.00
	Cli-Shr	<i>P</i>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		<i>U</i>	1869.00	552.00	392.00	234.00	77.00	42.00	602.00	181.50	126.00
	Cli-Tre	<i>P</i>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		<i>U</i>	394.00	198.00	19.00	0.00	0.00	0.00	42.00	22.00	3.00
	Her-Fer	<i>P</i>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		<i>U</i>	1961.00	644.00	354.00	162.00	52.00	25.00	752.00	248.00	133.00
	Her-Shr	<i>P</i>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		<i>U</i>	726.00	231.00	138.00	0.00	0.00	0.00	312.00	90.00	76.00
	Her-Tre	<i>P</i>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		<i>U</i>	1781.50	539.50	347.00	31.00	15.00	0.00	852.50	215.00	199.00
	Fer-Shr	<i>P</i>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		<i>U</i>	2813.50	749.50	657.00	286.00	91.00	54.00	1419.50	353.00	351.00
	Fer-Tre	<i>P</i>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		<i>U</i>	1597.50	444.50	359.00	26.00	14.00	0.00	881.50	224.50	219.00
	Shr-Tre	<i>P</i>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Life cycles	Ann-Per	<i>U</i>	2.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00
		<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Ann-Deci	<i>U</i>	2424.00	779.00	436.00	0.00	0.00	0.00	1758.00	482.00	378.00
		<i>P</i>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Types	Multiple comparisons	Mann-Whitney	Aboveground biomass productivity (g m ⁻²)								
			Grassland			Short grassland			Tall grassland		
	Per-Deci	U	O	D	W	O	D	W	O	D	W
		P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*

Mon -monocots, Dic- dicots, Fer- ferns, Gra- grasses, Sed- sedges, Cli- climbers, Heb- herbs, Shr- shrubs, Tre- trees, Ann- annuals, Per-perennials, Deci- deciduous, O- overall, D- dry season, W- wet season, U- Mann-Whitney test value and *indicates significant result at $P < 0.05$.

Appendix Table 5.4. Overall and seasonal family-wise aboveground biomass productivity (g m⁻²) recorded from riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Families	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Acanthaceae	194.10	13.86±4.23	94.90	10.54±5.63	99.20	19.84±5.92
Adiantaceae	2.96	2.96±0.00	0.00	0.00	2.96	2.96±0.00
Amaranthaceae	564.87	31.38±7.28	143.12	14.31±3.94	421.75	52.72±12.15
Amaryllidaceae	25.85	6.46±3.06	1.22	1.22±0.00	24.63	8.21±3.56
Apiaceae	105.18	8.77±3.82	16.74	3.35±1.43	88.44	12.63±6.23
Apocynaceae	85.45	7.12±1.51	44.95	6.42±2.17	40.50	8.10±2.20
Araceae	15.48	15.48±0.00	15.48	15.48±0.00	3.02	1.51±0.66
Araliaceae	3.02	1.51±0.66	0.00	0.00	0.00	0.00
Boraginaceae	431.50	25.38±7.98	123.71	13.75±4.45	307.79	38.47±15.40
Brassicaceae	404.97	23.82±6.83	113.16	11.32±2.79	291.81	41.69±13.95
Caryophyllaceae	204.19	15.71±6.31	6.89	1.15±0.46	197.30	28.19±9.56
Commelinaceae	18.35	4.59±1.05	6.22	6.22±0.00	12.13	4.04±1.27
Compositae	5969.83	331.66±53.20	3140.89	314.09±88.17	2828.94	353.62±53.37
Convolvulaceae	11822.35	656.80±138.87	4440.58	444.06±85.73	7381.77	922.72±274.56
Cyperaceae	20265.25	1125.85±236.86	4521.85	452.18±61.66	15743.40	1967.93±343.66
Euphorbiaceae	380.19	31.68±13.72	141.72	23.62±11.83	238.46	39.74±25.73
Lamiaceae	258.79	19.91±5.18	59.83	11.97±2.73	198.96	24.87±7.94
Lauraceae	1944.65	108.04±22.63	829.85	82.99±19.63	1114.80	139.35±43.90
Leguminosae	5592.31	310.68±43.52	2553.24	255.32±40.74	3039.07	379.88±80.32
Linderniaceae	253.58	16.91±4.39	73.60	9.20±1.17	179.98	25.71±8.37
Lygodiaceae	1077.02	59.83±13.89	480.85	48.09±19.22	596.17	74.52±20.12
Lythraceae	1164.65	89.59±25.85	211.99	42.40±22.59	952.66	119.08±36.83
Malvaceae	2754.93	183.66±72.55	958.27	136.90±40.70	1796.66	224.58±134.11
Marsileaceae	3.34	1.67±1.43	0.25	0.25±0.00	3.10	3.10±0.00
Menispermaceae	25.37	8.46±4.94	6.91	6.91±0.00	18.46	9.23±8.46
Molluginaceae	109.83	9.98±3.76	31.11	5.19±2.01	78.72	15.74±7.51
Onagraceae	135.52	12.32±3.52	20.34	6.78±5.31	115.18	14.40±4.36
Ophioglossaceae	16.67	5.56±2.86	0.00	0.00	16.67	5.56±2.86

Families	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Oxalidaceae	96.18	6.41±1.43	16.18	2.31±0.36	79.99	10.00±1.90
Phrymaceae	4.22	1.41±0.34	0.00	0.00	4.22	1.41±0.34
Phyllanthaceae	2718.32	159.90±45.80	836.74	92.97±20.32	1881.58	235.20±90.15
Piperaceae	8.79	4.40±2.73	0.00	0.00	8.79	4.40±2.73
Plantaginaceae	5.60	1.87±0.43	0.00	0.00	5.60	1.87±0.43
Poaceae	524933.56	29162.98±4092.60	152093.58	15209.36±825.81	372839.98	46605.00±3492.59
Polygonaceae	477.02	26.50±6.38	146.90	14.69±2.95	330.12	41.27±12.33
Pontederiaceae	8.34	8.34±0.00	0.00	0.00	8.34	8.34±0.00
Pteridaceae	0.70	0.70±0.00	0.00	0.00	0.70	0.70±0.00
Ranunculaceae	49.51	16.50±10.51	0.00	0.00	49.51	16.50±10.51
Rosaceae	13.86	1.73±0.20	5.32	1.77±0.45	8.54	1.71±0.23
Sapindaceae	79.07	15.81±8.75	7.77	7.77±0.00	71.29	17.82±11.00
Solanaceae	59.92	8.56±2.83	42.64	10.66±4.86	17.29	5.76±1.42
Thelypteridaceae	1586.44	88.14±15.73	851.76	85.18±18.33	734.68	91.84±28.43
Urticaceae	255.25	23.20±5.97	50.14	16.71±7.84	205.11	25.64±7.77
Verbenaceae	883.59	51.98±13.67	280.30	31.14±10.11	603.29	75.41±25.05
Violaceae	1.52	0.76±0.38	1.13	1.13±0.00	0.38	0.38±0.00
Vitaceae	67.82	6.78±1.50	20.29	6.76±2.86	47.54	6.79±1.90
Zingiberaceae	24011.48	1333.97±233.35	9497.77	949.78±157.51	14513.71	1814.21±445.37

SE- standard error.

Appendix Table 5.5. Overall and seasonal species-wise aboveground biomass productivity (g m^{-2}) recorded from riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Achyranthes aspera</i>	2.75	2.75±0.00	0.00	0.00	2.75	2.75±0.00
<i>Acmella uliginosa</i>	63.52	10.59±5.05	24.86	6.21±3.56	38.66	19.33±13.87
<i>Acroceras zizanioides</i>	17.67	8.84±3.12	0.00	0.00	17.67	8.84±3.12
<i>Adiantum philippense</i>	2.96	2.96±0.00	0.00	0.00	2.96	2.96±0.00
<i>Ageratum conyzoides</i>	204.51	13.63±5.56	67.15	9.59±4.22	137.36	17.17±9.94
<i>Alpinia nigra</i>	24011.48	1333.97±233.35	9497.77	949.78±157.51	14513.71	1814.21±445.37
<i>Alternanthera pungens</i>	116.13	9.68±2.76	17.22	3.44±0.86	98.91	14.13±3.95
<i>Alternanthera sessilis</i>	284.00	16.71±3.31	94.20	10.47±3.71	189.80	23.72±4.70
<i>Amaranthus spinosus</i>	14.58	7.29±2.61	0.00	0.00	14.58	7.29±2.61
<i>Apluda mutica</i>	288.87	26.26±7.63	82.95	16.59±4.43	205.93	34.32±13.11
<i>Arenaria serpyllifolia</i>	42.04	7.01±4.01	1.72	0.86±0.27	40.32	10.08±5.55
<i>Artemisia carvifolia</i>	65.43	13.09±4.79	6.35	6.35±0.00	59.08	14.77±5.79
<i>Axonopus compressus</i>	40.28	40.28±0.00	0.00	0.00	40.28	40.28±0.00

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Bombax ceiba</i>	2721.25	194.38±76.98	933.25	155.54±42.12	1788.01	223.50±134.26
<i>Cajanus scarabaeoides</i>	36.75	6.13±2.78	0.25	0.25±0.00	36.50	7.30±3.08
<i>Capillipedium assimile</i>	102.48	34.16±22.58	0.00	0.00	102.48	34.16±22.58
<i>Capsella bursa-pastoris</i>	60.02	15.01±7.38	10.12	10.12±0.00	49.90	16.63±10.18
<i>Cardiospermum halicacabum</i>	79.07	15.81±8.75	7.77	7.77±0.00	71.29	17.82±11.00
<i>Carex vesicaria</i>	18625.57	1034.75±214.07	4282.08	428.21±64.48	14343.49	1792.94±309.71
<i>Centella asiatica</i>	27.04	6.76±3.88	9.27	3.09±1.79	17.78	17.78±0.00
<i>Centipeda minima</i>	5.87	1.47±0.49	1.19	1.19±0.00	4.69	1.56±0.68
<i>Chenopodium album</i>	51.70	8.62±3.98	15.52	15.52±0.00	36.18	7.24±4.57
<i>Christella parasitica</i>	1586.44	88.14±15.73	851.76	85.18±18.33	734.68	91.84±28.43
<i>Chromolaena odorata</i>	11.15	5.58±3.50	11.15	5.58±3.50	0.00	0.00
<i>Chrysopogon aciculatus</i>	37.05	18.53±7.52	0.00	0.00	37.05	18.53±7.52
<i>Cissampelos pareira</i>	25.37	8.46±4.94	6.91	6.91±0.00	18.46	9.23±8.46
<i>Clerodendrum indicum</i>	104.75	20.95±7.38	40.23	13.41±4.38	64.52	32.26±16.55
<i>Colocasia esculenta</i>	15.48	15.48±0.00	15.48	15.48±0.00	0.00	0.00
<i>Commelina benghalensis</i>	10.62	5.31±0.02	0.00	0.00	10.62	5.31±0.02
<i>Cotula hemisphaerica</i>	26.95	13.48±13.01	0.47	0.47±0.00	26.49	26.49±0.00
<i>Crassocephalum crepidioides</i>	32.98	6.60±2.63	32.98	6.60±2.63	0.00	0.00
<i>Cuphea carthagenensis</i>	1023.30	78.72±21.06	211.99	42.40±22.59	811.31	101.41±29.35
<i>Cyanthillium cinereum</i>	3.33	3.33±0.00	0.00	0.00	3.33	3.33±0.00
<i>Cynodon dactylon</i>	19457.03	1080.95±136.30	7389.09	738.91±98.78	12067.94	1508.49±197.06
<i>Cyperus compressus</i>	12.59	6.30±1.67	0.00	0.00	12.59	6.30±1.67
<i>Cyperus cyperoides</i>	35.76	11.92±9.60	0.00	0.00	35.76	11.92±9.60
<i>Cyperus eragrostis</i>	152.21	11.71±3.31	27.26	5.45±3.61	124.95	15.62±4.50
<i>Cyperus esculentus</i>	15.21	15.21±0.00	0.00	0.00	15.21	15.21±0.00
<i>Cyperus iria</i>	6.18	6.18±0.00	0.00	0.00	6.18	6.18±0.00
<i>Dactyloctenium aegyptium</i>	1.91	1.91±0.00	1.91	1.91±0.00	0.00	0.00
<i>Desmodium heterocarpon</i>	10.80	5.40±0.68	0.00	0.00	10.80	5.40±0.68
<i>Dichanthium annulatum</i>	55.77	13.94±3.56	5.94	5.94±0.00	49.83	16.61±3.34
<i>Dichrocephala integrifolia</i>	8.15	8.15±0.00	0.00	0.00	8.15	8.15±0.00
<i>Digitaria ciliaris</i>	117.26	29.32±9.53	0.00	0.00	117.26	29.32±9.53
<i>Drymaria cordata</i>	0.03	0.03±0.00	0.03	0.03±0.00	0.00	0.00
<i>Duchesnea indica</i>	13.86	1.73±0.20	5.32	1.77±0.45	8.54	1.71±0.23
<i>Dysphania ambrosioides</i>	95.72	9.57±2.29	16.18	3.24±1.17	79.54	15.91±1.49
<i>Echinochloa crus-galli</i>	18.20	2.02±0.39	11.10	1.85±0.46	7.10	2.37±0.84
<i>Eclipta prostrata</i>	369.67	23.10±4.90	105.29	13.16±4.26	264.38	33.05±7.52
<i>Eichhornia crassipes</i>	8.34	8.34±0.00	0.00	0.00	8.34	8.34±0.00
<i>Eleusine indica</i>	10.96	5.48±2.38	0.00	0.00	10.96	5.48±2.38
<i>Enydra fluctuans</i>	32.20	10.73±9.32	2.84	1.42±0.38	29.36	29.36±0.00
<i>Eragrostis riparia</i>	113.25	37.75±24.68	15.86	15.86±0.00	97.38	48.69±38.32

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Eryngium foetidum</i>	0.17	0.17±0.00	0.00	0.00	0.17	0.17±0.00
<i>Ethulia conyzoides</i>	875.08	48.62±11.72	252.38	25.24±10.73	622.70	77.84±18.60
<i>Euphorbia hirta</i>	13.43	2.69±0.86	0.00	0.00	13.43	2.69±0.86
<i>Euphorbia thymifolia</i>	13.18	2.20±0.72	2.68	1.34±0.46	10.50	2.63±1.04
<i>Evolvulus nummularius</i>	10.86	2.72±0.42	0.00	0.00	10.86	2.72±0.42
<i>Fimbristylis aestivalis</i>	35.58	8.89±1.07	0.00	0.00	35.58	8.89±1.07
<i>Flemingia lineata</i>	3573.32	198.52±24.45	1864.81	186.48±30.18	1708.51	213.56±41.78
<i>Floscopa scandens</i>	7.73	3.86±2.35	6.22	6.22±0.00	1.51	1.51±0.00
<i>Flueggea virosa</i>	1790.57	105.33±30.63	589.48	65.50±18.87	1201.08	150.14±59.66
<i>Fuirena umbellata</i>	65.10	16.28±6.93	64.32	21.44±6.53	0.78	0.78±0.00
<i>Glinus lotoides</i>	109.83	9.98±3.76	31.11	5.19±2.01	78.72	15.74±7.51
<i>Glochidion multiloculare</i>	916.93	61.13±19.80	247.26	35.32±4.77	669.68	83.71±36.01
<i>Gnaphalium pensylvanicum</i>	40.64	8.13±3.56	0.00	0.00	40.64	8.13±3.56
<i>Gonostegia pentandra</i>	7.68	7.68±0.00	0.00	0.00	7.68	7.68±0.00
<i>Grangea maderaspatana</i>	590.07	32.78±6.53	184.27	18.43±3.95	405.80	50.73±11.20
<i>Heliotropium indicum</i>	424.05	26.50±8.06	123.71	13.75±4.45	300.34	42.91±16.06
<i>Heliotropium strigosum</i>	7.45	2.48±1.69	0.00	0.00	7.45	2.48±1.69
<i>Helminthostachys zeylanica</i>	16.67	5.56±2.86	0.00	0.00	16.67	5.56±2.86
<i>Hemarthria compressa</i>	31045.90	1724.77±231.80	10246.39	1024.64±127.62	20799.51	2599.94±265.50
<i>Hydrocotyle sibthorpioides</i>	3.02	1.51±0.66	0.00	0.00	3.02	1.51±0.66
<i>Hyptis suaveolens</i>	127.68	12.77±4.33	9.09	4.55±0.62	118.59	14.82±5.21
<i>Ichnocarpus frutescens</i>	64.70	6.47±1.44	30.44	5.07±1.47	34.26	8.56±2.77
<i>Imperata cylindrica</i>	160.33	16.03±4.73	45.85	15.28±8.99	114.48	16.35±6.04
<i>Ipomoea carnea</i>	18.72	18.72±0.00	18.72	18.72±0.00	0.00	0.00
<i>Isachne globosa</i>	19.17	19.17±0.00	0.00	0.00	19.17	19.17±0.00
<i>Isachne</i> spp.	3.42	3.42±0.00	0.00	0.00	3.42	3.42±0.00
<i>Kyllinga brevifolia</i>	120.32	13.37±4.91	12.41	4.14±1.33	107.91	17.99±6.69
<i>Laphangium lutealbum</i>	40.43	4.04±1.34	13.56	2.71±0.52	26.88	5.38±2.62
<i>Leersia hexandra</i>	5.50	1.83±0.37	2.00	2.00±0.00	3.50	1.75±0.63
<i>Leucas aspera</i>	26.36	6.59±2.61	10.51	5.26±0.16	15.85	7.93±6.10
<i>Lindernia crustacea</i>	253.58	16.91±4.39	73.60	9.20±1.17	179.98	25.71±8.37
<i>Lippia alba</i>	657.63	43.84±13.59	242.74	30.34±11.20	414.90	59.27±26.13
<i>Litsea salicifolia</i>	1944.65	108.04±22.63	829.85	82.99±19.63	1114.80	139.35±43.90
<i>Ludwigia adscendens</i>	135.52	12.32±3.52	20.34	6.78±5.31	115.18	14.40±4.36
<i>Lygodium flexuosum</i>	1077.02	59.83±13.89	480.85	48.09±19.22	596.17	74.52±20.12
<i>Mallotus nudiflorus</i>	353.57	50.51±20.54	139.04	34.76±15.03	214.53	71.51±45.98
<i>Marsilea quadrifolia</i>	3.34	1.67±1.43	0.25	0.25±0.00	3.10	3.10±0.00
<i>Mazus pumilus</i>	4.22	1.41±0.34	0.00	0.00	4.22	1.41±0.34
<i>Mecardonia procumbens</i>	5.60	1.87±0.43	0.00	0.00	5.60	1.87±0.43
<i>Merremia</i> spp.	301.25	100.42±47.11	0.00	0.00	301.25	100.42±47.11

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Merremia umbellata</i>	11491.52	638.42±130.35	4421.87	442.19±85.74	7069.66	883.71±256.04
<i>Mikania micrantha</i>	3438.05	191.00±53.07	2381.01	238.10±90.90	1057.05	132.13±34.92
<i>Mimosa</i> spp.	1964.09	115.53±24.07	688.17	76.46±19.61	1275.92	159.49±42.41
<i>Nelsonia canescens</i>	21.33	10.66±5.48	0.00	0.00	21.33	10.66±5.48
<i>Oenanthë javanica</i>	5.84	1.95±0.70	0.00	0.00	5.84	1.95±0.70
<i>Onychium japonicum</i>	0.70	0.70±0.00	0.00	0.00	0.70	0.70±0.00
<i>Oxalis corniculata</i>	96.18	6.41±1.43	16.18	2.31±0.36	79.99	10.00±1.90
<i>Panicum notatum</i>	57.83	11.57±6.39	18.26	6.09±3.95	39.57	19.79±15.79
<i>Paspalum conjugatum</i>	2121.65	132.60±27.00	725.99	90.75±23.81	1395.66	174.46±45.35
<i>Paspalum scrobiculatum</i>	99.13	24.78±3.50	26.57	26.57±0.00	72.56	24.19±4.87
<i>Peperomia pellucida</i>	8.79	4.40±2.73	0.00	0.00	8.79	4.40±2.73
<i>Persicaria hydropiper</i>	187.61	12.51±2.48	59.65	8.52±1.75	127.96	16.00±4.12
<i>Persicaria lapathifolia</i>	14.62	4.87±4.35	0.56	0.56±0.00	14.06	7.03±6.55
<i>Persicaria orientalis</i>	16.52	8.26±2.99	0.00	0.00	16.52	8.26±2.99
<i>Peucedanum</i> spp.	46.07	11.52±4.42	6.99	6.99±0.00	39.08	13.03±5.88
<i>Phragmites karka</i>	190.77	21.20±4.09	90.16	22.54±7.29	100.61	20.12±5.27
<i>Phyllanthus niruri</i>	10.82	3.61±1.06	0.00	0.00	10.82	3.61±1.06
<i>Physalis minima</i>	8.53	8.53±0.00	0.00	0.00	8.53	8.53±0.00
<i>Pimpinella</i> sp.	26.06	4.34±2.00	0.48	0.48±0.00	25.57	5.11±2.26
<i>Polycarpon prostratum</i>	79.48	9.94±3.75	1.14	0.57±0.37	78.34	13.06±4.30
<i>Polygonum plebeium</i>	190.04	12.67±2.79	73.12	9.14±2.23	116.92	16.70±5.22
<i>Polygonum viscosum</i>	68.23	11.37±6.30	13.57	6.79±2.39	54.66	13.67±9.64
<i>Pouzolzia</i> spp.	32.97	5.49±2.60	1.97	1.97±0.00	30.99	6.20±3.06
<i>Pouzolzia zeylanica</i>	214.60	19.51±4.36	48.17	16.06±8.39	166.43	20.80±5.37
<i>Ranunculus sceleratus</i>	49.51	16.50±10.51	0.00	0.00	49.51	16.50±10.51
<i>Rauvolfia serpentina</i>	20.76	6.92±3.33	14.51	7.26±5.74	6.24	6.24±0.00
<i>Rorippa indica</i>	344.95	21.56±5.91	103.04	10.30±2.81	241.91	40.32±11.95
<i>Rungia pectinata</i>	1.91	0.96±0.14	1.91	0.96±0.14	0.00	0.00
<i>Rungia repens</i>	170.86	15.53±5.20	92.99	13.28±6.98	77.87	19.47±8.32
<i>Saccharum</i> spp.	469057.59	26058.76±3732.35	132675.71	13267.57±775.73	336381.88	42047.74±3068.38
<i>Scleria terrestris</i>	1196.72	92.06±31.28	135.78	27.16±5.92	1060.94	132.62±45.85
<i>Senna tora</i>	5.41	5.41±0.00	0.00	0.00	5.41	5.41±0.00
<i>Setaria palmifolia</i>	25.30	8.43±2.92	0.00	0.00	25.30	8.43±2.92
<i>Setaria pumila</i>	1329.59	88.64±17.84	292.79	41.83±21.17	1036.80	129.60±18.55
<i>Solanum americanum</i>	3.72	3.72±0.00	3.72	3.72±0.00	0.00	0.00
<i>Solanum viarum</i>	47.67	7.95±2.96	38.91	9.73±4.32	8.76	4.38±0.54
<i>Sonchus oleraceus</i>	6.51	2.17±1.46	5.79	2.89±2.19	0.72	0.72±0.00
<i>Sporobolus diandrus</i>	16.63	16.63±0.00	0.00	0.00	16.63	16.63±0.00
<i>Stachytarpheta indica</i>	225.96	32.28±18.84	37.56	12.52±8.17	188.40	47.10±32.21
<i>Stellaria media</i>	82.64	8.26±4.31	4.00	1.00±0.36	78.64	13.11±6.62

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Synedrella nodiflora</i>	11.36	11.36±0.00	0.00	0.00	11.36	11.36±0.00
<i>Tetrastigma dubium</i>	67.82	6.78±1.50	20.29	6.76±2.86	47.54	6.79±1.90
<i>Themeda villosa</i>	540.02	45.00±23.73	463.02	77.17±45.30	77.00	12.83±3.50
<i>Urena lobata</i>	33.68	11.23±1.32	25.02	12.51±0.54	8.65	8.65±0.00
<i>Vicia sativa</i>	1.93	1.93±0.00	0.00	0.00	1.93	1.93±0.00
<i>Viola betonicifolia</i>	1.52	0.76±0.38	1.13	1.13±0.00	0.38	0.38±0.00
<i>Woodfordia fruticosa</i>	141.35	47.12±8.12	0.00	0.00	141.35	47.12±8.12
<i>Xanthium strumarium</i>	143.91	11.99±3.55	51.62	8.60±2.80	92.29	15.38±6.56
<i>Zephyranthes atamasco</i>	25.85	6.46±3.06	1.22	1.22±0.00	24.63	8.21±3.56

SE- standard error.

Appendix Table 5.6. Overall and seasonal family-wise aboveground biomass productivity (g m⁻²) recorded from short grasslands (SG) during 2014-15 in Kaziranga National Park, Assam, India.

Families	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Acanthaceae	170.63	13.13±4.62	94.90	10.54±5.63	75.73	18.93±8.43
Amaranthaceae	410.74	22.82±6.09	100.69	10.07±3.40	310.05	38.76±10.90
Amaryllidaceae	15.87	7.94±6.58	0.00	0.00	15.87	7.94±6.58
Apiaceae	56.38	7.05±3.29	7.48	2.49±2.01	48.90	9.78±4.92
Apocynaceae	0.59	0.59±0.00	0.59	0.59±0.00	0.00	0.00
Boraginaceae	417.23	26.08±8.23	115.32	12.81±4.09	301.91	43.13±16.50
Brassicaceae	324.32	20.27±5.20	109.52	10.95±2.76	214.80	35.80±10.78
Caryophyllaceae	140.87	12.81±6.83	5.14	1.29±0.39	135.73	19.39±10.12
Commelinaceae	10.62	5.31±0.02	0.00	0.00	10.62	5.31±0.02
Compositae	2150.63	119.48±20.52	624.98	62.50±12.94	1525.65	190.71±26.95
Convolvulaceae	33.54	5.59±2.65	22.67	11.34±7.38	10.86	2.72±0.42
Cyperaceae	18721.54	1040.09±216.33	4261.35	426.14±63.94	14460.19	1807.52±312.58
Lamiaceae	103.16	12.90±5.87	0.00	0.00	103.16	12.90±5.87
Leguminosae	34.71	17.36±15.42	0.00	0.00	34.71	17.36±15.42
Linderniaceae	253.58	16.91±4.39	73.60	9.20±1.17	179.98	25.71±8.37
Lythraceae	28.15	7.04±3.67	0.00	0.00	28.15	7.04±3.67
Malvaceae	11.97	11.97±0.00	11.97	11.97±0.00	0.00	0.00
Marsileaceae	3.34	1.67±1.43	0.25	0.25±0.00	3.10	3.10±0.00
Molluginaceae	109.83	9.98±3.76	31.11	5.19±2.01	78.72	15.74±7.51
Onagraceae	135.52	12.32±3.52	20.34	6.78±5.31	115.18	14.40±4.36
Ophioglossaceae	0.22	0.22±0.00	0.00	0.00	0.22	0.22±0.00
Oxalidaceae	19.15	3.19±0.64	6.17	2.06±0.14	12.98	4.33±0.85
Phrymaceae	4.22	1.41±0.34	0.00	0.00	4.22	1.41±0.34

Families	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Piperaceae	7.13	7.13±0.00	0.00	0.00	7.13	7.13±0.00
Plantaginaceae	5.60	1.87±0.43	0.00	0	5.60	1.87±0.43
Poaceae	50644.60	2813.59±371.66	17591.09	1759.11±215.43	33053.51	4131.69±483.18
Polygonaceae	421.34	24.78±6.25	143.17	14.32±3.04	278.18	39.74±13.03
Pontederiaceae	8.34	8.34±0	0.00	0	8.34	8.34±0.00
Pteridaceae	0.70	0.7±0	0.00	0	0.70	0.70±0.00
Ranunculaceae	49.51	16.5±10.51	0.00	0	49.51	16.50±10.51
Rosaceae	2.64	1.32±0.44	0.00	0	2.64	1.32±0.44
Sapindaceae	75.45	15.09±8.25	7.03	7.03±0	68.42	17.10±10.33
Solanaceae	58.40	9.73±3.05	41.11	13.7±5.35	17.29	5.76±1.42
Urticaceae	15.30	15.3±0	15.30	15.3±0	0.00	0.00
Verbenaceae	536.38	38.31±14.15	130.93	18.70±7.69	405.45	57.92±26.07

SE- standard error.

Appendix Table 5.7. Overall and seasonal species-wise aboveground biomass productivity (g m⁻²) recorded from short grasslands (SG) during 2014-15 in Kaziranga National Park, Assam, India.

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Acmella uliginosa</i>	14.91	3.73±1.19	4.53	2.27±0.58	10.38	5.19±1.97
<i>Acroceras zizanioides</i>	17.67	8.84±3.12	0.00	0.00	17.67	8.84±3.12
<i>Ageratum conyzoides</i>	13.17	4.39±2.08	12.85	6.43±0.77	0.32	0.32±0.00
<i>Alternanthera pungens</i>	112.99	10.27±2.89	15.96	3.99±0.86	97.04	13.86±3.96
<i>Alternanthera sessilis</i>	157.94	11.28±2.75	54.06	9.01±4.64	103.89	12.99±3.47
<i>Arenaria serpyllifolia</i>	35.09	17.55±8.48	0.00	0.00	35.09	17.55±8.48
<i>Artemisia carvifolia</i>	65.43	13.09±4.79	6.35	6.35±0.00	59.08	14.77±5.79
<i>Axonopus compressus</i>	40.28	40.28±0.00	0.00	0.00	40.28	40.28±0.00
<i>Capsella bursa-pastoris</i>	16.48	8.24±1.88	10.12	10.12±0.00	6.36	6.36±0.00
<i>Cardiospermum halicacabum</i>	75.45	15.09±8.25	7.03	7.03±0.00	68.42	17.10±10.33
<i>Carex vesicaria</i>	18521.23	1028.96±212.55	4235.40	423.54±64.04	14285.83	1785.73±304.98
<i>Centella asiatica</i>	7.00	3.50±3.02	7.00	3.50±3.02	0.00	0.00
<i>Centipeda minima</i>	5.87	1.47±0.49	1.19	1.19±0.00	4.69	1.56±0.68
<i>Chenopodium album</i>	48.89	9.78±4.66	15.52	15.52±0.00	33.37	8.34±5.72
<i>Chromolaena odorata</i>	11.15	5.58±3.50	11.15	5.58±3.50	0.00	0.00
<i>Chrysopogon aciculatus</i>	37.05	18.53±7.52	0.00	0.00	37.05	18.53±7.52
<i>Commelina benghalensis</i>	10.62	5.31±0.02	0.00	0.00	10.62	5.31±0.02
<i>Cotula hemisphaerica</i>	26.95	13.48±13.01	0.47	0.47±0.00	26.49	26.49±0.00
<i>Cuphea carthagenensis</i>	28.15	7.04±3.67	0.00	0.00	28.15	7.04±3.67
<i>Cynodon dactylon</i>	18379.44	1021.08±131.66	6995.07	699.51±96.35	11384.37	1423.05±195.57

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Cyperus cyperoides</i>	31.28	10.43±8.34	0.00	0.00	31.28	10.43±8.34
<i>Cyperus eragrostis</i>	66.47	8.31±2.18	25.95	6.49±4.08	40.52	10.13±1.81
<i>Cyperus esculentus</i>	15.21	15.21±0.00	0.00	0.00	15.21	15.21±0.00
<i>Cyperus iria</i>	6.18	6.18±0.00	0.00	0.00	6.18	6.18±0.00
<i>Dactyloctenium aegyptium</i>	1.91	1.91±0.00	1.91	1.91±0.00	0.00	0.00
<i>Dichanthium annulatum</i>	49.83	16.61±3.34	0.00	0.00	49.83	16.61±3.34
<i>Dichrocephala integrifolia</i>	8.15	8.15±0.00	0.00	0.00	8.15	8.15±0.00
<i>Digitaria ciliaris</i>	103.59	25.90±9.15	0.00	0.00	103.59	25.90±9.15
<i>Duchesnea indica</i>	2.64	1.32±0.44	0.00	0.00	2.64	1.32±0.44
<i>Dysphania ambrosioides</i>	90.91	9.09±2.30	15.16	3.03±0.99	75.76	15.15±2.13
<i>Echinochloa crus-galli</i>	18.20	2.02±0.39	11.10	1.85±0.46	7.10	2.37±0.84
<i>Eclipta prostrata</i>	348.96	21.81±4.69	104.93	13.12±4.24	244.03	30.50±7.39
<i>Eichhornia crassipes</i>	8.34	8.34±0.00	0.00	0.00	8.34	8.34±0.00
<i>Eleusine indica</i>	10.96	5.48±2.38	0.00	0.00	10.96	5.48±2.38
<i>Enydra fluctuans</i>	2.84	1.42±0.38	2.84	1.42±0.38	0.00	0.00
<i>Eragrostis riparia</i>	113.25	37.75±24.68	15.86	15.86±0.00	97.38	48.69±38.32
<i>Ethulia conyzoides</i>	836.00	46.44±10.94	237.13	23.71±9.57	598.87	74.86±17.31
<i>Evolvulus nummularius</i>	10.86	2.72±0.42	0.00	0.00	10.86	2.72±0.42
<i>Fimbristylis aestivalis</i>	35.58	8.89±1.07	0.00	0.00	35.58	8.89±1.07
<i>Flemingia lineata</i>	32.78	32.78±0.00	0.00	0.00	32.78	32.78±0.00
<i>Glinus lotoides</i>	109.83	9.98±3.76	31.11	5.19±2.01	78.72	15.74±7.51
<i>Gnaphalium pensylvanicum</i>	40.10	10.03±3.88	0.00	0.00	40.10	10.03±3.88
<i>Grangea maderaspatana</i>	583.47	32.41±6.45	180.44	18.04±3.77	403.02	50.38±11.01
<i>Heliotropium indicum</i>	411.18	25.70±7.95	115.32	12.81±4.09	295.86	42.27±15.86
<i>Heliotropium strigosum</i>	6.05	3.03±2.78	0.00	0.00	6.05	3.03±2.78
<i>Helminthostachys zeylanica</i>	0.22	0.22±0.00	0.00	0.00	0.22	0.22±0.00
<i>Hemarthria compressa</i>	29362.35	1631.24±224.28	9762.13	976.21±127.54	19600.22	2450.03±276.29
<i>Hyptis suaveolens</i>	100.16	12.52±5.58	0.00	0.00	100.16	12.52±5.58
<i>Ichnocarpus frutescens</i>	0.59	0.59±0.00	0.59	0.59±0.00	0.00	0.00
<i>Imperata cylindrica</i>	9.35	4.67±0.90	5.57	5.57±0.00	3.77	3.77±0.00
<i>Ipomoea carnea</i>	18.72	18.72±0.00	18.72	18.72±0.00	0.00	0.00
<i>Isachne globosa</i>	19.17	19.17±0.00	0.00	0.00	19.17	19.17±0.00
<i>Isachne spp.</i>	3.42	3.42±0.00	0.00	0.00	3.42	3.42±0.00
<i>Kyllinga brevifolia</i>	45.59	11.40±6.25	0.00	0.00	45.59	11.40±6.25
<i>Laphangium luteoalbum</i>	38.35	3.84±1.34	11.48	2.30±0.23	26.88	5.38±2.62
<i>Leersia hexandra</i>	2.00	2.00±0.00	2.00	2.00±0.00	0.00	0.00
<i>Leucas aspera</i>	3.00	3.00±0.00	0.00	0.00	3.00	3.00±0.00
<i>Lindernia crustacea</i>	253.58	16.91±4.39	73.60	9.20±1.17	179.98	25.71±8.37
<i>Lippia alba</i>	536.38	38.31±14.15	130.93	18.70±7.69	405.45	57.92±26.07
<i>Ludwigia adscendens</i>	135.52	12.32±3.52	20.34	6.78±5.31	115.18	14.40±4.36

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Marsilea quadrifolia</i>	3.34	1.67±1.43	0.25	0.25±0.00	3.10	3.10±0.00
<i>Mazus pumilus</i>	4.22	1.41±0.34	0.00	0.00	4.22	1.41±0.34
<i>Mecardonia procumbens</i>	5.60	1.87±0.43	0.00	0.00	5.60	1.87±0.43
<i>Merremia umbellata</i>	3.96	3.96±0.00	3.96	3.96±0.00	0.00	0.00
<i>Onychium japonicum</i>	0.70	0.70±0.00	0.00	0.00	0.70	0.70±0.00
<i>Oxalis corniculata</i>	19.15	3.19±0.64	6.17	2.06±0.14	12.98	4.33±0.85
<i>Panicum notatum</i>	35.57	35.57±0.00	0.00	0.00	35.57	35.57±0.00
<i>Paspalum conjugatum</i>	769.85	64.15±23.44	274.77	54.95±19.90	495.09	70.73±39.00
<i>Peperomia pellucida</i>	7.13	7.13±0.00	0.00	0.00	7.13	7.13±0.00
<i>Persicaria hydropiper</i>	169.16	12.08±2.65	57.78	8.25±1.89	111.38	15.91±4.68
<i>Persicaria lapathifolia</i>	0.56	0.56±0.00	0.56	0.56±0.00	0.00	0.00
<i>Persicaria orientalis</i>	11.25	11.25±0.00	0.00	0.00	11.25	11.25±0.00
<i>Peucedanum</i> spp.	35.07	11.69±5.01	0.00	0.00	35.07	11.69±5.01
<i>Phragmites karka</i>	190.77	21.20±4.09	90.16	22.54±7.29	100.61	20.12±5.27
<i>Physalis minima</i>	8.53	8.53±0.00	0.00	0.00	8.53	8.53±0.00
<i>Pimpinella</i> sp.	14.31	3.58±3.03	0.48	0.48±0.00	13.83	4.61±4.02
<i>Polycarpon prostratum</i>	23.14	3.86±1.52	1.14	0.57±0.37	22.00	5.50±1.74
<i>Polygonum plebeium</i>	175.84	11.72±2.54	73.12	9.14±2.23	102.72	14.67±4.78
<i>Polygonum viscosum</i>	64.53	10.76±6.05	11.71	5.86±1.46	52.82	13.21±9.23
<i>Pouzolzia zeylanica</i>	15.30	15.30±0.00	15.30	15.30±0.00	0.00	0.00
<i>Ranunculus sceleratus</i>	49.51	16.50±10.51	0.00	0.00	49.51	16.50±10.51
<i>Rorippa indica</i>	307.83	19.24±5.01	99.40	9.94±2.91	208.44	34.74±9.92
<i>Rungia pectinata</i>	1.91	0.96±0.14	1.91	0.96±0.14	0.00	0.00
<i>Rungia repens</i>	168.72	15.34±5.21	92.99	13.28±6.98	75.73	18.93±8.43
<i>Saccharum</i> spp.	318.37	35.37±6.34	138.17	34.54±14.00	180.20	36.04±5.18
<i>Setaria pumila</i>	1119.42	74.63±16.27	273.03	39.00±19.30	846.39	105.80±20.40
<i>Solanum americanum</i>	3.72	3.72±0.00	3.72	3.72±0.00	0.00	0.00
<i>Solanum viarum</i>	46.14	9.23±3.27	37.39	12.46±4.73	8.76	4.38±0.54
<i>Sporobolus diandrus</i>	16.63	16.63±0.00	0.00	0.00	16.63	16.63±0.00
<i>Stellaria media</i>	82.64	8.26±4.31	4.00	1.00±0.36	78.64	13.11±6.62
<i>Synedrella nodiflora</i>	11.36	11.36±0.00	0.00	0.00	11.36	11.36±0.00
<i>Themeda villosa</i>	25.51	12.76±8.56	21.31	21.31±0.00	4.20	4.20±0.00
<i>Urena lobata</i>	11.97	11.97±0.00	11.97	11.97±0.00	0.00	0.00
<i>Vicia sativa</i>	1.93	1.93±0.00	0.00	0.00	1.93	1.93±0.00
<i>Xanthium strumarium</i>	143.91	11.99±3.55	51.62	8.60±2.80	92.29	15.38±6.56
<i>Zephyranthes atamasco</i>	15.87	7.94±6.58	0.00	0.00	15.87	7.94±6.58

SE- standard error.

Appendix Table 5.8. Overall and seasonal family-wise aboveground biomass productivity (g m^{-2}) recorded from tall grasslands (TG) during 2014-15 in Kaziranga National Park, Assam, India.

Families	Overall		Dry season		Wet season	
	Total	Mean $\pm$ SE	Total	Mean $\pm$ SE	Total	Mean $\pm$ SE
Acanthaceae	23.46	5.87 $\pm$ 3.56	0.00	0.00	23.46	5.87 $\pm$ 3.56
Adiantaceae	2.96	2.96 $\pm$ 0.00	0.00	0.00	2.96	2.96 $\pm$ 0.00
Amaranthaceae	154.14	10.28 $\pm$ 1.71	42.43	6.06 $\pm$ 1.24	111.70	13.96 $\pm$ 2.37
Amaryllidaceae	9.98	3.33 $\pm$ 1.64	1.22	1.22 $\pm$ 0.00	8.76	4.38 $\pm$ 2.18
Apiaceae	48.80	6.97 $\pm$ 3.07	9.26	4.63 $\pm$ 2.36	39.54	7.91 $\pm$ 4.30
Apocynaceae	84.87	7.07 $\pm$ 1.53	44.37	6.34 $\pm$ 2.21	40.50	8.10 $\pm$ 2.20
Araceae	15.48	15.48 $\pm$ 0.00	15.48	15.48 $\pm$ 0.00	0.00	0.00
Araliaceae	3.02	1.51 $\pm$ 0.66	0.00	0.00	3.02	1.51 $\pm$ 0.66
Boraginaceae	14.27	2.85 $\pm$ 1.43	8.39	8.39 $\pm$ 0.00	5.88	1.47 $\pm$ 0.45
Brassicaceae	80.65	13.44 $\pm$ 5.48	3.64	3.64 $\pm$ 0.00	77.01	15.40 $\pm$ 6.27
Caryophyllaceae	63.33	7.92 $\pm$ 3.98	1.75	0.58 $\pm$ 0.32	61.57	12.31 $\pm$ 5.61
Commelinaceae	7.73	3.86 $\pm$ 2.35	6.22	6.22 $\pm$ 0.00	1.51	1.51 $\pm$ 0.00
Compositae	3819.20	212.18 $\pm$ 52.92	2515.91	251.59 $\pm$ 90.59	1303.29	162.91 $\pm$ 38.55
Convolvulaceae	11788.81	654.93 $\pm$ 138.81	4417.91	441.79 $\pm$ 85.83	7370.90	921.36 $\pm$ 274.22
Cyperaceae	1543.71	96.48 $\pm$ 29.59	260.49	32.56 $\pm$ 3.03	1283.21	160.40 $\pm$ 50.75
Euphorbiaceae	380.19	31.68 $\pm$ 13.72	141.72	23.62 $\pm$ 11.83	238.46	39.74 $\pm$ 25.73
Lamiaceae	155.63	12.97 $\pm$ 3.66	59.83	11.97 $\pm$ 2.73	95.80	13.69 $\pm$ 6.19
Lauraceae	1944.65	108.04 $\pm$ 22.63	829.85	82.99 $\pm$ 19.63	1114.80	139.35 $\pm$ 43.90
Leguminosae	5557.59	308.76 $\pm$ 43.93	2553.24	255.32 $\pm$ 40.74	3004.35	375.54 $\pm$ 82.03
Lygodiaceae	1077.02	59.83 $\pm$ 13.89	480.85	48.09 $\pm$ 19.22	596.17	74.52 $\pm$ 20.12
Lythraceae	1136.49	87.42 $\pm$ 26.11	211.99	42.40 $\pm$ 22.59	924.51	115.56 $\pm$ 37.71
Malvaceae	2742.96	182.86 $\pm$ 72.63	946.30	135.19 $\pm$ 41.01	1796.66	224.58 $\pm$ 134.11
Menispermaceae	25.37	8.46 $\pm$ 4.94	6.91	6.91 $\pm$ 0.00	18.46	9.23 $\pm$ 8.46
Ophioglossaceae	16.45	8.22 $\pm$ 1.77	0.00	0.00	16.45	8.22 $\pm$ 1.77
Oxalidaceae	77.03	5.50 $\pm$ 1.28	10.02	1.67 $\pm$ 0.26	67.01	8.38 $\pm$ 1.59
Phyllanthaceae	2718.32	159.90 $\pm$ 45.80	836.74	92.97 $\pm$ 20.32	1881.58	235.20 $\pm$ 90.15
Piperaceae	1.67	1.67 $\pm$ 0.00	0.00	0.00	1.67	1.67 $\pm$ 0.00
Poaceae	474288.97	26349.39 $\pm$ 3757.13	134502.49	13450.25 $\pm$ 772.19	339786.47	42473.31 $\pm$ 3053.44
Polygonaceae	55.68	6.96 $\pm$ 3.21	3.73	1.87 $\pm$ 0.01	51.94	8.66 $\pm$ 4.11
Rosaceae	11.22	1.87 $\pm$ 0.22	5.32	1.77 $\pm$ 0.45	5.90	1.97 $\pm$ 0.17
Sapindaceae	3.62	1.81 $\pm$ 1.07	0.74	0.74 $\pm$ 0.00	2.88	2.88 $\pm$ 0.00
Solanaceae	1.53	1.53 $\pm$ 0.00	1.53	1.53 $\pm$ 0.00	0.00	0.00
Thelypteridaceae	1586.44	88.14 $\pm$ 15.73	851.76	85.18 $\pm$ 18.33	734.68	91.84 $\pm$ 28.43
Urticaceae	239.95	24.00 $\pm$ 6.55	34.84	17.42 $\pm$ 13.53	205.11	25.64 $\pm$ 7.77
Verbenaceae	347.21	31.56 $\pm$ 12.50	149.37	21.34 $\pm$ 8.69	197.85	49.46 $\pm$ 31.61
Violaceae	1.52	0.76 $\pm$ 0.38	1.13	1.13 $\pm$ 0.00	0.38	0.38 $\pm$ 0.00
Vitaceae	67.82	6.78 $\pm$ 1.50	20.29	6.76 $\pm$ 2.86	47.54	6.79 $\pm$ 1.90

Families	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Zingiberaceae	24011.48	1333.97±233.35	9497.77	949.78±157.51	14513.71	1814.21±445.37

SE- standard error.

Appendix Table 5.9. Overall and seasonal species-wise aboveground biomass productivity (g m⁻²) recorded from tall grasslands (TG) during 2014-15 in Kaziranga National Park, Assam, India.

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Achyranthes aspera</i>	2.75	2.75±0.00	0.00	0.00	2.75	2.75±0.00
<i>Acmella uliginosa</i>	48.61	9.72±4.63	20.33	6.78±3.64	28.28	14.14±11.90
<i>Adiantum philippense</i>	2.96	2.96±0.00	0.00	0.00	2.96	2.96±0.00
<i>Ageratum conyzoides</i>	191.34	12.76±5.45	54.30	7.76±3.06	137.04	17.13±9.93
<i>Alpinia nigra</i>	24011.48	1333.97±233.35	9497.77	949.78±157.51	14513.71	1814.21±445.37
<i>Alternanthera pungens</i>	3.14	1.57±0.30	1.26	1.26±0.00	1.87	1.87±0.00
<i>Alternanthera sessilis</i>	126.06	9.00±1.64	40.15	5.74±1.27	85.91	12.27±2.56
<i>Amaranthus spinosus</i>	14.58	7.29±2.61	0.00	0.00	14.58	7.29±2.61
<i>Apluda mutica</i>	288.87	26.26±7.63	82.95	16.59±4.43	205.93	34.32±13.11
<i>Arenaria serpyllifolia</i>	6.95	1.74±0.71	1.72	0.86±0.27	5.23	2.62±1.19
<i>Bombax ceiba</i>	2721.25	194.38±76.98	933.25	155.54±42.12	1788.01	223.50±134.26
<i>Cajanus scarabaeoides</i>	36.75	6.13±2.78	0.25	0.25±0.00	36.50	7.30±3.08
<i>Capillipedium assimile</i>	102.48	34.16±22.58	0.00	0.00	102.48	34.16±22.58
<i>Capsella bursa-pastoris</i>	43.54	21.77±15.23	0.00	0.00	43.54	21.77±15.23
<i>Cardiospermum halicacabum</i>	3.62	1.81±1.07	0.74	0.74±0.00	2.88	2.88±0.00
<i>Carex vesicaria</i>	104.34	14.91±5.13	46.68	11.67±4.15	57.66	19.22±11.55
<i>Centella asiatica</i>	20.04	10.02±7.76	2.27	2.27±0.00	17.78	17.78±0.00
<i>Chenopodium album</i>	2.81	2.81±0.00	0.00	0.00	2.81	2.81±0.00
<i>Christella parasitica</i>	1586.44	88.14±15.73	851.76	85.18±18.33	734.68	91.84±28.43
<i>Cissampelos pareira</i>	25.37	8.46±4.94	6.91	6.91±0.00	18.46	9.23±8.46
<i>Clerodendrum indicum</i>	104.75	20.95±7.38	40.23	13.41±4.38	64.52	32.26±16.55
<i>Colocasia esculenta</i>	15.48	15.48±0.00	15.48	15.48±0.00	0.00	0.00
<i>Crassocephalum crepidioides</i>	32.98	6.60±2.63	32.98	6.60±2.63	0.00	0.00
<i>Cuphea carthagenensis</i>	995.15	76.55±21.27	211.99	42.40±22.59	783.16	97.90±30.16
<i>Cyanthillium cinereum</i>	3.33	3.33±0.00	0.00	0.00	3.33	3.33±0.00
<i>Cynodon dactylon</i>	1077.58	59.87±13.04	394.02	39.40±12.41	683.57	85.45±22.66
<i>Cyperus compressus</i>	12.59	6.30±1.67	0.00	0.00	12.59	6.30±1.67
<i>Cyperus cyperoides</i>	4.48	2.24±1.79	0.00	0.00	4.48	2.24±1.79
<i>Cyperus eragrostis</i>	85.74	8.57±3.07	1.31	0.65±0.44	84.43	10.55±3.52
<i>Desmodium heterocarpon</i>	10.80	5.40±0.68	0.00	0.00	10.80	5.40±0.68
<i>Dichanthium annulatum</i>	5.94	5.94±0.00	5.94	5.94±0.00	0.00	0.00

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Digitaria ciliaris</i>	13.67	4.56±0.91	0.00	0.00	13.67	4.56±0.91
<i>Drymaria cordata</i>	0.03	0.03±0.00	0.03	0.03±0.00	0.00	0.00
<i>Duchesnea indica</i>	11.22	1.87±0.22	5.32	1.77±0.45	5.90	1.97±0.17
<i>Dysphania ambrosioides</i>	4.81	2.40±1.38	1.02	1.02±0.00	3.78	3.78±0.00
<i>Eclipta prostrata</i>	20.70	2.59±0.86	0.35	0.35±0.00	20.35	2.91±0.93
<i>Enydra fluctuans</i>	29.36	29.36±0.00	0.00	0.00	29.36	29.36±0.00
<i>Eryngium foetidum</i>	0.17	0.17±0.00	0.00	0.00	0.17	0.17±0.00
<i>Ethulia conyzoides</i>	39.08	5.58±2.67	15.25	7.62±6.43	23.84	4.77±3.21
<i>Euphorbia hirta</i>	13.43	2.69±0.86	0.00	0.00	13.43	2.69±0.86
<i>Euphorbia thymifolia</i>	13.18	2.20±0.72	2.68	1.34±0.46	10.50	2.63±1.04
<i>Flemingia lineata</i>	3540.54	196.70±24.97	1864.81	186.48±30.18	1675.73	209.47±43.61
<i>Floscopa scandens</i>	7.73	3.86±2.35	6.22	6.22±0.00	1.51	1.51±0.00
<i>Flueggea virosa</i>	1790.57	105.33±30.63	589.48	65.50±18.87	1201.08	150.14±59.66
<i>Fuirena umbellata</i>	65.10	16.28±6.93	64.32	21.44±6.53	0.78	0.78±0.00
<i>Glochidion multiloculare</i>	916.93	61.13±19.80	247.26	35.32±4.77	669.68	83.71±36.01
<i>Gnaphalium pensylvanicum</i>	0.54	0.54±0.00	0.00	0.00	0.54	0.54±0.00
<i>Gonostegia pentandra</i>	7.68	7.68±0.00	0.00	0.00	7.68	7.68±0.00
<i>Grangea maderaspatana</i>	6.61	2.20±1.03	3.83	1.91±1.71	2.78	2.78±0.00
<i>Heliotropium indicum</i>	12.87	3.22±1.78	8.39	8.39±0.00	4.48	1.49±0.63
<i>Heliotropium strigosum</i>	1.40	1.40±0.00	0.00	0.00	1.40	1.40±0.00
<i>Helminthostachys zeylanica</i>	16.45	8.22±1.77	0.00	0.00	16.45	8.22±1.77
<i>Hemarthria compressa</i>	1683.56	93.53±25.60	484.27	48.43±8.28	1199.29	149.91±51.51
<i>Hydrocotyle sibthorpioides</i>	3.02	1.51±0.66	0.00	0.00	3.02	1.51±0.66
<i>Hyptis suaveolens</i>	27.52	4.59±1.62	9.09	4.55±0.62	18.42	4.61±2.54
<i>Ichnocarpus frutescens</i>	64.11	6.41±1.46	29.85	4.98±1.53	34.26	8.56±2.77
<i>Imperata cylindrica</i>	150.98	18.87±5.50	40.27	20.14±13.10	110.71	18.45±6.70
<i>Kyllinga brevifolia</i>	74.73	10.68±5.37	12.41	4.14±1.33	62.32	15.58±9.01
<i>Laphangium lutealbum</i>	2.08	2.08±0.00	2.08	2.08±0.00	0.00	0.00
<i>Leersia hexandra</i>	3.50	1.75±0.63	0.00	0.00	3.50	1.75±0.63
<i>Leucas aspera</i>	23.36	5.84±1.91	10.51	5.26±0.16	12.85	6.43±4.60
<i>Lippia alba</i>	121.25	20.21±9.63	111.80	22.36±11.49	9.45	9.45±0.00
<i>Litsea salicifolia</i>	1944.65	108.04±22.63	829.85	82.99±19.63	1114.80	139.35±43.90
<i>Lygodium flexuosum</i>	1077.02	59.83±13.89	480.85	48.09±19.22	596.17	74.52±20.12
<i>Mallotus nudiflorus</i>	353.57	50.51±20.54	139.04	34.76±15.03	214.53	71.51±45.98
<i>Merremia spp.</i>	301.25	100.42±47.11	0.00	0.00	301.25	100.42±47.11
<i>Merremia umbellata</i>	11487.57	638.20±130.38	4417.91	441.79±85.83	7069.66	883.71±256.04
<i>Mikania micrantha</i>	3438.05	191.00±53.07	2381.01	238.10±90.90	1057.05	132.13±34.92
<i>Mimosa spp.</i>	1964.09	115.53±24.07	688.17	76.46±19.61	1275.92	159.49±42.41
<i>Nelsonia canescens</i>	21.33	10.66±5.48	0.00	0.00	21.33	10.66±5.48
<i>Oenanthe javanica</i>	5.84	1.95±0.70	0.00	0.00	5.84	1.95±0.70

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Oxalis corniculata</i>	77.03	5.50±1.28	10.02	1.67±0.26	67.01	8.38±1.59
<i>Panicum notatum</i>	22.25	5.56±2.84	18.26	6.09±3.95	4.00	4.00±0.00
<i>Paspalum conjugatum</i>	1351.80	84.49±24.17	451.22	56.40±16.94	900.58	112.57±44.63
<i>Paspalum scrobiculatum</i>	99.13	24.78±3.50	26.57	26.57±0.00	72.56	24.19±4.87
<i>Peperomia pellucida</i>	1.67	1.67±0.00	0.00	0.00	1.67	1.67±0.00
<i>Persicaria hydropiper</i>	18.45	6.15±4.15	1.87	1.87±0.00	16.58	8.29±6.16
<i>Persicaria lapathifolia</i>	14.06	7.03±6.55	0.00	0.00	14.06	7.03±6.55
<i>Persicaria orientalis</i>	5.27	5.27±0.00	0.00	0.00	5.27	5.27±0.00
<i>Peucedanum</i> spp.	11.00	3.67±1.81	6.99	6.99±0.00	4.01	2.00±1.24
<i>Phyllanthus niruri</i>	10.82	3.61±1.06	0.00	0.00	10.82	3.61±1.06
<i>Pimpinella</i> sp.	11.75	5.87±1.22	0.00	0.00	11.75	5.87±1.22
<i>Polycarpon prostratum</i>	56.34	14.09±6.87	0.00	0.00	56.34	14.09±6.87
<i>Polygonum plebeium</i>	14.20	4.73±2.29	0.00	0.00	14.20	4.73±2.29
<i>Polygonum viscosum</i>	3.70	1.23±0.55	1.86	1.86±0.00	1.84	0.92±0.77
<i>Pouzolzia</i> spp.	32.97	5.49±2.60	1.97	1.97±0.00	30.99	6.20±3.06
<i>Pouzolzia zeylanica</i>	199.30	19.93±4.79	32.87	16.44±14.52	166.43	20.80±5.37
<i>Rauvolfia serpentina</i>	20.76	6.92±3.33	14.51	7.26±5.74	6.24	6.24±0.00
<i>Rorippa indica</i>	37.11	9.28±4.37	3.64	3.64±0.00	33.47	11.16±5.57
<i>Rungia repens</i>	2.14	1.07±0.31	0.00	0.00	2.14	1.07±0.31
<i>Saccharum</i> spp.	468739.22	26041.07±3731.24	132537.54	13253.75±774.43	336201.68	42025.21±3068.02
<i>Scleria terrestris</i>	1196.72	92.06±31.28	135.78	27.16±5.92	1060.94	132.62±45.85
<i>Senna tora</i>	5.41	5.41±0.00	0.00	0.00	5.41	5.41±0.00
<i>Setaria palmifolia</i>	25.30	8.43±2.92	0.00	0.00	25.30	8.43±2.92
<i>Setaria pumila</i>	210.17	42.03±20.43	19.76	9.88±3.55	190.41	63.47±28.50
<i>Solanum viarum</i>	1.53	1.53±0.00	1.53	1.53±0.00	0.00	0.00
<i>Sonchus oleraceus</i>	6.51	2.17±1.46	5.79	2.89±2.19	0.72	0.72±0.00
<i>Stachytarpheta indica</i>	225.96	32.28±18.84	37.56	12.52±8.17	188.40	47.10±32.21
<i>Tetrastigma dubium</i>	67.82	6.78±1.50	20.29	6.76±2.86	47.54	6.79±1.90
<i>Themeda villosa</i>	514.51	46.77±25.84	441.71	73.62±46.06	72.80	14.56±3.74
<i>Urena lobata</i>	21.70	10.85±2.20	13.05	13.05±0.00	8.65	8.65±0.00
<i>Viola betonicifolia</i>	1.52	0.76±0.38	1.13	1.13±0.00	0.38	0.38±0.00
<i>Woodfordia fruticosa</i>	141.35	47.12±8.12	0.00	0.00	141.35	47.12±8.12
<i>Zephyranthes atamasco</i>	9.98	3.33±1.64	1.22	1.22±0.00	8.76	4.38±2.18

SE- standard error.

Appendix Table 5.10. Overall and seasonal aboveground biomass productivity (g m⁻²) of invasives (*Mimosa* spp. and *Mikania micrantha*) recorded from experimental sites in riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Seasons	Species	HET		HIT		HETB		HETIR		Total (TG)	
		Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE

Overall	<i>Mimosa</i> spp.	1505.23	94.08±20.41	408.34	68.06±15.07	50.52	25.26±22.61	211.47	21.15±4.09	2175.56	127.97±24.20
	<i>Mikania micrantha</i>	1582.27	87.90±19.07	636.24	106.04±36.42	1219.54	152.44±55.16	285.24	25.93±6.80	3723.29	206.85±55.95
	Total	3087.50	171.53±33.18	1044.58	130.57±32.08	1270.07	158.76±55.09	496.70	38.21±10.09	5898.85	327.71±62.03
Dry	<i>Mimosa</i> spp.	569.42	71.18±14.88	68.23	34.11±23.98	50.52	25.26±22.61	147.16	29.43±6.25	835.33	92.81±20.05
	<i>Mikania micrantha</i>	958.12	95.81±21.38	318.50	159.25±121.3	1104.39	184.06±69.83	230.93	38.49±9.65	2611.93	261.19±95.29
	Total	1527.54	152.75±21.29	386.73	96.68±62.07	1154.91	192.49±68.94	378.09	54.01±16.44	3447.27	344.73±95.99
Wet	<i>Mimosa</i> spp.	935.81	116.98±37.60	340.11	85.03±13.56	0.00	0.00	64.31	12.86±1.34	1340.23	167.53±43.65
	<i>Mikania micrantha</i>	624.15	78.02±35.04	317.74	79.44±12.46	115.16	57.58±6.04	54.31	10.86±3.23	1111.36	138.92±36.38
	Total	1559.96	194.99±71.73	657.85	164.46±13.51	115.16	57.58±6.04	118.62	19.77±4.95	2451.58	306.45±78.08

HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal and SE- standard error.

Appendix Table 5.11. Mann-Whitney significance test between dry and wet season's aboveground biomass productivity (g m^{-2}) of invasives (*Mimosa* spp. and *Mikania micrantha*) recorded from riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Mann-Whitney	Aboveground biomass productivity (g m^{-2})		
		<i>Mimosa</i> spp.	<i>Mikania micrantha</i>	Total invasion
HET	U	24.00	29.00	32.00
	P	0.15	0.33	0.48
HIT	U	0.00	4.00	4.00
	P	0.02*	0.25	0.25
HETB	U	24.00	12.00	12.00
	P	0.14	0.02*	0.02*
HETIR	U	36.50	30.00	29.00
	P	0.74	0.36	0.32
Total (TG)	U	387.50	340.00	341.00
	P	0.35	0.11	0.11

TG- tall grassland, HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal, U- Mann-Whitney test value and *indicates significant result at $P < 0.05$.

Appendix Table 5.12. Mann-Whitney and Kruskal-Wallis significance test between experimental sites aboveground biomass productivity (g m^{-2}) in terms of classes, growth forms and life cycles recorded from riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Seasons	Tests		Aboveground biomass productivity (g m ⁻²)													
				Total Biomass	Classes			Growth forms							Life cycles		
					Monocots	Dicots	Ferns	Grasses	Sedges	Climbers	Herbs	Ferns	Shrubs	Trees	Annuals	Perennials	Deciduous
SG & TG	Overall	Mann-Whitney	U	127.00	165.00	161.00	20.00	132.00	24.00	55.00	98.00	20.00	372.00	403.00	174.00	121.00	390.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Dry		U	20.00	37.00	1.00	0.00	34.00	4.00	8.50	1.00	0.00	71.00	133.00	45.00	20.00	126.00
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.01*	0.00*	0.00*	0.00*

Experimental sites	Seasons	Tests	Aboveground biomass productivity (g m ⁻²)															
			Total Biomass	Classes			Growth forms							Life cycles				
		U	Monocots	Dicots	Ferns	Grasses	Sedges	Climbers	Herbs	Ferns	Shrubs	Trees	Annuals	Perennials	Deciduous			
Four sites (HET, HIT, HETB & HETIR)	Wet	Kruskal-Wallis	U	12.00	21.00	58.00	11.50	10.00	0.00	15.50	31.00	11.50	105.00	72.00	9.00	11.00	72.00	
			P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.06	0.00*	0.00*	0.00*	0.00*	0.00*	
			U	487.00	478.00	689.00	891.00	496.00	638.00	769.00	612.00	891.00	848.00	830.00	444.00	494.00	851.00	
	Between dry & wet		P	0.00*	0.00*	0.05*	0.80	0.00*	0.01*	0.19	0.01*	0.80	0.53	0.36	0.00*	0.00*	0.48	
			Overall	χ ²	35.15	35.31	6.92	1.94	34.80	12.76	7.31	14.56	1.94	19.31	23.70	3.24	35.23	23.83
				df	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	P			0.00*	0.00*	0.07	0.58	0.00*	0.01*	0.06	0.00*	0.58	0.00*	0.00*	0.36	0.00*	0.00*	
	χ ²			24.21	23.81	10.37	0.57	23.37	3.57	22.72	16.35	0.57	7.80	11.73	2.37	23.94	11.49	
	df			3	3	3	3	3	3	3	3	3	3	3	3	3	3	
P	0.00*	0.00*		0.02*	0.90	0.00*	0.31	0.00*	0.00*	0.90	0.05*	0.01*	0.50	0.00*	0.01*			
Dry	χ ²	21.11	21.30	4.85	2.32	21.31	11.10	1.08	5.72	2.32	11.62	12.65	3.11	21.30	12.65			
	df	3	3	3	3	3	3	3	3	3	3	3	3	3	3			
	P	0.00*	0.00*	0.18	0.51	0.00*	0.01*	0.78	0.13	0.51	0.01*	0.01*	0.38	0.00*	0.01*			
Wet	Mann-Whitney	U	172.00	174.00	340.00	406.00	172.00	235.00	333.50	285.00	406.00	445.00	392.00	171.00	173.00	407.00		
		P	0.00*	0.00*	0.11	0.53	0.00*	0.00*	0.09	0.02*	0.53	0.96	0.37	0.00*	0.00*	0.52		
		Between dry & wet	χ ²	64.84	63.17	39.47	53.24	64.25	58.79	51.46	49.83	53.24	35.28	45.74	36.85	65.16	46.75	
df	5		5	5	5	5	5	5	5	5	5	5	5	5	5			
P	0.00*		0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*			
χ ²	39.84		37.89	33.56	29.55	37.54	31.19	39.39	36.60	29.55	21.06	22.12	22.26	39.43	22.42			
df	5		5	5	5	5	5	5	5	5	5	5	5	5	5			
P	0.00*		0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*			
Dry	Kruskal-Wallis	χ ²	35.04	35.04	17.75	23.13	35.24	30.43	21.56	20.83	23.13	17.91	24.94	25.02	35.20	24.94		
		df	5	5	5	5	5	5	5	5	5	5	5	5	5	5		
		P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*		
Wet	Mann-Whitney	U	487.00	478.00	689.00	891.00	496.00	638.00	769.00	612.00	891.00	848.00	830.00	444.00	494.00	851.00		
		P	0.00*	0.00*	0.05*	0.80	0.00*	0.01*	0.19	0.01*	0.80	0.53	0.35	0.00*	0.00*	0.48		

SG- short grassland, TG- tall grassland, HES- herbivore exclusion in short grassland, HIS- herbivore inclusion in short grassland, HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal, U- Mann-Whitney test value, χ^2 - chi square value, *df*- degree of freedom and *indicates significant result at $P < 0.05$.

Appendix Table 5.13. Mann-Whitney significance test for multiple comparisons between experimental sites aboveground biomass productivity (g m⁻²) in terms of classes, growth forms and life cycles recorded from riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Seasons	Mann-Whitney	Aboveground biomass productivity (g m ⁻²)													
			Total biomass	Classes			Growth forms							Life cycles		
				Monocots	Dicots	Ferns	Grasses	Sedges	Climbers	Herbs	Ferns	Shrubs	Trees	Annuals	Perennials	Deciduous
HES - HIS	Overall	U	14.00	15.00	54.00	70.50	15.00	26.00	51.50	51.00	70.50	65.00	72.00	46.00	16.00	72.00

Experimental sites	Seasons	Mann-Whitney	Aboveground biomass productivity (g m ⁻²)														
			Total biomass	Classes			Growth forms								Life cycles		
				Monocots	Dicots	Ferns	Grasses	Sedges	Climbers	Herbs	Ferns	Shrubs	Trees	Annuals	Perennials	Deciduous	
	Dry	P	1.00	1.00	1.00	1.00	1.00	0.00*	1.00	1.00	1.00	1.00	1.00	0.25	1.00	1.00	
		U	0.00	1.00	14.00	18.00	2.00	1.00	14.00	11.00	18.00	8.00	20.00	6.00	2.00	20.00	
		P	1.00	1.00	1.00	1.00	1.00	0.00*	1.00	1.00	1.00	1.00	1.00	0.11	1.00	1.00	
	Wet	U	0.00	0.00	4.00	15.00	0.00	5.00	11.00	5.00	15.00	9.00	16.00	1.00	0.00	16.00	
		P	1.00	1.00	1.00	1.00	1.00	0.01	1.00	1.00	1.00	1.00	1.00	0.15	1.00	1.00	
	Between dry & wet	U	26.00	27.00	7.00	68.50	28.00	31.00	65.50	7.00	68.50	53.00	84.00	1.00	27.00	84.00	
		P	0.00*	0.00*	0.00*	0.20	0.00*	0.01*	0.24	0.00*	0.20	0.11	1.00	0.00*	0.00*	1.00	
	HES - HET	Overall	U	61.00	81.00	12.00	0.00	68.00	0.00	2.00	37.00	0.00	35.00	63.00	14.00	58.00	54.00
P			1.00	1.00	0.02	0.01	1.00	0.00*	0.00*	1.00	0.01	0.01	1.00	0.00*	1.00	1.00	
Dry		U	4.00	18.00	0.00	0.00	18.00	0.00	0.00	0.00	0.00	9.00	30.00	1.00	4.00	25.00	
		P	1.00	1.00	0.00*	0.40	1.00	0.00*	0.00*	1.00	0.40	0.01	1.00	0.00*	1.00	0.89	
Wet		U	0.00	1.00	4.00	0.00	0.00	0.00	1.00	11.00	0.00	9.00	4.00	0.00	0.00	4.00	
		P	0.35	0.62	0.92	0.20	0.10	0.00*	0.50	1.00	0.20	1.00	1.00	0.00*	0.26	1.00	
Between dry & wet		U	23.00	18.00	100.00	155.00	30.00	118.00	141.00	73.00	155.00	115.00	126.00	74.00	26.00	136.50	
		P	0.00*	0.00*	0.06	0.87	0.00*	0.18	0.54	0.01*	0.87	0.15	0.18	0.01*	0.00*	0.37	
HES - HIT	Overall	U	60.00	71.00	15.00	0.00	58.00	0.00	1.00	19.00	0.00	15.00	9.00	10.00	59.00	9.00	
		P	1.00	1.00	1.00	0.10	1.00	0.00*	0.65	1.00	0.10	1.00	1.00	0.00*	1.00	1.00	
	Dry	U	16.00	19.00	0.00	0.00	16.00	0.00	0.00	1.00	0.00	0.00	5.00	0.00	16.00	5.00	
		P	1.00	1.00	0.98	1.00	1.00	0.00*	0.01	1.00	1.00	1.00	1.00	0.00*	1.00	1.00	
	Wet	U	12.00	12.00	4.00	0.00	10.00	0.00	0.00	5.00	0.00	5.00	0.00	0.00	11.00	0.00	
		P	1.00	1.00	1.00	0.20	1.00	0.00*	1.00	1.00	0.20	1.00	1.00	0.00*	1.00	1.00	
	Between dry & wet	U	0.00	0.00	24.00	69.00	0.00	51.00	63.00	21.00	69.00	40.00	73.00	32.00	0.00	73.00	
		P	0.00*	0.00*	0.00*	0.39	0.00*	0.09	0.26	0.00*	0.39	0.02*	0.47	0.01*	0.00*	0.47	
HES - HETB	Overall	U	1.00	1.00	66.00	10.50	0.00	0.00	16.50	15.00	10.50	133.00	45.00	6.00	0.00	45.00	
		P	0.00*	0.00*	0.12	0.17	0.00*	0.00*	0.00*	0.00*	0.17	1.00	0.01	0.00*	0.00*	0.01	
	Dry	U	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00	10.00	1.00	0.00	10.00	
		P	0.00*	0.00*	0.00*	1.00	0.00*	0.00*	0.00*	0.00*	1.00	1.00	0.03	0.00*	0.00*	0.02	
	Wet	U	0.00	0.00	32.00	5.00	0.00	0.00	10.00	10.00	5.00	19.00	12.00	0.00	0.00	12.00	
		P	0.00*	0.00*	1.00	1.00	0.00*	0.00*	0.55	0.27	1.00	1.00	0.31	0.00*	0.00*	0.31	
	Between dry & wet	U	63.00	63.00	124.00	139.50	64.00	100.00	143.50	100.00	139.50	123.00	144.00	87.50	64.00	144.00	
		P	0.01*	0.01*	0.49	0.87	0.01*	0.13	0.99	0.13	0.87	0.47	1.00	0.05*	0.01*	1.00	
HES - HETIR	Overall	U	1.00	2.00	44.00	0.00	0.00	0.00	26.50	22.00	0.00	60.00	162.00	45.00	1.00	162.00	
		P	0.00*	0.00*	0.70	0.00*	0.00*	0.00*	0.49	0.05	0.00*	0.35	1.00	0.00*	0.00*	1.00	
	Dry	U	0.00	0.00	1.00	0.00	0.00	0.00	6.50	0.00	0.00	4.00	50.00	17.00	0.00	50.00	
		P	0.00*	0.00*	0.14	0.01	0.00*	0.00*	0.88	0.06	0.01	0.03	1.00	0.00*	0.00*	1.00	
	Wet	U	0.00	0.00	5.00	0.00	0.00	0.00	2.00	4.00	0.00	22.00	32.00	2.00	0.00	32.00	

Experimental sites	Seasons	Mann-Whitney	Aboveground biomass productivity (g m ⁻²)														
			Total biomass	Classes			Growth forms								Life cycles		
				Monocots	Dicots	Ferns	Grasses	Sedges	Climbers	Herbs	Ferns	Shrubs	Trees	Annuals	Perennials	Deciduous	
		<i>P</i>	0.00*	0.00*	1.00	0.10	0.00*	0.00*	1.00	0.90	0.10	1.00	1.00	0.00*	0.00*	1.00	
	Between dry & wet	<i>U</i>	79.00	78.00	59.00	157.00	80.00	115.00	97.00	81.00	157.00	117.00	160.00	74.00	79.00	160.00	
		<i>P</i>	0.01*	0.01*	0.00*	0.92	0.01*	0.15	0.04*	0.01*	0.92	0.17	1.00	0.01*	0.01*	1.00	
HIS - HET	Overall	<i>U</i>	0.00	2.00	0.00	2.00	2.00	2.00	0.00	2.00	2.00	8.00	28.00	23.00	0.00	24.00	
		<i>P</i>	1.00	1.00	0.07	0.13	1.00	0.19	0.04	1.00	0.13	0.03	1.00	0.20	1.00	1.00	
	Dry	<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.00	12.00	4.00	0.00	10.00	
		<i>P</i>	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	2.00	0.00	2.00	0.00	0.00	2.00	
	Wet	<i>U</i>	0.07	0.12	1.00	0.73	0.05	0.10	0.89	1.00	0.73	0.50	1.00	0.18	0.06	1.00	
		<i>P</i>	0.07	0.12	1.00	0.73	0.05	0.10	0.89	1.00	0.73	0.50	1.00	0.18	0.06	1.00	
	Between dry & wet	<i>U</i>	40.00	39.00	65.00	71.00	39.00	59.00	78.00	55.00	71.00	83.00	63.00	20.00	41.00	71.50	
<i>P</i>		0.02*	0.02*	0.33	0.50	0.02*	0.19	0.76	0.14	0.50	0.96	0.23	0.00*	0.03*	0.48		
HIS - HIT	Overall	<i>U</i>	4.00	8.00	0.00	0.00	4.00	5.00	0.00	1.00	0.00	3.00	4.00	10.00	3.00	4.00	
		<i>P</i>	1.00	1.00	1.00	0.34	1.00	0.75	0.98	1.00	0.34	1.00	1.00	0.88	1.00	1.00	
	Dry	<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	2.00	1.00	0.00	2.00	
		<i>P</i>	1.00	1.00	1.00	1.00	1.00	1.00	0.03	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
	Wet	<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
		<i>P</i>	1.00	1.00	1.00	0.54	1.00	0.43	1.00	1.00	0.54	1.00	1.00	0.69	1.00	1.00	
	Between dry & wet	<i>U</i>	12.00	9.00	16.00	25.00	13.00	13.00	24.00	15.00	25.00	28.00	27.00	9.00	14.00	27.00	
<i>P</i>		0.04*	0.02*	0.09	0.44	0.05*	0.05*	0.38	0.07	0.44	0.67	0.56	0.02*	0.06	0.56		
HIS - HETB	Overall	<i>U</i>	0.00	0.00	19.00	5.50	0.00	14.00	4.50	1.00	5.50	53.00	20.00	22.00	0.00	20.00	
		<i>P</i>	0.00*	0.00*	0.24	0.73	0.00*	0.41	0.01	0.00*	0.73	1.00	0.11	0.13	0.00*	0.10	
	Dry	<i>U</i>	0.00	0.00	0.00	0.00	0.00	4.00	0.00	0.00	0.00	16.00	4.00	7.00	0.00	4.00	
		<i>P</i>	0.00*	0.00*	0.00*	1.00	0.00*	1.00	0.00*	0.00*	1.00	1.00	0.20	1.00	0.00*	0.19	
	Wet	<i>U</i>	0.00	0.00	13.00	2.50	0.00	0.00	2.50	1.00	2.50	12.00	6.00	0.00	0.00	6.00	
		<i>P</i>	0.00*	0.00*	1.00	1.00	0.00*	0.19	0.97	0.44	1.00	1.00	0.83	0.06	0.00*	0.83	
	Between dry & wet	<i>U</i>	32.00	33.00	63.00	69.00	33.00	33.00	60.00	69.00	69.00	51.00	69.00	29.50	33.00	69.00	
<i>P</i>		0.02*	0.02*	0.60	0.86	0.02*	0.02*	0.48	0.86	0.86	0.22	0.85	0.01*	0.02*	0.85		
HIS - HETIR	Overall	<i>U</i>	0.00	0.00	5.00	2.00	0.00	3.00	4.50	1.00	2.00	21.00	72.00	44.00	0.00	72.00	
		<i>P</i>	0.00*	0.00*	0.94	0.01	0.00*	0.21	1.00	0.15	0.01	0.43	1.00	1.00	0.00*	1.00	
	Dry	<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	6.00	20.00	14.00	0.00	20.00	
		<i>P</i>	0.00*	0.00*	0.48	0.14	0.00*	1.00	1.00	0.24	0.14	0.59	1.00	1.00	0.00*	1.00	
	Wet	<i>U</i>	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00	2.00	4.00	16.00	7.00	0.00	16.00	
		<i>P</i>	0.00*	0.00*	1.00	0.46	0.00*	0.11	1.00	1.00	0.46	1.00	1.00	0.91	0.00*	1.00	
	Between dry & wet	<i>U</i>	40.00	41.00	49.00	79.00	41.00	55.00	48.50	56.00	79.00	77.00	84.00	29.00	41.00	84.00	
<i>P</i>		0.02*	0.03*	0.07	0.80	0.03*	0.13	0.06	0.15	0.80	0.72	1.00	0.00*	0.03*	1.00		
HET - HIT	Overall	<i>U</i>	32.00	34.00	32.00	55.00	35.00	34.00	53.00	71.00	55.00	29.00	39.50	61.50	33.00	44.00	

Experimental sites	Seasons	Mann-Whitney	Aboveground biomass productivity (g m ⁻²)													
			Total biomass	Classes			Growth forms							Life cycles		
				Monocots	Dicots	Ferns	Grasses	Sedges	Climbers	Herbs	Ferns	Shrubs	Trees	Annuals	Perennials	Deciduous
		<i>P</i>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		<i>U</i>	2.00	5.00	4.00	17.00	6.00	13.00	10.00	13.00	17.00	5.00	13.00	14.50	4.00	15.50
	Dry	<i>P</i>	1.00	1.00	0.93	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		<i>U</i>	1.00	0.00	9.00	8.00	0.00	4.00	16.00	12.00	8.00	9.00	7.00	16.00	0.00	7.00
	Wet	<i>P</i>	1.00	1.00	1.00	1.00	0.68	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
		<i>U</i>	11.00	11.00	46.00	80.00	11.00	48.00	59.00	21.00	80.00	69.00	58.50	16.00	11.00	67.00
	Between dry & wet	<i>P</i>	0.00*	0.00*	0.05*	0.84	0.00*	0.06	0.20	0.00*	0.84	0.44	0.18	0.00*	0.00*	0.38
		<i>U</i>	24.00	24.00	92.00	133.00	24.00	57.00	133.00	54.00	133.00	43.00	98.50	141.00	24.00	104.00
HET - HETB	Overall	<i>P</i>	0.00*	0.00*	1.00	1.00	0.00*	1.00	1.00	0.01	1.00	0.03	0.38	1.00	0.00*	0.45
		<i>U</i>	0.00	0.00	37.00	34.00	0.00	23.00	19.00	1.00	34.00	14.00	24.00	31.50	0.00	27.00
	Dry	<i>P</i>	0.00*	0.00*	1.00	1.00	0.00*	1.00	0.04	0.00*	1.00	0.19	1.00	1.00	0.00*	1.00
		<i>U</i>	0.00	0.00	14.00	29.00	0.00	5.00	24.00	22.00	29.00	7.00	25.50	21.00	0.00	25.50
	Wet	<i>P</i>	0.00*	0.00*	1.00	1.00	0.00*	1.00	1.00	0.85	1.00	0.63	1.00	1.00	0.00*	1.00
		<i>U</i>	40.00	40.00	143.00	113.00	40.00	79.00	126.00	123.00	113.00	143.00	127.00	44.00	40.00	136.00
	Between dry & wet	<i>P</i>	0.00*	0.00*	0.97	0.28	0.00*	0.02*	0.53	0.47	0.28	0.97	0.55	0.00*	0.00*	0.78
		<i>U</i>	29.00	27.00	92.00	140.00	30.00	146.00	85.00	78.00	140.00	85.00	63.00	113.50	28.00	54.00
HET - HETIR	Overall	<i>P</i>	0.00*	0.00*	1.00	1.00	0.00*	1.00	1.00	0.87	1.00	1.00	1.00	1.00	0.00*	1.00
		<i>U</i>	0.00	0.00	18.00	44.00	1.00	47.00	1.00	28.00	44.00	32.00	30.00	31.50	0.00	25.00
	Dry	<i>P</i>	0.00*	0.00*	0.38	1.00	0.00*	1.00	0.00*	1.00	1.00	1.00	1.00	0.77	0.00*	0.89
		<i>U</i>	0.00	0.00	23.00	30.00	0.00	25.00	31.00	11.00	30.00	13.00	4.00	25.00	0.00	4.00
	Wet	<i>P</i>	0.00*	0.00*	1.00	1.00	0.00*	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00*	1.00
		<i>U</i>	51.00	53.00	86.00	130.00	51.00	107.00	68.00	75.00	130.00	153.00	126.00	60.00	52.00	136.50
	Between dry & wet	<i>P</i>	0.00*	0.00*	0.02*	0.34	0.00*	0.08	0.00*	0.01*	0.34	0.82	0.18	0.00*	0.00*	0.37
		<i>U</i>	1.00	1.00	62.00	45.00	1.00	55.00	45.00	24.00	45.00	23.00	59.50	54.00	1.00	59.50
HIT - HETB	Overall	<i>P</i>	0.00*	0.00*	1.00	1.00	0.00*	1.00	1.00	0.07	1.00	1.00	1.00	1.00	0.00*	1.00
		<i>U</i>	0.00	0.00	5.00	15.00	0.00	14.00	3.00	0.00	15.00	10.00	12.00	14.50	0.00	12.00
	Dry	<i>P</i>	0.00*	0.00*	0.68	1.00	0.00*	1.00	0.02	0.01	1.00	1.00	1.00	1.00	0.00*	1.00
		<i>U</i>	0.00	0.00	9.00	7.00	0.00	14.00	14.00	12.00	7.00	4.00	14.00	10.00	0.00	14.00
	Wet	<i>P</i>	0.00*	0.00*	1.00	1.00	0.00*	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00*	1.00
		<i>U</i>	31.00	31.00	67.00	66.00	31.00	18.00	58.00	69.00	66.00	70.00	69.50	27.00	31.00	69.50
	Between dry & wet	<i>P</i>	0.02*	0.02*	0.77	0.73	0.02*	0.00*	0.42	0.86	0.73	0.91	0.88	0.01*	0.02*	0.88
		<i>U</i>	1.00	1.00	64.00	69.00	1.00	41.50	47.00	34.00	69.00	62.00	9.00	59.50	1.00	9.00
HIT - HETIR	Overall	<i>P</i>	0.00*	0.00*	1.00	1.00	0.00*	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00*	1.00
		<i>U</i>	0.00	0.00	11.00	18.00	0.00	14.50	1.00	4.00	18.00	19.00	5.00	17.50	0.00	5.00
	Dry	<i>P</i>	0.00*	0.00*	1.00	1.00	0.00*	1.00	0.35	1.00	1.00	1.00	1.00	1.00	0.00*	1.00
		<i>U</i>	0.00	0.00	15.00	13.00	0.00	6.00	11.00	4.00	13.00	11.00	0.00	13.00	0.00	0.00

Experimental sites	Seasons	Mann-Whitney	Aboveground biomass productivity (g m ⁻²)													
			Total biomass	Classes			Growth forms								Life cycles	
		Monocots		Dicots	Ferns	Grasses	Sedges	Climbers	Herbs	Ferns	Shrubs	Trees	Annuals	Perennials	Deciduous	
	<i>P</i>	0.00*	0.00*	1.00	1.00	0.00*	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00*	1.00
	Between dry & wet	<i>U</i>	39.00	39.00	26.00	74.00	39.00	41.00	14.00	31.00	74.00	69.00	73.00	35.00	39.00	73.00
		<i>P</i>	0.02*	0.02*	0.00*	0.61	0.02*	0.02*	0.00*	0.01*	0.61	0.44	0.47	0.01*	0.02*	0.47
		<i>U</i>	135.00	137.00	139.00	114.00	137.00	70.00	89.50	122.00	114.00	61.00	45.00	101.00	136.00	45.00
HETB - HETIR	Overall	<i>P</i>	1.00	1.00	1.00	0.71	1.00	1.00	0.29	1.00	0.71	0.82	0.01	1.00	1.00	0.01
		<i>U</i>	38.00	39.00	15.00	33.00	38.00	24.00	0.00	18.00	33.00	22.00	10.00	31.50	38.00	10.00
	Dry	<i>P</i>	1.00	1.00	0.27	1.00	1.00	1.00	0.00*	0.06	1.00	0.56	0.03	1.00	1.00	0.02
		<i>U</i>	31.00	30.00	19.00	23.00	29.00	11.00	24.00	26.00	23.00	10.00	12.00	17.00	30.00	12.00
	Wet	<i>P</i>	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.31	1.00	1.00	0.31
		<i>U</i>	0.00	0.00	126.00	125.00	0.00	70.00	110.50	108.00	125.00	121.00	144.00	72.00	0.00	144.00
	Between dry & wet	<i>P</i>	0.00*	0.00*	0.53	0.51	0.00*	0.01*	0.25	0.21	0.51	0.43	1.00	0.01*	0.00*	1.00
		<i>U</i>	0.00	0.00	126.00	125.00	0.00	70.00	110.50	108.00	125.00	121.00	144.00	72.00	0.00	144.00

HES- herbivore exclusion in short grassland, HIS- herbivore inclusion in short grassland, HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal, U- Mann-Whitney test value and *indicates significant result at $P < 0.01$ (corrected with Bonferroni correction for multiple comparisons) except for seasonal differences (between dry & wet) significant result at $P < 0.05$.

Appendix Table 5.14. Mann-Whitney significance test for multiple comparisons between classes, growth forms and life cycles aboveground biomass productivity (g m⁻²) recorded from experimental sites in riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Types	Multiple comparisons	Mann-Whitney	Aboveground biomass productivity (g m ⁻²)																	
			HES			HIS			HET			HIT			HETB			HETIR		
			O	D	W	O	D	W	O	D	W	O	D	W	O	D	W	O	D	W
Classes	Mon-Dic	<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Mon-Fer	<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Dic-Fer	<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.00	0.00	10.00	13.00	8.00	0.00
		<i>P</i>	1.00	1.00	1.00	1.00	1.00	1.00	0.75	0.25	0.34	1.00	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Growth Forms	Gra-Sed	<i>U</i>	153.00	45.00	31.00	24.00	3.00	8.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		<i>P</i>	1.00	1.00	1.00	1.00	0.03	1.00	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Gra-Cli	<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		<i>P</i>	0.00*	0.00*	0.00*	0.01	0.00*	0.19	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Gra-Her	<i>U</i>	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		<i>P</i>	0.00*	0.00*	0.00*	0.06	0.00*	0.54	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Gra-Fer	<i>U</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		<i>P</i>	0.00*	0.00*	0.00*	0.01	0.00*	0.19	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*

Types	Multiple comparisons	Mann-Whitney	Aboveground biomass productivity (g m ⁻²)																	
			HES			HIS			HET			HIT			HETB			HETIR		
			O	D	W	O	D	W	O	D	W	O	D	W	O	D	W	O	D	W
	Gra-Shr	U	4.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		P	0.00*	0.00*	0.00*	0.03	0.00*	0.27	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Gra-Tre	U	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		P	0.00*	0.00*	0.00*	0.01	0.00*	0.19	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Sed-Cli	U	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	41.00	0.00	24.00	41.50	14.50	2.00
		P	0.00*	0.00*	0.00*	0.01	0.01	0.03	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Sed-Her	U	4.00	0.00	0.00	9.00	1.00	0.00	0.00	0.00	0.00	2.00	0.00	0.00	5.00	0.00	4.00	1.00	0.00	0.00
		P	0.00*	0.00*	0.00*	0.03	0.10	0.08	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Sed-Fer	U	0.00	0.00	0.00	0.00	0.00	0.00	64.00	12.00	18.00	25.00	1.00	5.00	93.00	24.00	7.00	75.00	14.00	22.00
		P	0.00*	0.00*	0.00*	0.01	0.01	0.03	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Sed-Shr	U	5.00	0.00	0.00	3.00	2.00	0.00	14.00	7.00	0.00	9.00	0.00	3.00	99.00	26.00	8.00	25.00	2.00	11.00
		P	0.00*	0.00*	0.00*	0.02	0.22	0.04	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Sed-Tre	U	0.00	0.00	0.00	0.00	0.00	0.00	116.00	44.00	16.00	21.50	3.50	8.00	110.00	18.00	27.00	63.00	25.00	8.00
		P	0.00*	0.00*	0.00*	0.01	0.01	0.02	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Cli-Her	U	20.00	1.00	6.00	0.00	0.00	0.00	162.00	40.00	28.00	22.00	7.00	0.00	63.00	13.00	17.00	50.00	2.00	8.00
		P	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Cli-Fer	U	116.50	38.50	20.00	31.50	8.00	7.50	4.00	0.00	1.00	0.00	0.00	0.00	28.50	0.00	13.50	83.00	41.00	1.00
		P	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Cli-Shr	U	58.00	18.00	10.00	0.00	0.00	0.00	144.00	41.00	31.00	14.00	2.00	3.00	46.00	4.00	15.00	156.00	22.00	14.00
		P	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Cli-Tre	U	99.00	35.00	16.00	28.00	8.00	6.00	43.00	17.00	6.00	3.00	1.00	0.00	77.50	11.00	24.50	9.00	5.00	0.00
		P	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Her-Fer	U	0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.00	6.00	0.00
		P	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Her-Shr	U	70.00	11.00	13.00	18.00	5.00	0.00	147.00	36.00	30.00	12.00	3.00	0.00	15.00	1.00	5.00	53.00	20.00	6.00
		P	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Her-Tre	U	0.00	0.00	0.00	0.00	0.00	0.00	45.00	19.00	7.00	4.00	1.00	0.00	39.00	3.00	13.00	0.00	0.00	0.00
		P	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Fer-Shr	U	21.00	11.00	0.00	0.00	0.00	0.00	22.00	10.00	2.00	1.00	0.00	0.00	112.00	30.00	20.00	68.00	17.00	13.00
		P	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Fer-Tre	U	135.00	45.00	24.00	28.00	8.00	6.00	139.00	29.00	23.00	14.00	4.00	4.00	80.50	18.00	22.50	0.00	0.00	0.00
		P	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Shr-Tre	U	18.00	10.00	0.00	0.00	0.00	0.00	51.5	18.88	7.00	14.00	3.00	2.00	100	26.00	24.00	0.00	0.00	0.00
		P	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.88	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Life cycles	Ann-Per	U	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
		P	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*
	Ann-Deci	U	0.00	0.00	0.00	0.00	0.00	0.00	119.00	38.50	24.00	12.50	3.50	3.00	70.00	13.00	22.50	27.00	15.00	0.00
		P	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Per-Deci	U	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Types	Multiple comparisons	Mann-Whitney	Aboveground biomass productivity (g m ⁻²)																	
			HES			HIS			HET			HIT			HETB			HETIR		
			O	D	W	O	D	W	O	D	W	O	D	W	O	D	W	O	D	W
		<i>P</i>	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*	0.00*

HES- herbivore exclusion in short grassland, HIS- herbivore inclusion in short grassland, HET-herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal, O- overall, D- dry season, W- wet season, Mon- monocots, Dic- dicots, Fer- ferns, Gra- grasses, Sed- sedges, Cli- climbers, Heb- herbs, Shr-shrubs, Tre- trees, Ann- annuals, Per- perennials, Deci- deciduous, U- Mann-Whitney test value and *indicates significant result at $P < 0.05$.

Appendix Table 5.15. Overall and seasonal family-wise aboveground biomass productivity (g m⁻²) recorded from herbivore exclusion in short grassland (HES) during 2014-15 in Kaziranga National Park, Assam, India.

Families	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Acanthaceae	165.08	12.70±4.63	90.42	10.05±5.64	74.66	18.67±8.39
Amaranthaceae	323.23	19.01±5.91	77.68	8.63±3.22	245.56	30.69±10.92
Amaryllidaceae	15.87	7.94±6.58	0.00	0.00	15.87	7.94±6.58
Apiaceae	45.61	5.70±2.68	7.48	2.49±2.01	38.13	7.63±4.06
Apocynaceae	0.59	0.59±0.00	0.59	0.59±0.00	0.00	0.00
Boraginaceae	222.53	13.91±3.02	89.91	9.99±3.60	132.62	18.95±4.72
Brassicaceae	239.45	15.96±4.08	96.67	9.67±2.96	142.78	28.56±8.73
Caryophyllaceae	108.56	13.57±8.05	1.25	0.63±0.16	107.31	17.89±10.3
Commelinaceae	10.62	5.31±0.02	0.00	0.00	10.62	5.31±0.02
Compositae	1707.50	94.86±14.92	497.88	49.79±8.32	1209.62	151.20±17.00
Convolvulaceae	33.54	5.59±2.65	22.67	11.34±7.38	10.86	2.72±0.42
Cyperaceae	16515.56	917.53±193.27	3657.73	365.77±49.14	12857.83	1607.23±279.11
Lamiaceae	93.58	11.70±5.67	0.00	0.00	93.58	11.70±5.67
Leguminosae	34.71	17.36±15.42	0.00	0.00	34.71	17.36±15.42
Linderniaceae	200.41	13.36±4.27	53.19	6.65±1.12	147.22	21.03±8.44
Lythraceae	28.15	7.04±3.67	0.00	0.00	28.15	7.04±3.67
Marsileaceae	0.25	0.25±0.00	0.25	0.25±0.00	0.00	0.00
Molluginaceae	105.36	9.58±3.62	28.73	4.79±1.92	76.63	15.33±7.16
Onagraceae	114.25	10.39±2.42	15.13	5.04±3.59	99.13	12.39±2.83
Ophioglossaceae	0.22	0.22±0.00	0.00	0.00	0.22	0.22±0.00
Oxalidaceae	3.23	1.62±1.15	0.00	0.00	3.23	1.62±1.15
Phrymaceae	4.22	1.41±0.34	0.00	0.00	4.22	1.41±0.34
Plantaginaceae	5.23	1.74±0.51	0.00	0.00	5.23	1.74±0.51
Poaceae	43556.02	2419.78±295.24	15231.80	1523.18±196.78	28324.21	3540.53±301.80
Polygonaceae	348.17	23.21±6.16	113.33	14.17±3.36	234.84	33.55±11.88
Pontederiaceae	8.34	8.34±0.00	0.00	0.00	8.34	8.34±0.00
Pteridaceae	0.70	0.70±0.00	0.00	0.00	0.70	0.70±0.00
Ranunculaceae	49.51	16.50±10.51	0.00	0.00	49.51	16.50±10.51

Rosaceae	2.64	1.32±0.44	0.00	0.00	2.64	1.32±0.44
Sapindaceae	73.71	14.74±8.22	7.03	7.03±0.00	66.67	16.67±10.32
Solanaceae	53.48	10.70±3.54	41.11	13.70±5.35	12.37	6.18±2.35
Verbenaceae	375.68	31.31±15.19	26.19	5.24±1.26	349.49	49.93±24.19

SE- standard error.

Appendix Table 5.16. Overall and seasonal family-wise aboveground biomass productivity (g m^{-2}) recorded from herbivore inclusion in short grassland (HIS) during 2014-15 in Kaziranga National Park, Assam, India.

Families	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Acanthaceae	5.56	1.85±0.53	4.48	2.99±0.83	1.07	1.07±0.00
Amaranthaceae	87.50	12.50±4.59	23.01	9.21±3.73	64.49	21.50±8.37
Apiaceae	10.77	10.77±0.00	0.00	0.00	10.77	10.77±0.00
Boraginaceae	194.70	27.81±12.00	25.41	12.71±5.15	169.29	42.32±18.22
Brassicaceae	84.87	12.12±4.34	12.85	6.43±3.16	72.02	18.00±5.79
Caryophyllaceae	32.31	8.08±3.87	3.89	2.59±0.65	28.42	14.21±3.84
Compositae	443.13	55.39±14.40	127.10	50.84±24.76	316.03	79.01±13.40
Cyperaceae	2205.98	275.75±73.70	603.63	241.45±105.49	1602.35	400.59±100.37
Lamiaceae	9.58	4.79±1.64	0.00	0.00	9.58	4.79±1.64
Linderniaceae	53.17	7.60±2.21	20.41	10.20±4.33	32.77	8.19±3.11
Malvaceae	11.97	11.97±0.00	11.97	11.97±0.00	0.00	0.00
Marsileaceae	3.10	3.10±0.00	0.00	0.00	3.10	3.10±0.00
Molluginaceae	4.48	1.49±0.49	2.38	1.59±0.56	2.10	2.10±0.00
Onagraceae	21.27	10.64±5.42	5.22	5.22±0.00	16.05	16.05±0.00
Oxalidaceae	15.91	3.18±0.74	6.17	3.08±1.03	9.75	4.87±0.81
Piperaceae	7.13	7.13±0.00	0.00	0.00	7.13	7.13±0.00
Plantaginaceae	0.37	0.37±0.00	0.00	0.00	0.37	0.37±0.00
Poaceae	7088.58	886.07±155.30	2359.29	943.71±360.06	4729.29	1182.32±216.08
Polygonaceae	73.17	9.15±1.81	29.83	11.93±5.10	43.34	10.84±1.84
Sapindaceae	1.74	1.74±0.00	0.00	0.00	1.74	1.74±0.00
Solanaceae	4.92	4.92±0.00	0.00	0.00	4.92	4.92±0.00
Urticaceae	15.30	15.3±0	15.30	15.3±0	0.00	0.00
Verbenaceae	160.70	26.78±7.64	104.74	52.37±19.61	55.96	18.65±8.16

SE- standard error.

Appendix Table 5.17. Overall and seasonal species-wise aboveground biomass productivity (g m⁻²) recorded from herbivore exclusion in short grassland (HES) during 2014-15 in Kaziranga National Park, Assam, India.

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Acmella uliginosa</i>	14.91	3.73±1.19	4.53	2.27±0.58	10.38	5.19±1.97
<i>Ageratum conyzoides</i>	13.17	4.39±2.08	12.85	6.43±0.77	0.32	0.32±0.00
<i>Alternanthera pungens</i>	88.60	9.84±3.54	9.26	4.63±1.23	79.34	11.33±4.44
<i>Alternanthera sessilis</i>	117.48	9.04±2.54	45.64	9.13±4.95	71.85	8.98±3.03
<i>Arenaria serpyllifolia</i>	35.09	17.55±8.48	0.00	0.00	35.09	17.55±8.48
<i>Artemisia carvifolia</i>	54.33	13.58±4.68	0.00	0.00	54.33	13.58±4.68
<i>Axonopus compressus</i>	40.28	40.28±0.00	0.00	0.00	40.28	40.28±0.00
<i>Cardiospermum halicacabum</i>	73.71	14.74±8.22	7.03	7.03±0.00	66.67	16.67±10.32
<i>Carex vesicaria</i>	16328.75	907.15±189.94	3632.78	363.28±49.27	12695.97	1587.00±272.74
<i>Centella asiatica</i>	7.00	3.50±3.02	7.00	3.50±3.02	0.00	0.00
<i>Centipeda minima</i>	3.74	1.25±0.61	1.19	1.19±0.00	2.55	1.28±1.06
<i>Chenopodium album</i>	48.68	12.17±5.16	15.52	15.52±0.00	33.16	11.05±7.13
<i>Chromolaena odorata</i>	11.15	5.58±3.50	11.15	5.58±3.50	0.00	0.00
<i>Chrysopogon aciculatus</i>	37.05	18.53±7.52	0.00	0.00	37.05	18.53±7.52
<i>Commelina benghalensis</i>	10.62	5.31±0.02	0.00	0.00	10.62	5.31±0.02
<i>Cotula hemisphaerica</i>	26.95	13.48±13.01	0.47	0.47±0.00	26.49	26.49±0.00
<i>Cuphea carthagenensis</i>	28.15	7.04±3.67	0.00	0.00	28.15	7.04±3.67
<i>Cynodon dactylon</i>	15230.37	846.13±100.14	5875.46	587.55±83.37	9354.91	1169.36±129.47
<i>Cyperus cyperoides</i>	31.28	10.43±8.34	0.00	0.00	31.28	10.43±8.34
<i>Cyperus eragrostis</i>	52.98	8.83±2.50	24.95	8.32±5.16	28.03	9.34±2.09
<i>Cyperus esculentus</i>	15.21	15.21±0.00	0.00	0.00	15.21	15.21±0.00
<i>Cyperus iria</i>	6.18	6.18±0.00	0.00	0.00	6.18	6.18±0.00
<i>Dactyloctenium aegyptium</i>	1.91	1.91±0.00	1.91	1.91±0.00	0.00	0.00
<i>Dichanthium annulatum</i>	22.21	22.21±0.00	0.00	0.00	22.21	22.21±0.00
<i>Dichrocephala integrifolia</i>	8.15	8.15±0.00	0.00	0.00	8.15	8.15±0.00
<i>Digitaria ciliaris</i>	103.59	25.90±9.15	0.00	0.00	103.59	25.90±9.15
<i>Duchesnea indica</i>	2.64	1.32±0.44	0.00	0.00	2.64	1.32±0.44
<i>Dysphania ambrosioides</i>	68.47	8.56±2.68	7.26	2.42±0.87	61.21	12.24±3.29
<i>Echinochloa crus-galli</i>	18.20	2.02±0.39	11.10	1.85±0.46	7.10	2.37±0.84
<i>Eclipta prostrata</i>	313.99	20.93±5.11	89.36	12.77±5.06	224.63	28.08±7.93
<i>Eichhornia crassipes</i>	8.34	8.34±0.00	0.00	0.00	8.34	8.34±0.00
<i>Eleusine indica</i>	10.96	5.48±2.38	0.00	0.00	10.96	5.48±2.38
<i>Enydra fluctuans</i>	2.84	1.42±0.38	2.84	1.42±0.38	0.00	0.00
<i>Eragrostis riparia</i>	113.25	37.75±24.68	15.86	15.86±0.00	97.38	48.69±38.32
<i>Ethulia conyzoides</i>	603.73	33.54±7.66	160.92	16.09±5.73	442.81	55.35±12.07
<i>Evolvulus nummularius</i>	10.86	2.72±0.42	0.00	0.00	10.86	2.72±0.42
<i>Fimbristylis aestivalis</i>	35.58	8.89±1.07	0.00	0.00	35.58	8.89±1.07
<i>Flemingia lineata</i>	32.78	32.78±0.00	0.00	0.00	32.78	32.78±0.00
<i>Glinus lotoides</i>	105.36	9.58±3.62	28.73	4.79±1.92	76.63	15.33±7.16
<i>Gnaphalium pensylvanicum</i>	24.47	12.23±4.52	0.00	0.00	24.47	12.23±4.52
<i>Grangea maderaspatana</i>	468.73	27.57±4.98	153.99	17.11±3.59	314.74	39.34±8.17
<i>Heliotropium indicum</i>	216.48	13.53±2.91	89.91	9.99±3.60	126.57	18.08±4.47
<i>Heliotropium strigosum</i>	6.05	3.03±2.78	0.00	0.00	6.05	3.03±2.78
<i>Helminthostachys zeylanica</i>	0.22	0.22±0.00	0.00	0.00	0.22	0.22±0.00
<i>Hemarthria compressa</i>	25884.41	1438.02±188.40	8571.19	857.12±121.90	17313.22	2164.15±185.69
<i>Hyptis suaveolens</i>	90.58	11.32±5.39	0.00	0.00	90.58	11.32±5.39
<i>Ichnocarpus frutescens</i>	0.59	0.59±0.00	0.59	0.59±0.00	0.00	0.00
<i>Ipomoea carnea</i>	18.72	18.72±0.00	18.72	18.72±0.00	0.00	0.00
<i>Isachne globosa</i>	19.17	19.17±0.00	0.00	0.00	19.17	19.17±0.00
<i>Isachne spp.</i>	3.42	3.42±0.00	0.00	0.00	3.42	3.42±0.00
<i>Kyllinga brevifolia</i>	45.59	11.40±6.25	0.00	0.00	45.59	11.40±6.25
<i>Laphangium luteoalbum</i>	33.92	4.24±1.67	8.96	2.24±0.29	24.96	6.24±3.20
<i>Leersia hexandra</i>	2.00	2.00±0.00	2.00	2.00±0.00	0.00	0.00
<i>Leucas aspera</i>	3.00	3.00±0.00	0.00	0.00	3.00	3.00±0.00
<i>Lindernia crustacea</i>	200.41	13.36±4.27	53.19	6.65±1.12	147.22	21.03±8.44
<i>Lippia alba</i>	375.68	31.31±15.19	26.19	5.24±1.26	349.49	49.93±24.19
<i>Ludwigia adscendens</i>	114.25	10.39±2.42	15.13	5.04±3.59	99.13	12.39±2.83
<i>Marsilea quadrifolia</i>	0.25	0.25±0.00	0.25	0.25±0.00	0.00	0.00
<i>Mazus pumilus</i>	4.22	1.41±0.34	0.00	0.00	4.22	1.41±0.34
<i>Mecardonia procumbens</i>	5.23	1.74±0.51	0.00	0.00	5.23	1.74±0.51

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Merremia umbellata</i>	3.96	3.96±0.00	3.96	3.96±0.00	0.00	0.00
<i>Onychium japonicum</i>	0.70	0.70±0.00	0.00	0.00	0.70	0.70±0.00
<i>Oxalis corniculata</i>	3.23	1.62±1.15	0.00	0.00	3.23	1.62±1.15
<i>Panicum notatum</i>	35.57	35.57±0.00	0.00	0.00	35.57	35.57±0.00
<i>Paspalum conjugatum</i>	722.21	60.18±22.85	255.94	51.19±19.84	466.26	66.61±37.91
<i>Persicaria hydropiper</i>	128.84	10.74±3.03	31.71	6.34±2.26	97.13	13.88±4.74
<i>Persicaria lapathifolia</i>	0.56	0.56±0.00	0.56	0.56±0.00	0.00	0.00
<i>Peucedanum spp.</i>	24.30	8.10±1.92	0.00	0.00	24.30	8.10±1.92
<i>Phragmites karka</i>	173.81	21.73±4.60	90.16	22.54±7.29	83.65	20.91±6.73
<i>Physalis minima</i>	8.53	8.53±0.00	0.00	0.00	8.53	8.53±0.00
<i>Pimpinella sp.</i>	14.31	3.58±3.03	0.48	0.48±0.00	13.83	4.61±4.02
<i>Polycarpon prostratum</i>	22.20	4.44±1.72	0.20	0.20±0.00	22.00	5.50±1.74
<i>Polygonum plebeium</i>	154.24	10.28±2.21	69.35	8.67±2.22	84.89	12.13±4.11
<i>Polygonum viscosum</i>	64.53	10.76±6.05	11.71	5.86±1.46	52.82	13.21±9.23
<i>Ranunculus sceleratus</i>	49.51	16.50±10.51	0.00	0.00	49.51	16.50±10.51
<i>Rorippa indica</i>	239.45	15.96±4.08	96.67	9.67±2.96	142.78	28.56±8.73
<i>Rungia pectinata</i>	1.91	0.96±0.14	1.91	0.96±0.14	0.00	0.00
<i>Rungia repens</i>	163.17	14.83±5.24	88.51	12.64±7.04	74.66	18.67±8.39
<i>Saccharum spp.</i>	202.11	40.42±11.19	113.83	37.94±19.20	88.28	44.14±11.09
<i>Setaria pumila</i>	893.36	59.56±12.28	273.03	39.00±19.30	620.32	77.54±13.69
<i>Solanum americanum</i>	3.72	3.72±0.00	3.72	3.72±0.00	0.00	0.00
<i>Solanum viarum</i>	41.22	10.31±3.98	37.39	12.46±4.73	3.84	3.84±0.00
<i>Sporobolus diandrus</i>	16.63	16.63±0.00	0.00	0.00	16.63	16.63±0.00
<i>Stellaria media</i>	51.27	7.32±4.52	1.05	0.53±0.26	50.22	10.04±6.04
<i>Synedrella nodiflora</i>	11.36	11.36±0.00	0.00	0.00	11.36	11.36±0.00
<i>Themeda villosa</i>	25.51	12.76±8.56	21.31	21.31±0.00	4.20	4.20±0.00
<i>Vicia sativa</i>	1.93	1.93±0.00	0.00	0.00	1.93	1.93±0.00
<i>Xanthium strumarium</i>	116.06	11.61±4.04	51.62	8.60±2.80	64.44	16.11±9.57
<i>Zephyranthes atamasco</i>	15.87	7.94±6.58	0.00	0.00	15.87	7.94±6.58

SE- standard error.

Appendix Table 5.18. Overall and seasonal species-wise aboveground biomass productivity (g m⁻²) recorded from herbivore inclusion in short grassland (HIS) during 2014-15 in Kaziranga National Park, Assam, India.

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Acroceras zizanioides</i>	17.67	8.84±3.12	0.00	0.00	17.67	8.84±3.12
<i>Alternanthera pungens</i>	24.40	4.88±1.66	6.70	2.23±0.60	17.70	8.85±0.32
<i>Alternanthera sessilis</i>	40.46	5.78±2.27	8.42	2.11±0.68	32.04	10.68±3.78
<i>Artemisia carvifolia</i>	11.10	5.55±0.80	6.35	6.35±0.00	4.75	4.75±0.00
<i>Capsella bursa-pastoris</i>	16.48	8.24±1.88	10.12	10.12±0.00	6.36	6.36±0.00
<i>Cardiospermum halicacabum</i>	1.74	1.74±0.00	0.00	0.00	1.74	1.74±0.00
<i>Carex vesicaria</i>	2192.48	274.06±73.81	602.62	150.66±70.00	1589.86	397.47±101.85
<i>Centipeda minima</i>	2.14	2.14±0.00	0.00	0.00	2.14	2.14±0.00
<i>Chenopodium album</i>	0.21	0.21±0.00	0.00	0.00	0.21	0.21±0.00
<i>Cynodon dactylon</i>	3149.07	393.63±65.88	1119.62	279.90±37.69	2029.46	507.36±101.05
<i>Cyperus eragrostis</i>	13.50	4.50±1.91	1.00	1.00±0.00	12.49	6.25±1.34
<i>Dichanthium annulatum</i>	27.62	13.81±3.17	0.00	0.00	27.62	13.81±3.17
<i>Dysphania ambrosioides</i>	22.44	5.61±2.24	7.89	3.95±2.49	14.55	7.27±4.27
<i>Eclipta prostrata</i>	34.98	7.00±3.09	15.58	5.19±2.75	19.40	9.70±7.79
<i>Ethulia conyzoides</i>	232.27	29.03±9.44	76.21	19.05±15.45	156.06	39.01±10.51
<i>Gliricidia lotoides</i>	4.48	1.49±0.49	2.38	1.19±0.68	2.10	2.10±0.00
<i>Gnaphalium pensylvanicum</i>	15.63	5.21±0.41	0.00	0.00	15.63	5.21±0.41
<i>Grangea maderaspatana</i>	114.73	14.34±4.36	26.45	6.61±3.43	88.28	22.07±6.10
<i>Heliotropium indicum</i>	194.70	27.81±12.00	25.41	8.47±4.14	169.29	42.32±18.22
<i>Hemarthria compressa</i>	3477.94	434.74±87.45	1190.94	297.73±58.78	2287.00	571.75±140.43
<i>Hyptis suaveolens</i>	9.58	4.79±1.64	0.00	0.00	9.58	4.79±1.64
<i>Imperata cylindrica</i>	9.35	4.67±0.90	5.57	5.57±0.00	3.77	3.77±0.00
<i>Laphangium luteoalbum</i>	4.43	2.22±0.30	2.52	2.52±0.00	1.91	1.91±0.00
<i>Lindernia crustacea</i>	53.17	7.60±2.21	20.41	6.80±3.80	32.77	8.19±3.11
<i>Lippia alba</i>	160.70	26.78±7.64	104.74	34.91±12.63	55.96	18.65±8.16
<i>Ludwigia adscendens</i>	21.27	10.64±5.42	5.22	5.22±0.00	16.05	16.05±0.00
<i>Marsilea quadrifolia</i>	3.10	3.10±0.00	0.00	0.00	3.10	3.10±0.00

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Mecardonia procumbens</i>	0.37	0.37±0.00	0.00	0.00	0.37	0.37±0.00
<i>Oxalis corniculata</i>	15.91	3.18±0.74	6.17	2.06±0.14	9.75	4.87±0.81
<i>Paspalum conjugatum</i>	47.65	15.88±6.97	18.82	9.41±4.48	28.82	28.82±0.00
<i>Peperomia pellucida</i>	7.13	7.13±0.00	0.00	0.00	7.13	7.13±0.00
<i>Persicaria hydropiper</i>	40.32	6.72±1.95	26.06	6.52±2.85	14.26	7.13±2.80
<i>Persicaria orientalis</i>	11.25	11.25±0.00	0.00	0.00	11.25	11.25±0.00
<i>Peucedanum spp.</i>	10.77	10.77±0.00	0.00	0.00	10.77	10.77±0.00
<i>Phragmites karka</i>	16.96	16.96±0.00	0.00	0.00	16.96	16.96±0.00
<i>Polycarpon prostratum</i>	0.94	0.94±0.00	0.94	0.94±0.00	0.00	0.00
<i>Polygonum plebeium</i>	21.60	5.40±0.68	3.77	3.77±0.00	17.83	5.94±0.57
<i>Pouzolzia zeylanica</i>	15.30	15.30±0.00	15.30	15.30±0.00	0.00	0.00
<i>Rorippa indica</i>	68.39	9.77±4.31	2.73	0.91±0.15	65.66	16.41±5.52
<i>Rungia repens</i>	5.56	1.85±0.53	4.48	2.24±0.61	1.07	1.07±0.00
<i>Saccharum spp.</i>	116.26	29.07±2.90	24.34	24.34±0.00	91.92	30.64±3.44
<i>Setaria pumila</i>	226.07	75.36±34.87	0.00	0.00	226.07	75.36±34.87
<i>Solanum viarum</i>	4.92	4.92±0.00	0.00	0.00	4.92	4.92±0.00
<i>Stellaria media</i>	31.37	7.84±4.00	2.95	1.48±0.53	28.42	14.21±3.84
<i>Urena lobata</i>	11.97	11.97±0.00	11.97	11.97±0.00	0.00	0.00
<i>Xanthium strumarium</i>	27.85	9.28±2.80	0.00	0.00	27.85	9.28±2.80

SE- standard error.

Appendix Table 5.19. Overall and seasonal family-wise aboveground biomass productivity (g m⁻²) recorded from herbivore exclusion in tall grassland (HET) during 2014-15 in Kaziranga National Park, Assam, India.

Families	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Acanthaceae	1.38	1.38±0.00	0.00	0.00	1.38	1.38±0.00
Amaranthaceae	42.79	5.35±1.33	4.61	2.31±0.98	38.17	6.36±1.55
Amaryllidaceae	1.22	1.22±0.00	1.22	1.22±0.00	0.00	0.00
Apiaceae	10.95	2.74±1.32	2.27	2.27±0.00	8.69	2.90±1.86
Apocynaceae	45.15	6.45±2.10	33.09	6.62±2.94	12.06	6.03±2.48
Araceae	15.48	15.48±0.00	15.48	15.48±0.00	0.00	0.00
Brassicaceae	46.85	15.62±10.92	0.00	0.00	46.85	15.62±10.92
Caryophyllaceae	7.92	1.58±0.74	0.63	0.31±0.28	7.30	2.43±0.96
Commelinaceae	6.22	6.22±0.00	6.22	6.22±0.00	0.00	0.00
Compositae	1690.53	93.92±19.17	973.65	97.37±20.91	716.87	89.61±36.06
Convolvulaceae	4260.00	236.67±44.65	1665.00	166.50±26.76	2595.00	324.38±88.12
Cyperaceae	165.15	16.52±5.93	42.89	10.72±3.30	122.26	20.38±9.67
Euphorbiaceae	288.80	36.10±20.13	119.10	39.70±20.08	169.70	33.94±31.79
Lamiaceae	70.91	10.13±2.86	35.86	11.95±5.24	35.05	8.76±3.67
Lauraceae	1126.35	70.40±17.12	487.47	54.16±14.19	638.89	91.27±34.64
Leguminosae	2773.80	154.10±31.10	1215.80	121.58±20.06	1558.01	194.75±64.92
Lygodiaceae	276.55	18.44±7.87	108.09	13.51±7.05	168.47	24.07±15.27
Lythraceae	420.76	38.25±16.19	88.14	29.38±14.87	332.62	41.58±22.03
Malvaceae	253.23	25.32±9.23	127.24	42.41±31.00	125.99	18.00±3.96
Menispermaceae	1.40	1.40±0.00	0.00	0.00	1.40	1.40±0.00
Oxalidaceae	18.80	2.69±1.45	2.32	1.16±1.13	16.48	3.30±1.99
Phyllanthaceae	1167.17	68.66±16.77	433.94	48.22±13.82	733.22	91.65±31.25
Poaceae	76259.85	4236.66±654.20	21034.57	2103.46±327.03	55225.29	6903.16±581.71
Polygonaceae	5.71	1.90±0.91	0.00	0.00	5.71	1.90±0.91
Rosaceae	7.53	1.88±0.34	3.29	1.65±0.75	4.24	2.12±0.10
Sapindaceae	0.74	0.74±0.00	0.74	0.74±0.00	0.00	0.00
Thelypteridaceae	625.01	34.72±6.44	386.78	38.68±9.40	238.23	29.78±8.86
Urticaceae	42.51	7.09±1.32	0.00	0.00	42.51	7.09±1.32
Verbenaceae	207.40	34.57±19.02	52.78	13.19±7.31	154.63	77.31±48.65
Violaceae	0.38	0.38±0.00	0.00	0.00	0.38	0.38±0.00
Vitaceae	42.15	6.02±2.29	11.17	5.59±4.52	30.98	6.20±2.98
Zingiberaceae	4877.97	271.00±29.06	2304.15	230.42±18.70	2573.81	321.73±58.23

SE- standard error.

Appendix Table 5.20. Overall and seasonal family-wise aboveground biomass productivity (g m^{-2}) recorded from herbivore inclusion in tall grassland (HIT) during 2014-15 in Kaziranga National Park, Assam, India.

Families	Overall		Dry season		Wet season	
	Total	Mean $\pm$ SE	Total	Mean $\pm$ SE	Total	Mean $\pm$ SE
Acanthaceae	0.76	0.76 $\pm$ 0.00	0.00	0.00	0.76	0.76 $\pm$ 0.00
Amaranthaceae	21.80	10.90 $\pm$ 9.88	1.02	1.02 $\pm$ 0.00	20.78	20.78 $\pm$ 0.00
Apiaceae	1.33	1.33 $\pm$ 0.00	0.00	0.00	1.33	1.33 $\pm$ 0.00
Apocynaceae	8.34	4.17 $\pm$ 0.51	0.00	0.00	8.34	4.17 $\pm$ 0.51
Boraginaceae	8.39	8.39 $\pm$ 0.00	8.39	8.39 $\pm$ 0.00	0.00	0.00
Brassicaceae	3.64	3.64 $\pm$ 0.00	3.64	3.64 $\pm$ 0.00	0.00	0.00
Caryophyllaceae	1.13	1.13 $\pm$ 0.00	1.13	1.13 $\pm$ 0.00	0.00	0.00
Compositae	756.78	108.11 $\pm$ 33.35	340.62	113.54 $\pm$ 83.63	416.17	104.04 $\pm$ 19.58
Convolvulaceae	2936.32	367.04 $\pm$ 68.34	1204.83	301.21 $\pm$ 115.42	1731.48	432.87 $\pm$ 74.73
Cyperaceae	657.98	94.00 $\pm$ 55.38	60.24	20.08 $\pm$ 0.94	597.74	149.44 $\pm$ 91.35
Euphorbiaceae	73.87	18.47 $\pm$ 9.67	20.40	10.20 $\pm$ 9.74	53.47	26.74 $\pm$ 18.15
Lamiaceae	77.54	12.92 $\pm$ 4.13	16.79	8.40 $\pm$ 2.98	60.75	15.19 $\pm$ 6.00
Lauraceae	178.04	25.43 $\pm$ 5.63	82.61	27.54 $\pm$ 10.14	95.43	23.86 $\pm$ 7.58
Leguminosae	1653.81	206.73 $\pm$ 38.97	494.65	123.66 $\pm$ 32.07	1159.16	289.79 $\pm$ 38.18
Lygodiaceae	384.92	48.12 $\pm$ 14.48	111.40	27.85 $\pm$ 8.31	273.52	68.38 $\pm$ 25.21
Lythraceae	517.58	103.52 $\pm$ 19.21	123.61	123.61 $\pm$ 0.00	393.96	98.49 $\pm$ 23.93
Malvaceae	375.85	53.69 $\pm$ 11.93	129.72	43.24 $\pm$ 12.57	246.13	61.53 $\pm$ 19.28
Menispermaceae	23.20	11.60 $\pm$ 4.69	6.91	6.91 $\pm$ 0.00	16.29	16.29 $\pm$ 0.00
Ophioglossaceae	6.46	6.46 $\pm$ 0.00	0.00	0.00	6.46	6.46 $\pm$ 0.00
Oxalidaceae	21.10	4.22 $\pm$ 1.19	2.92	1.46 $\pm$ 0.12	18.19	6.06 $\pm$ 0.67
Phyllanthaceae	521.80	74.54 $\pm$ 17.62	136.16	45.39 $\pm$ 18.80	385.64	96.41 $\pm$ 23.20
Poaceae	36121.22	4515.15 $\pm$ 1014.03	9877.37	2469.34 $\pm$ 480.02	26243.85	6560.96 $\pm$ 1333.38
Polygonaceae	4.01	2.00 $\pm$ 0.13	1.87	1.87 $\pm$ 0.00	2.13	2.13 $\pm$ 0.00
Sapindaceae	2.88	2.88 $\pm$ 0.00	0.00	0.00	2.88	2.88 $\pm$ 0.00
Solanaceae	1.53	1.53 $\pm$ 0.00	1.53	1.53 $\pm$ 0.00	0.00	0.00
Thelypteridaceae	392.68	49.09 $\pm$ 13.76	153.72	38.43 $\pm$ 14.94	238.96	59.74 $\pm$ 24.17
Urticaceae	35.24	8.81 $\pm$ 2.14	3.89	3.89 $\pm$ 0.00	31.35	10.45 $\pm$ 1.94
Verbenaceae	88.81	44.41 $\pm$ 22.54	88.81	44.41 $\pm$ 22.54	0.00	0.00
Vitaceae	11.72	5.86 $\pm$ 3.26	9.12	9.12 $\pm$ 0.00	2.60	2.60 $\pm$ 0.00
Zingiberaceae	4279.17	534.90 $\pm$ 100.59	1179.44	294.86 $\pm$ 15.76	3099.73	774.93 $\pm$ 92.49

SE- standard error.

Appendix Table 5.21. Overall and seasonal family-wise aboveground biomass productivity (g m^{-2}) recorded from herbivore exclusion in tall grassland burning (HETB) during 2014-15 in Kaziranga National Park, Assam, India.

Families	Overall		Dry season		Wet season	
	Total	Mean $\pm$ SE	Total	Mean $\pm$ SE	Total	Mean $\pm$ SE
Acanthaceae	21.33	10.66 $\pm$ 5.48	0.00	0.00	21.33	10.66 $\pm$ 5.48
Adiantaceae	2.96	2.96 $\pm$ 0.00	0.00	0.00	2.96	2.96 $\pm$ 0.00
Amaryllidaceae	3.85	3.85 $\pm$ 0.00	0.00	0.00	0.00	0.00
Apiaceae	24.77	12.39 $\pm$ 5.39	6.99	6.99 $\pm$ 0.00	17.78	17.78 $\pm$ 0.00
Apocynaceae	25.94	12.97 $\pm$ 3.45	9.52	9.52 $\pm$ 0.00	16.42	16.42 $\pm$ 0.00
Boraginaceae	1.40	1.40 $\pm$ 0.00	0.00	0.00	1.40	1.40 $\pm$ 0.00
Brassicaceae	6.54	6.54 $\pm$ 0.00	0.00	0.00	6.54	6.54 $\pm$ 0.00
Caryophyllaceae	3.80	3.80 $\pm$ 0.00	0.00	0.00	3.80	3.80 $\pm$ 0.00
Commelinaceae	1.51	1.51 $\pm$ 0.00	0.00	0.00	1.51	1.51 $\pm$ 0.00
Compositae	1265.79	115.07 $\pm$ 44.59	1120.59	140.07 $\pm$ 59.18	145.20	48.40 $\pm$ 26.69
Convolvulaceae	2989.54	229.96 $\pm$ 74.63	1236.91	176.70 $\pm$ 26.13	1752.63	292.11 $\pm$ 163.01
Cyperaceae	558.91	39.92 $\pm$ 10.05	119.17	19.86 $\pm$ 7.02	439.74	54.97 $\pm$ 15.04
Euphorbiaceae	6.93	1.39 $\pm$ 0.28	2.22	1.11 $\pm$ 0.22	4.71	1.57 $\pm$ 0.46
Lauraceae	165.89	82.94 $\pm$ 67.91	15.03	15.03 $\pm$ 0.00	150.86	150.86 $\pm$ 0.00
Leguminosae	249.83	20.82 $\pm$ 5.84	153.90	25.65 $\pm$ 8.32	95.93	15.99 $\pm$ 8.46
Lygodiaceae	53.70	6.71 $\pm$ 2.22	22.53	3.76 $\pm$ 1.43	31.16	15.58 $\pm$ 1.54
Lythraceae	95.65	47.83 $\pm$ 42.61	0.00	0.00	95.65	47.83 $\pm$ 42.61
Malvaceae	2113.88	192.17 $\pm$ 88.71	689.34	114.89 $\pm$ 36.96	1424.54	284.91 $\pm$ 193.11
Menispermaceae	0.77	0.77 $\pm$ 0.00	0.00	0.00	0.77	0.77 $\pm$ 0.00
Ophioglossaceae	9.99	9.99 $\pm$ 0.00	0.00	0.00	9.99	9.99 $\pm$ 0.00
Phyllanthaceae	270.33	67.58 $\pm$ 52.79	39.32	39.32 $\pm$ 0.00	231.01	77.00 $\pm$ 73.46

Families	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Piperaceae	1.67	1.67±0.00	0.00	0.00	1.67	1.67±0.00
Poaceae	209388.84	13086.80±1747.32	56193.78	7024.22±1143.72	153195.06	19149.38±1129.31
Polygonaceae	25.25	12.63±1.82	0.00	0.00	25.25	12.63±1.82
Rosaceae	3.69	1.85±0.19	2.03	2.03±0.00	1.66	1.66±0.00
Thelypteridaceae	246.93	16.46±2.76	128.65	16.08±3.85	118.28	16.90±4.27
Urticaceae	46.02	9.20±5.63	30.95	30.95±0.00	15.07	3.77±1.87
Violaceae	1.13	1.13±0.00	1.13	1.13±0.00	0.00	0.00
Vitaceae	10.97	5.49±2.37	0.00	0.00	10.97	5.49±2.37
Zingiberaceae	9854.85	615.93±170.95	3979.02	497.38±78.27	5875.83	734.48±339.27

SE- standard error.

Appendix Table 5.22. Overall and seasonal family-wise aboveground biomass productivity (g m⁻²) recorded from herbivore exclusion in tall grassland invasive removal (HETIR) during 2014-15 in Kaziranga National Park, Assam, India.

Families	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Amaranthaceae	89.55	8.14±1.33	36.80	7.36±1.23	52.75	8.79±2.30
Amaryllidaceae	4.91	2.46±0.26	0.00	0.00	4.91	2.46±0.26
Apiaceae	11.75	5.87±1.22	0.00	0.00	11.75	5.87±1.22
Apocynaceae	5.43	1.81±0.49	1.80	1.76±0.00	3.68	1.84±0.85
Araliaceae	3.02	1.51±0.66	0.00	0.00	3.02	1.51±0.66
Boraginaceae	4.48	1.49±0.63	0.00	0.00	4.48	1.49±0.63
Brassicaceae	23.62	11.81±0.27	0.00	0.00	23.62	11.81±0.27
Caryophyllaceae	50.47	25.24±5.71	0.00	0.00	50.47	25.24±5.71
Compositae	106.10	8.84±2.14	81.10	11.58±3.32	25.05	5.01±0.91
Convolvulaceae	1602.96	94.29±27.08	311.20	34.57±8.44	1291.79	161.47±47.45
Cyperaceae	161.66	14.70±4.58	38.20	7.64±2.71	123.47	20.58±7.54
Euphorbiaceae	10.58	3.53±1.91	0.00	0.00	10.58	3.53±1.91
Lamiaceae	7.17	3.59±1.51	7.20	3.59±1.51	0.00	0.00
Lauraceae	474.37	79.06±23.94	244.80	81.58±42.46	229.62	76.54±32.50
Leguminosae	880.15	51.77±11.65	688.90	68.89±17.04	191.26	27.32±9.33
Lygodiaceae	361.85	27.83±12.75	238.80	29.85±20.54	123.01	24.60±9.14
Lythraceae	102.51	14.64±6.49	0.20	0.23±0.00	102.27	17.05±7.13
Oxalidaceae	37.13	3.71±1.28	4.80	1.20±0.46	32.35	5.39±1.86
Phyllanthaceae	759.02	69.00±41.27	227.30	45.46±21.49	531.71	88.62±75.95
Poaceae	152519.06	8473.28±1155.17	47396.80	4739.68±739.47	105122.28	13140.29±901.12
Polygonaceae	20.71	6.90±3.48	1.90	1.86±0.00	18.85	9.43±4.15
Thelypteridaceae	321.82	18.93±3.45	182.60	20.29±4.39	139.21	17.40±5.68
Urticaceae	116.18	16.60±5.74	0.00	0.00	116.18	16.60±5.74
Verbenaceae	51.00	12.75±2.46	7.80	7.78±0.00	43.22	14.41±2.57
Vitaceae	2.98	1.49±0.50	0.00	0.00	2.98	1.49±0.50
Zingiberaceae	4999.50	277.75±52.23	2035.20	203.52±45.46	2964.35	370.54±96.81

SE- standard error.

Appendix Table 5.23. Overall and seasonal species-wise aboveground biomass productivity (g m⁻²) recorded from herbivore exclusion in tall grassland (HET) during 2014-15 in Kaziranga National Park, Assam, India.

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Achyranthes aspera</i>	2.75	2.75±0.00	0.00	0.00	2.75	2.75±0.00
<i>Acmella uliginosa</i>	11.07	11.07±0.00	11.07	11.07±0.00	0.00	0.00
<i>Ageratum conyzoides</i>	81.29	9.03±5.02	4.46	1.49±1.13	76.82	12.80±7.18
<i>Alpinia nigra</i>	4877.97	271±29.06	2304.15	230.42±18.70	2573.81	321.73±58.23
<i>Alternanthera pungens</i>	1.87	1.87±0.00	0.00	0.00	1.87	1.87±0.00
<i>Alternanthera sessilis</i>	20.78	3.46±1.00	4.61	2.31±0.98	16.16	4.04±1.42
<i>Amaranthus spinosus</i>	14.58	7.29±2.61	0.00	0.00	14.58	7.29±2.61
<i>Apluda mutica</i>	31.54	31.54±0.00	31.54	31.54±0.00	0.00	0.00
<i>Arenaria serpyllifolia</i>	2.02	1.01±0.42	0.59	0.59±0.00	1.43	1.43±0.00
<i>Bombax ceiba</i>	240.18	26.69±10.21	114.19	57.10±47.28	125.99	18.00±3.96
<i>Cajanus scarabaeoides</i>	26.09	13.05±5.53	0.00	0.00	26.09	13.05±5.53
<i>Capillipedium assimile</i>	1.74	1.74±0.00	0.00	0.00	1.74	1.74±0.00

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Capsella bursa-pastoris</i>	37.00	37.00±0.00	0.00	0.00	37.00	37.00±0.00
<i>Cardiospermum halicacabum</i>	0.74	0.74±0.00	0.74	0.74±0.00	0.00	0.00
<i>Carex vesicaria</i>	11.33	5.66±5.00	10.66	10.66±0.00	0.66	0.66±0.00
<i>Centella asiatica</i>	2.27	2.27±0.00	2.27	2.27±0.00	0.00	0.00
<i>Chenopodium album</i>	2.81	2.81±0.00	0.00	0.00	2.81	2.81±0.00
<i>Christella parasitica</i>	625.01	34.72±6.44	386.78	38.68±9.40	238.23	29.78±8.86
<i>Cissampelos pareira</i>	1.40	1.40±0.00	0.00	0.00	1.40	1.40±0.00
<i>Clerodendrum indicum</i>	46.36	15.45±4.38	28.85	14.42±7.38	17.52	17.52±0.00
<i>Colocasia esculenta</i>	15.48	15.48±0.00	15.48	15.48±0.00	0.00	0.00
<i>Cuphea carthagenensis</i>	372.66	37.27±14.49	88.14	29.38±14.87	284.52	40.65±20.29
<i>Cyanthillium cinereum</i>	3.33	3.33±0.00	0.00	0.00	3.33	3.33±0.00
<i>Cynodon dactylon</i>	168.20	14.02±5.99	26.78	5.36±1.75	141.42	20.20±9.80
<i>Cyperus compressus</i>	12.59	6.30±1.67	0.00	0.00	12.59	6.30±1.67
<i>Cyperus cyperoides</i>	3.07	1.53±1.09	0.00	0.00	3.07	1.53±1.09
<i>Cyperus eragrostis</i>	16.49	4.12±1.02	0.00	0.00	16.49	4.12±1.02
<i>Dichanthium annulatum</i>	5.94	5.94±0.00	5.94	5.94±0.00	0.00	0.00
<i>Digitaria ciliaris</i>	2.98	2.98±0.00	0.00	0.00	2.98	2.98±0.00
<i>Drymaria cordata</i>	0.03	0.03±0.00	0.03	0.03±0.00	0.00	0.00
<i>Duchesnea indica</i>	7.53	1.88±0.34	3.29	1.65±0.75	4.24	2.12±0.10
<i>Eclipta prostrata</i>	10.89	2.72±1.46	0.00	0.00	10.89	2.72±1.46
<i>Ethulia conyzoides</i>	0.96	0.96±0.00	0.00	0.00	0.96	0.96±0.00
<i>Euphorbia hirta</i>	3.60	3.60±0.00	0.00	0.00	3.60	3.60±0.00
<i>Euphorbia thymifolia</i>	5.04	1.68±1.21	0.00	0.00	5.04	1.68±1.21
<i>Flemingia lineata</i>	1242.48	69.03±14.68	646.37	64.64±13.52	596.11	74.51±29.60
<i>Floscopa scandens</i>	6.22	6.22±0.00	6.22	6.22±0.00	0.00	0.00
<i>Flueggea virosa</i>	832.01	52.00±17.17	353.39	44.17±15.28	478.61	59.83±31.81
<i>Fuirena umbellata</i>	14.71	14.71±0.00	14.71	14.71±0.00	0.00	0.00
<i>Glochidion multiloculare</i>	335.16	27.93±5.88	80.55	16.11±3.13	254.61	36.37±8.69
<i>Gonostegia pentandra</i>	7.68	7.68±0.00	0.00	0.00	7.68	7.68±0.00
<i>Hemarthria compressa</i>	718.29	59.86±27.57	122.29	24.46±14.11	596.00	85.14±45.16
<i>Hyptis suaveolens</i>	24.55	4.91±1.82	7.02	3.51±0.42	17.53	5.84±3.14
<i>Ichnocarpus frutescens</i>	27.09	5.42±1.59	18.58	4.65±1.79	8.51	8.51±0.00
<i>Imperata cylindrica</i>	30.20	6.04±1.71	7.04	7.04±0.00	23.16	5.79±2.18
<i>Kyllinga brevifolia</i>	12.40	6.20±0.42	6.62	6.62±0.00	5.78	5.78±0.00
<i>Leersia hexandra</i>	2.38	2.38±0.00	0.00	0.00	2.38	2.38±0.00
<i>Lippia alba</i>	32.44	8.11±0.77	22.99	7.66±0.89	9.45	9.45±0.00
<i>Litsea salicifolia</i>	1126.35	70.40±17.12	487.47	54.16±14.19	638.89	91.27±34.64
<i>Lygodium flexuosum</i>	276.55	18.44±7.87	108.09	13.51±7.05	168.47	24.07±15.27
<i>Mallotus nudiflorus</i>	280.16	70.04±33.50	119.10	39.70±20.08	161.06	161.06±0.00
<i>Merremia spp.</i>	103.51	103.51±0.00	0.00	0.00	103.51	103.51±0.00
<i>Merremia umbellata</i>	4156.49	230.92±44.05	1665.00	166.50±26.76	2491.50	311.44±88.22
<i>Mikania micrantha</i>	1582.27	87.90±19.07	958.12	95.81±21.38	624.15	78.02±35.04
<i>Mimosa spp.</i>	1505.23	94.08±20.41	569.42	71.18±14.88	935.81	116.98±37.60
<i>Oenanthe javanica</i>	4.68	2.34±1.01	0.00	0.00	4.68	2.34±1.01
<i>Oxalis corniculata</i>	18.80	2.69±1.45	2.32	1.16±1.13	16.48	3.30±1.99
<i>Paspalum conjugatum</i>	889.43	80.86±27.64	331.78	55.30±21.65	557.65	111.53±55.39
<i>Paspalum scrobiculatum</i>	18.74	18.74±0.00	0.00	0.00	18.74	18.74±0.00
<i>Persicaria lapathifolia</i>	0.48	0.48±0.00	0.00	0.00	0.48	0.48±0.00
<i>Peucedanum spp.</i>	4.01	2.00±1.24	0.00	0.00	4.01	2.00±1.24
<i>Polycarpon prostratum</i>	5.87	2.94±1.42	0.00	0.00	5.87	2.94±1.42
<i>Polygonum plebeium</i>	5.08	2.54±1.12	0.00	0.00	5.08	2.54±1.12
<i>Polygonum viscosum</i>	0.15	0.15±0.00	0.00	0.00	0.15	0.15±0.00
<i>Pouzolzia spp.</i>	1.62	1.62±0.00	0.00	0.00	1.62	1.62±0.00
<i>Pouzolzia zeylanica</i>	33.21	5.53±1.50	0.00	0.00	33.21	5.53±1.50
<i>Rauvolfia serpentina</i>	18.07	6.02±3.54	14.51	7.26±5.74	3.55	3.55±0.00
<i>Rorippa indica</i>	9.85	4.93±3.85	0.00	0.00	9.85	4.93±3.85
<i>Rungia repens</i>	1.38	1.38±0.00	0.00	0.00	1.38	1.38±0.00
<i>Saccharum spp.</i>	74160.90	4120.05±642.42	20363.90	2036.39±315.31	53797.01	6724.63±592.39
<i>Scleria terrestris</i>	94.57	15.76±8.34	10.90	5.45±1.68	83.67	20.92±12.12
<i>Setaria pumila</i>	11.42	11.42±0.00	0.00	0.00	11.42	11.42±0.00
<i>Sonchus oleraceus</i>	0.72	0.72±0.00	0.00	0.00	0.72	0.72±0.00
<i>Stachytarpheta indica</i>	174.96	43.74±27.98	29.78	14.89±13.54	145.18	72.59±53.37
<i>Tetragstigma dubium</i>	42.15	6.02±2.29	11.17	5.59±4.52	30.98	6.20±2.98
<i>Themeda villosa</i>	218.09	19.83±3.88	145.29	24.22±6.12	72.80	14.56±3.74
<i>Urena lobata</i>	13.05	13.05±0.00	13.05	13.05±0.00	0.00	0.00
<i>Viola betonicifolia</i>	0.38	0.38±0.00	0.00	0.00	0.38	0.38±0.00

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Woodfordia fruticosa</i>	48.10	24.05±10.35	0.00	0.00	48.10	24.05±10.35
<i>Zephyranthes atamasco</i>	1.22	1.22±0.00	1.22	1.22±0.00	0.00	0.00

SE- standard error.

Appendix Table 5.24. Overall and seasonal species-wise aboveground biomass productivity (g m⁻²) recorded from herbivore inclusion in tall grassland (HIT) during 2014-15 in Kaziranga National Park, Assam, India.

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Acmella uliginosa</i>	29.76	9.92±8.06	1.48	1.48±0.00	28.28	14.14±11.90
<i>Ageratum conyzoides</i>	54.00	10.80±7.08	4.51	4.51±0.00	49.49	12.37±8.91
<i>Alpinia nigra</i>	4279.17	534.90±100.59	1179.44	294.86±15.76	3099.73	774.93±92.49
<i>Alternanthera sessilis</i>	20.78	20.78±0.00	0.00	0.00	20.78	20.78±0.00
<i>Apluda mutica</i>	50.23	16.74±3.17	32.75	16.38±5.45	17.48	17.48±0.00
<i>Arenaria serpyllifolia</i>	1.13	1.13±0.00	1.13	1.13±0.00	0.00	0.00
<i>Bombax ceiba</i>	367.20	52.46±11.13	129.72	43.24±12.57	237.48	59.37±17.82
<i>Cajanus scarabaeoides</i>	1.89	1.89±0.00	0.00	0.00	1.89	1.89±0.00
<i>Cardiospermum halicacabum</i>	2.88	2.88±0.00	0.00	0.00	2.88	2.88±0.00
<i>Carex vesicaria</i>	34.40	11.47±2.59	17.82	8.91±0.69	16.58	16.58±0.00
<i>Christella parasitica</i>	392.68	49.09±13.76	153.72	38.43±14.94	238.96	59.74±24.17
<i>Cissampelos pareira</i>	23.20	11.60±4.69	6.91	6.91±0.00	16.29	16.29±0.00
<i>Clerodendrum indicum</i>	58.38	19.46±6.05	11.38	11.38±0.00	47.00	23.50±7.79
<i>Cuphea carthagenensis</i>	424.33	84.87±16.07	123.61	123.61±0.00	300.72	75.18±16.56
<i>Cynodon dactylon</i>	346.83	57.81±20.83	143.80	47.93±31.85	203.03	67.68±32.53
<i>Cyperus eragrostis</i>	9.20	3.07±2.15	0.22	0.22±0.00	8.99	4.49±2.78
<i>Desmodium heterocarpon</i>	6.08	6.08±0.00	0.00	0.00	6.08	6.08±0.00
<i>Dysphania ambrosioides</i>	1.02	1.02±0.00	1.02	1.02±0.00	0.00	0.00
<i>Eryngium foetidum</i>	0.17	0.17±0.00	0.00	0.00	0.17	0.17±0.00
<i>Ethulia conyzoides</i>	31.38	15.69±1.64	14.05	14.05±0.00	17.33	17.33±0.00
<i>Euphorbia thymifolia</i>	0.46	0.46±0.00	0.46	0.46±0.00	0.00	0.00
<i>Flemingia lineata</i>	1237.51	154.69±27.43	426.42	106.61±31.56	811.08	202.77±31.22
<i>Flueggea virosa</i>	342.22	48.89±15.49	55.84	18.61±8.27	286.38	71.6±20.12
<i>Glochidion multiloculare</i>	177.24	25.32±5.37	80.32	26.77±12.29	96.92	24.23±4.96
<i>Gnaphalium pensylvanicum</i>	0.54	0.54±0.00	0.00	0.00	0.54	0.54±0.00
<i>Grangea maderaspatana</i>	2.78	2.78±0.00	0.00	0.00	2.78	2.78±0.00
<i>Heliotropium indicum</i>	8.39	8.39±0.00	8.39	8.39±0.00	0.00	0.00
<i>Helminthostachys zeylanica</i>	6.46	6.46±0.00	0.00	0.00	6.46	6.46±0.00
<i>Hemarthria compressa</i>	268.64	44.77±8.47	131.50	43.83±15.65	137.14	45.71±10.63
<i>Hyptis suaveolens</i>	0.89	0.89±0.00	0.00	0.00	0.89	0.89±0.00
<i>Ichnocarpus frutescens</i>	8.34	4.17±0.51	0.00	0.00	8.34	4.17±0.51
<i>Imperata cylindrica</i>	66.37	33.19±0.05	33.23	33.23±0.00	33.14	33.14±0.00
<i>Kyllinga brevifolia</i>	47.46	15.82±12.98	3.70	3.70±0.00	43.76	21.88±19.89
<i>Laphangium luteoalbum</i>	2.08	2.08±0.00	2.08	2.08±0.00	0.00	0.00
<i>Leucas aspera</i>	18.27	6.09±2.68	5.41	5.41±0.00	12.85	6.43±4.60
<i>Lippia alba</i>	88.81	44.41±22.54	88.81	44.41±22.54	0.00	0.00
<i>Litsea salicifolia</i>	178.04	25.43±5.63	82.61	27.54±10.14	95.43	23.86±7.58
<i>Lygodium flexuosum</i>	384.92	48.12±14.48	111.40	27.85±8.31	273.52	68.38±25.21
<i>Mallotus nudiflorus</i>	73.41	24.47±10.72	19.94	19.94±0.00	53.47	26.74±18.15
<i>Merremia umbellata</i>	2936.32	367.04±68.34	1204.83	301.21±115.42	1731.48	432.87±74.73
<i>Mikania micrantha</i>	636.24	106.04±36.42	318.50	159.25±121.30	317.74	79.44±12.46
<i>Mimosa</i> spp.	408.34	68.06±15.07	68.23	34.11±23.98	340.11	85.03±13.56
<i>Oenanthe javanica</i>	1.16	1.16±0.00	0.00	0.00	1.16	1.16±0.00
<i>Oxalis corniculata</i>	21.10	4.22±1.19	2.92	1.46±0.12	18.19	6.06±0.67
<i>Paspalum conjugatum</i>	83.02	16.60±6.86	21.56	10.78±8.18	61.47	20.49±10.77
<i>Persicaria hydropiper</i>	4.01	2.00±0.13	1.87	1.87±0.00	2.13	2.13±0.00
<i>Phyllanthus niruri</i>	2.34	2.34±0.00	0.00	0.00	2.34	2.34±0.00
<i>Pouzolzia</i> spp.	1.97	1.97±0.00	1.97	1.97±0.00	0.00	0.00
<i>Pouzolzia zeylanica</i>	33.27	8.32±2.53	1.92	1.92±0.00	31.35	10.45±1.94
<i>Rorippa indica</i>	3.64	3.64±0.00	3.64	3.64±0.00	0.00	0.00
<i>Rungia repens</i>	0.76	0.76±0.00	0.00	0.00	0.76	0.76±0.00
<i>Saccharum</i> spp.	35128.96	4391.12±1004.82	9514.53	2378.63±487.86	25614.43	6403.61±1331.79
<i>Scleria terrestris</i>	566.92	80.99±54.41	38.51	12.84±2.59	528.41	132.10±91.25
<i>Setaria palmifolia</i>	7.83	7.83±0.00	0.00	0.00	7.83	7.83±0.00

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Setaria pumila</i>	169.33	84.67±15.29	0.00	0.00	169.33	84.67±15.29
<i>Solanum viarum</i>	1.53	1.53±0.00	1.53	1.53±0.00	0.00	0.00
<i>Tetragastigma dubium</i>	11.72	5.86±3.26	9.12	9.12±0.00	2.60	2.60±0.00
<i>Urena lobata</i>	8.65	8.65±0.00	0.00	0.00	8.65	8.65±0.00
<i>Woodfordia fruticosa</i>	93.25	46.62±15.61	0.00	0.00	93.25	46.62±15.61

SE- standard error.

Appendix Table 5.25. Overall and seasonal species-wise aboveground biomass productivity (g m⁻²) recorded from herbivore exclusion in tall grassland burning (HETB) during 2014-15 in Kaziranga National Park, Assam, India.

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Adiantum philippense</i>	2.96	2.96±0.00	0.00	0.00	2.96	2.96±0.00
<i>Ageratum conyzoides</i>	5.29	2.65±1.00	5.29	2.65±1.00	0.00	0.00
<i>Alpinia nigra</i>	9854.85	615.93±170.95	3979.02	497.38±78.27	5875.83	734.48±339.27
<i>Apluda mutica</i>	207.10	29.59±11.92	18.65	9.33±1.37	188.45	37.69±15.52
<i>Arenaria serpyllifolia</i>	3.80	3.80±0.00	0.00	0.00	3.80	3.80±0.00
<i>Bombax ceiba</i>	2113.88	192.17±88.71	689.34	114.89±36.96	1424.54	284.91±193.11
<i>Capillipedium assimile</i>	23.15	23.15±0.00	0.00	0.00	23.15	23.15±0.00
<i>Capsella bursa-pastoris</i>	6.54	6.54±0.00	0.00	0.00	6.54	6.54±0.00
<i>Carex vesicaria</i>	49.38	24.69±15.73	8.96	8.96±0.00	40.42	40.42±0.00
<i>Centella asiatica</i>	17.78	17.78±0.00	0.00	0.00	17.78	17.78±0.00
<i>Christella parasitica</i>	246.93	16.46±2.76	128.65	16.08±3.85	118.28	16.90±4.27
<i>Cissampelos pareira</i>	0.77	0.77±0.00	0.00	0.00	0.77	0.77±0.00
<i>Crassocephalum crepidioides</i>	5.13	2.56±1.03	5.13	2.56±1.03	0.00	0.00
<i>Cuphea carthagenensis</i>	95.65	47.83±42.61	0.00	0.00	95.65	47.83±42.61
<i>Cynodon dactylon</i>	212.91	53.23±45.58	3.59	3.59±0.00	209.32	69.77±60.07
<i>Cyperus cyperoides</i>	1.41	1.41±0.00	0.00	0.00	1.41	1.41±0.00
<i>Cyperus eragrostis</i>	34.89	17.45±8.77	0.00	0.00	34.89	17.45±8.77
<i>Desmodium heterocarpon</i>	4.72	4.72±0.00	0.00	0.00	4.72	4.72±0.00
<i>Digitaria ciliaris</i>	4.57	4.57±0.00	0.00	0.00	4.57	4.57±0.00
<i>Duchesnea indica</i>	3.69	1.85±0.19	2.03	2.03±0.00	1.66	1.66±0.00
<i>Elydra fluctuans</i>	29.36	29.36±0.00	0.00	0.00	29.36	29.36±0.00
<i>Ethulia conyzoides</i>	0.68	0.68±0.00	0.00	0.00	0.68	0.68±0.00
<i>Euphorbia hirta</i>	1.12	1.12±0.00	0.00	0.00	1.12	1.12±0.00
<i>Euphorbia thymifolia</i>	5.81	1.45±0.36	2.22	1.11±0.22	3.59	1.80±0.69
<i>Flemingia lineata</i>	189.18	21.02±6.80	103.38	25.84±9.38	85.80	17.16±10.27
<i>Floscopa scandens</i>	1.51	1.51±0.00	0.00	0.00	1.51	1.51±0.00
<i>Flueggea virosa</i>	261.85	130.93±91.61	39.32	39.32±0.00	222.53	222.53±0.00
<i>Fuirena umbellata</i>	36.99	18.50±16.00	36.99	18.50±16.00	0.00	0.00
<i>Heliotropium strigosum</i>	1.40	1.40±0.00	0.00	0.00	1.40	1.40±0.00
<i>Helminthostachys zeylanica</i>	9.99	9.99±0.00	0.00	0.00	9.99	9.99±0.00
<i>Hemarthria compressa</i>	391.48	48.94±19.74	107.42	26.86±20.16	284.06	71.02±32.96
<i>Ichnocarpus frutescens</i>	25.94	12.97±3.45	9.52	9.52±0.00	16.42	16.42±0.00
<i>Imperata cylindrica</i>	54.41	18.14±6.43	0.00	0.00	54.41	18.14±6.43
<i>Kyllinga brevifolia</i>	2.09	2.09±0.00	2.09	2.09±0.00	0.00	0.00
<i>Leersia hexandra</i>	1.13	1.13±0.00	0.00	0.00	1.13	1.13±0.00
<i>Litsea salicifolia</i>	165.89	82.94±67.91	15.03	15.03±0.00	150.86	150.86±0.00
<i>Lygodium flexuosum</i>	53.70	6.71±2.22	22.53	3.76±1.43	31.16	15.58±1.54
<i>Merremia spp.</i>	80.12	80.12±0.00	0.00	0.00	80.12	80.12±0.00
<i>Merremia umbellata</i>	2909.42	223.80±74.11	1236.91	176.70±26.13	1672.51	278.75±162.73
<i>Mikania micrantha</i>	1219.54	152.44±55.16	1104.39	184.06±69.83	115.16	57.58±6.04
<i>Mimosa spp.</i>	50.52	25.26±22.61	50.52	25.26±22.61	0.00	0.00
<i>Nelsonia canescens</i>	21.33	10.66±5.48	0.00	0.00	21.33	10.66±5.48
<i>Panicum notatum</i>	16.60	8.30±5.66	16.60	8.30±5.66	0.00	0.00
<i>Paspalum conjugatum</i>	35.99	35.99±0.00	0.00	0.00	35.99	35.99±0.00
<i>Paspalum scrobiculatum</i>	16.60	16.60±0.00	0.00	0.00	16.60	16.60±0.00
<i>Peperomia pellucida</i>	1.67	1.67±0.00	0.00	0.00	1.67	1.67±0.00
<i>Persicaria hydropiper</i>	14.44	14.44±0.00	0.00	0.00	14.44	14.44±0.00
<i>Peucedanum spp.</i>	6.99	6.99±0.00	6.99	6.99±0.00	0.00	0.00
<i>Phyllanthus niruri</i>	8.48	2.83±1.29	0.00	0.00	8.48	2.83±1.29
<i>Polygonum plebeium</i>	9.12	9.12±0.00	0.00	0.00	9.12	9.12±0.00
<i>Polygonum viscosum</i>	1.69	1.69±0.00	0.00	0.00	1.69	1.69±0.00

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Pouzolzia</i> spp.	15.07	3.77±1.87	0.00	0.00	15.07	3.77±1.87
<i>Pouzolzia zeylanica</i>	30.95	30.95±0.00	30.95	30.95±0.00	0.00	0.00
<i>Saccharum</i> spp.	208387.67	13024.23±1736.34	56027.77	7003.47±1140.07	152359.91	19044.99±1124.37
<i>Scleria terrestris</i>	434.14	48.24±13.19	71.13	35.56±4.30	363.02	51.86±16.96
<i>Senna tora</i>	5.41	5.41±0.00	0.00	0.00	5.41	5.41±0.00
<i>Setaria palmifolia</i>	17.46	8.73±5.04	0.00	0.00	17.46	8.73±5.04
<i>Setaria pumila</i>	19.76	9.88±3.55	19.76	9.88±3.55	0.00	0.00
<i>Sonchus oleraceus</i>	5.79	2.89±2.19	5.79	2.89±2.19	0.00	0.00
<i>Tetraglia dubium</i>	10.97	5.49±2.37	0.00	0.00	10.97	5.49±2.37
<i>Viola betonicifolia</i>	1.13	1.13±0.00	1.13	1.13±0.00	0.00	0.00
<i>Zephyranthes atamasco</i>	3.85	3.85±0.00	0.00	0.00	3.85	3.85±0.00

SE= standard error.

Appendix Table 5.26. Overall and seasonal species-wise aboveground biomass productivity (g m⁻²) recorded from herbivore exclusion in tall grassland invasive removal (HETIR) during 2014-15 in Kaziranga National Park, Assam, India.

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Acmella uliginosa</i>	7.78	3.89±1.20	7.78	3.89±1.20	0.00	0.00
<i>Ageratum conyzoides</i>	50.76	5.64±2.15	40.04	10.01±4.00	10.72	2.14±0.32
<i>Alpinia nigra</i>	4999.50	277.75±52.23	2035.15	203.52±45.46	2964.35	370.54±96.81
<i>Alternanthera pungens</i>	1.26	1.26±0.00	1.26	1.26±0.00	0.00	0.00
<i>Alternanthera sessilis</i>	84.50	7.68±1.19	35.53	7.11±1.28	48.97	8.16±2.00
<i>Cajanus scarabaeoides</i>	8.77	2.92±2.07	0.25	0.25±0.00	8.52	4.26±2.75
<i>Capillipedium assimile</i>	77.59	77.59±0.00	0.00	0.00	77.59	77.59±0.00
<i>Carex vesicaria</i>	9.24	4.62±1.20	9.24	4.62±1.20	0.00	0.00
<i>Christella parasitica</i>	321.82	18.93±3.45	182.62	20.29±4.39	139.21	17.40±5.68
<i>Crassocephalum crepidioides</i>	27.86	9.29±3.70	27.86	9.29±3.70	0.00	0.00
<i>Cuphea carthagenensis</i>	102.51	14.64±6.49	0.23	0.23±0.00	102.27	17.05±7.13
<i>Cynodon dactylon</i>	349.65	24.97±6.70	219.86	27.48±11.36	129.79	21.63±5.22
<i>Cyperus eragrostis</i>	25.15	5.03±2.24	1.09	1.09±0.00	24.06	6.02±2.59
<i>Digitaria ciliaris</i>	6.12	6.12±0.00	0.00	0.00	6.12	6.12±0.00
<i>Dysphania ambrosioides</i>	3.78	3.78±0.00	0.00	0.00	3.78	3.78±0.00
<i>Eclipta prostrata</i>	9.82	2.45±1.16	0.35	0.35±0.00	9.46	3.15±1.30
<i>Ethulia conyzoides</i>	6.06	2.02±1.07	1.20	1.20±0.00	4.86	2.43±1.72
<i>Euphorbia hirta</i>	8.71	2.90±1.39	0.00	0.00	8.71	2.90±1.39
<i>Euphorbia thymifolia</i>	1.87	1.87±0.00	0.00	0.00	1.87	1.87±0.00
<i>Flemingia lineata</i>	871.38	51.26±11.63	688.64	68.86±17.04	182.74	26.11±8.64
<i>Flueggea virosa</i>	354.49	44.31±19.54	140.93	46.98±24.58	213.56	42.71±29.76
<i>Fuirena umbellata</i>	13.40	6.70±5.92	12.62	12.62±0.00	0.78	0.78±0.00
<i>Glochidion multiloculare</i>	404.54	67.42±48.42	86.39	28.80±8.87	318.15	106.05±100.75
<i>Grangea maderaspatana</i>	3.83	1.91±1.71	3.83	1.91±1.71	0.00	0.00
<i>Heliotropium indicum</i>	4.48	1.49±0.63	0.00	0.00	4.48	1.49±0.63
<i>Hemarthria compressa</i>	305.15	27.74±8.76	123.05	24.61±8.84	182.09	30.35±15.04
<i>Hydrocotyle sibthorpioides</i>	3.02	1.51±0.66	0.00	0.00	3.02	1.51±0.66
<i>Hyptis suaveolens</i>	2.08	2.08±0.00	2.08	2.08±0.00	0.00	0.00
<i>Ichnocarpus frutescens</i>	2.74	1.37±0.39	1.76	1.76±0.00	0.99	0.99±0.00
<i>Kyllinga brevifolia</i>	12.78	12.78±0.00	0.00	0.00	12.78	12.78±0.00
<i>Leucas aspera</i>	5.10	5.10±0.00	5.10	5.10±0.00	0.00	0.00
<i>Litsea salicifolia</i>	474.37	79.06±23.94	244.75	81.58±42.46	229.62	76.54±32.50
<i>Lygodium flexuosum</i>	361.85	27.83±12.75	238.83	29.85±20.54	123.01	24.60±9.14
<i>Merremia</i> spp.	117.62	58.81±41.50	0.00	0.00	117.62	58.81±41.50
<i>Merremia umbellata</i>	1485.34	87.37±26.30	311.17	34.57±8.44	1174.17	146.77±48.13
<i>Oxalis corniculata</i>	37.13	3.71±1.28	4.78	1.20±0.46	32.35	5.39±1.86
<i>Panicum notatum</i>	5.66	2.83±1.17	1.66	1.66±0.00	4.00	4.00±0.00
<i>Paspalum conjugatum</i>	343.35	31.21±6.54	97.88	24.47±3.77	245.47	35.07±10.06
<i>Paspalum scrobiculatum</i>	63.79	21.26±8.88	26.57	26.57±0.00	37.22	18.61±14.67
<i>Persicaria lapathifolia</i>	13.58	13.58±0.00	0.00	0.00	13.58	13.58±0.00
<i>Persicaria orientalis</i>	5.27	5.27±0.00	0.00	0.00	5.27	5.27±0.00
<i>Pimpinella</i> sp.	11.75	5.87±1.22	0.00	0.00	11.75	5.87±1.22
<i>Polycarpon prostratum</i>	50.47	25.24±5.71	0.00	0.00	50.47	25.24±5.71
<i>Polygonum viscosum</i>	1.86	1.86±0.00	1.86	1.86±0.00	0.00	0.00
<i>Pouzolzia</i> spp.	14.30	4.77±2.34	0.00	0.00	14.30	4.77±2.34

Species	Overall		Dry season		Wet season	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
<i>Pouzolzia zeylanica</i>	101.88	14.55±4.70	0.00	0.00	101.88	14.55±4.70
<i>Rauvolfia serpentina</i>	2.69	2.69±0.00	0.00	0.00	2.69	2.69±0.00
<i>Rorippa indica</i>	23.62	11.81±0.27	0.00	0.00	23.62	11.81±0.27
<i>Saccharum</i> spp.	151061.68	8392.32±1149.80	46631.34	4663.13±723.74	104430.34	13053.79±891.45
<i>Scleria terrestris</i>	101.08	20.22±7.93	15.24	7.62±7.37	85.84	28.61±10.16
<i>Setaria pumila</i>	9.66	9.66±0.00	0.00	0.00	9.66	9.66±0.00
<i>Stachytarpheta indica</i>	51.00	12.75±2.46	7.78	7.78±0.00	43.22	14.41±2.57
<i>Tetragium dubium</i>	2.98	1.49±0.50	0.00	0.00	2.98	1.49±0.50
<i>Themeda villosa</i>	296.41	296.41±0.00	296.41	296.41±0.00	0.00	0.00
<i>Zephyranthes atamasco</i>	4.91	2.46±0.26	0.00	0.00	4.91	2.46±0.26

SE- standard error.

Appendix Table 5.27. Mann-Whitney significance between experimental sites aboveground biomass productivity (g m^{-2}) of invasives (*Mimosa* spp. and *Mikania micrantha*) recorded from riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Seasons	Test		Aboveground biomass productivity (g m ⁻²)		
				<i>Mimosa</i> spp.	<i>Mikania micrantha</i>	Total invasion
HET-HIT	Overall	Mann-Whitney	U	56.00	65.00	66.00
	Dry		P	0.74	1.00	1.00
			U	10.00	12.00	14.00
			P	0.25	1.00	1.00
	Wet		U	14.00	9.00	12.00
			P	1.00	1.00	1.00
	Between dry & wet		U	38.00	83.00	82.00
P	0.02*	0.96	0.92			
HET-HETB	Overall	Mann-Whitney	U	24.00	92.00	76.00
	Dry		P	0.00*	1.00	1.00
			U	13.00	39.00	33.00
			P	0.01	1.00	1.00
	Wet		U	0.00	11.00	7.00
			P	0.00*	0.20	0.05
	Between dry & wet		U	139.00	75.00	84.00
P	0.86	0.02*	0.04*			
HET-HETIR	Overall	Mann-Whitney	U	41.00	38.00	19.00
	Dry		P	0.00*	0.11	0.02
			U	21.00	12.00	8.00
			P	0.03	0.76	0.47
	Wet		U	2.00	5.00	0.00
			P	0.01	0.11	0.03
	Between dry & wet		U	139.50	118.00	130.00
P	0.51	0.18	0.34			
HIT-HETB	Overall	Mann-Whitney	U	19.00	51.00	35.00
	Dry		P	0.17	1.00	1.00
			U	11.00	11.00	15.00
			P	1.00	1.00	1.00
	Wet		U	0.00	2.00	0.00
			P	0.15	0.43	0.38
	Between dry & wet		U	64.00	52.00	48.00
P	0.58	0.23	0.16			
HIT-HETIR	Overall	Mann-Whitney	U	36.00	35.00	11.00
	Dry		P	0.39	0.58	0.14
			U	19.00	19.00	8.00
			P	1.00	1.00	0.84
	Wet		U	0.00	0.00	0.00
			P	0.25	0.27	0.27
	Between dry & wet		U	58.50	76.00	84.00
P	0.18	0.67	1.00			
HETB-HETIR	Overall	Mann-Whitney	U	82.00	123.00	129.00
	Dry		P	1.00	0.31	0.47
			U	30.00	20.00	21.00
			P	1.00	0.16	0.22

Experimental sites	Seasons	Test	Aboveground biomass productivity (g m ⁻²)		
			<i>Mimosa</i> spp.	<i>Mikania micrantha</i>	Total invasion
TG	Wet	U	12.00	25.00	22.00
		P	1.00	1.00	1.00
	Between dry & wet	U	124.50	84.00	83.00
		P	0.43	0.03*	0.03*
	Overall	χ^2	28.26	13.60	21.80
		df	3.00	3.00	3.00
		P	0.00*	0.00*	0.00*
		χ^2	8.87	7.81	9.84
		df	3.00	3.00	3.00
		P	0.03*	0.05*	0.02*
	Dry	χ^2	22.01	14.29	17.86
		df	3.00	3.00	3.00
		P	0.00*	0.00*	0.00*
	Wet	U	387.50	340.00	341.00
		P	0.35	0.11	0.11
	Between dry & wet	U	387.50	340.00	341.00
		P	0.35	0.11	0.11

TG- tall grassland, HET- herbivore exclusion in tall grassland, HIT- herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal, U- Mann-Whitney test value, χ^2 - chi square value, df- degree of freedom and *indicates significant result at $P < 0.01$ (Corrected for Bonferroni) except for TG and comparison between dry and wet seasons at $P < 0.05$.

Appendix Table 5.28. Independent sample T-test between dry and wet season's belowground biomass productivity (g m⁻²) recorded from herbivore inclusion in short grassland (HIS) and herbivore inclusion in tall grassland (HIT) during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Independent samples T-test	Belowground biomass productivity (g m ⁻²)
HIS	t	4.82
	df	6
	P	0.00*
HIT	t	3.34
	df	6
	P	0.02*
Total (HIS & HIT)	t	1.48
	df	14
	P	0.16

HIS- herbivore inclusion in short grassland, HIT- herbivore inclusion in tall grassland, t-Independent samples test value, df- degree of freedom and *indicates significant result at $P < 0.05$

Appendix Table 5.29. Independent sample T-test between experimental sites belowground biomass productivity (g m⁻²) recorded from riverine alluvial grasslands during 2014-15 in Kaziranga National Park, Assam, India.

Experimental sites	Seasons	Independent samples T-test	Belowground biomass productivity (g m ⁻²)
HIS & HIT	Overall	t	-6.77
		df	14
		P	0.00*
	Dry	t	-7.34
		df	6
		P	0.00*
	Wet	t	-9.1
		df	6
		P	0.00*
	Between dry & wet	t	1.48
		df	14
		P	0.16

HIS- herbivore inclusion in short grassland, HIT- herbivore inclusion in tall grassland, t- Independent samples test value, df- degree of freedom and *indicates significant result at $P < 0.05$

APPENDIX 6: Resource dependence and attitudes of local communities toward conservation of Kaziranga Tiger Reserve

Appendix Table 6.1. GPS coordinates of villages and entry point selected for socio-economic and entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Forest Range	Village	GPS (Location)					
		Village		Thatching/Fodder/Fuelwood entry point		Fishing entry point	
		Latitude	Latitude	Latitude	Latitude	Latitude	Latitude
Agoratoli	Bamun Gaon	26.701722	93.622417	26.702306	93.622278	26.698194	93.622444
Agoratoli	Beloguri	26.675000	93.597583	26.680694	93.602889	26.681611	93.603611
Agoratoli	Tamuli Pathar	26.663333	93.525694	26.665472	93.523750	26.662889	93.531778
Agoratoli	Japari Pathar	26.655639	93.530611	26.656000	93.516778	26.649722	93.533667
Agoratoli	Methoni Tea Estate	26.618444	93.513000	26.626611	93.506500	26.622000	93.513500
Agoratoli	Borjuri Tea Estate	26.638528	93.544056	26.634028	93.547861	26.637250	93.539167
Kohora	Halidhibari	26.585917	93.360194	26.581944	93.360139	26.584306	93.359778
Kohora	Siljuri	26.620222	93.518306	26.619667	93.519167	26.627444	93.523528
Kohora	No.1 Sildubi	26.605222	93.426139	26.610694	93.425778	26.610694	93.425778
Kohora	No.2 Sildubi	26.589389	93.393472	26.598583	93.385250	26.594139	93.373667
Kohora	Goshanibar	26.618944	93.495500	26.619389	93.496833	26.619250	93.496139
Kohora	Domjan No.1	26.615861	93.470389	26.618028	93.468333	26.618167	93.466139
Kohora	Domjan No.2	26.616806	93.487583	26.617556	93.488000	26.617389	93.486111
Kohora	Kaziranga N.C.	26.580222	93.378444	26.579222	93.379417	26.580167	93.378972
Kohora	Mohpara	26.608361	93.458583	26.613861	93.456417	26.614278	93.454806
Kohora	No.2 Kohora	26.598806	93.444917	26.613611	93.441917	26.613611	93.441917
Kohora	Panbari Reserved Forest	26.621389	93.544500	26.612500	93.544889	26.614417	93.545083
Kohora	Hatikhuli Tea Estate	26.589000	93.396083	26.580528	93.394250	26.593333	93.385111
Bagori	Bagari	26.578944	93.284194	26.582694	93.286611	26.582611	93.281667
Bagori	Harmati No.1	26.581306	93.272000	26.581250	93.267250	26.581333	93.267167
Bagori	Na-Jan N.C.	26.579194	93.250139	26.579139	93.253583	26.581528	93.248750
Bagori	Na-Jan	26.575444	93.239111	26.579528	93.238889	26.579056	93.242861
Bagori	Baghmari	26.581750	93.212639	26.582111	93.212639	26.582472	93.213500
Bagori	Kawaimari	26.573222	93.151583	26.568722	93.132556	26.570917	93.132389
Bagori	Bandar Dubi	26.586111	93.202417	26.583333	93.206972	26.585778	93.203917
Bagori	Deopani	26.574944	93.200417	26.574972	93.196083	26.570056	93.201611
Burapahar	Nahrubasti	26.572889	93.148139	26.575778	93.151778	26.576750	93.149194
Burapahar	Burapahar No.1	26.570667	93.144556	26.572694	93.142861	26.572583	93.143639
Burapahar	Kanchanjuri	26.574111	93.170722	26.576194	93.169056	26.572861	93.171306
Biswanath	Pachi Gaon	26.667833	93.045083	26.666194	93.047778	26.664861	93.054667
Biswanath	Kathani Basti	26.756556	93.296944	26.753250	93.297806	26.747639	93.294694

Appendix Table 6.2. Census (2011) based secondary information of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	District	Total geographical area (in hectare)		Household (in No.)	Population (in No.)														
					Total			Illiterate			Literate			Working			Non-working		
		Village	Forest area		Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total
Bamg	Gol	1040.09	0.00	48	166	153	319	134	98	232	32	55	87	78	70	148	88	83	171
Belo	Gol	277.34	8.09	162	439	517	956	295	252	547	144	265	409	252	264	516	187	253	440
Tamp	Gol	184.91	0.00	99	256	271	527	75	73	148	181	198	379	58	153	211	198	118	316
Japp	Gol	187.28	0.00	63	141	156	297	42	21	63	99	135	234	66	83	149	75	73	148
Meth	Gol	191.27	12.05	391	877	872	1749	501	315	816	376	557	933	391	507	898	486	365	851
Borj	Gol	320.34	0.00	245	595	606	1201	337	210	547	258	396	654	223	317	540	372	289	661
Hali	Gol	119.25	0.00	84	169	244	413	54	44	98	115	200	315	19	139	158	150	105	255
Silj	Gol	157.88	28.11	139	284	300	584	197	130	327	87	170	257	123	171	294	161	129	290
Sild1	Gol	457.79	317.07	126	284	310	594	91	87	178	193	223	416	115	182	297	169	128	297
Sild2	Gol	186.82	0.00	112	297	327	624	192	179	371	105	148	253	18	140	158	279	187	466
Gosh	Gol	250.41	0.00	229	505	564	1069	246	185	431	259	379	638	169	325	494	336	239	575
Domj1	Gol	113.05	0.00	68	162	179	341	87	73	160	75	106	181	70	105	175	92	74	166
Domj2	Gol	116.99	0.00	28	73	72	145	40	31	71	33	41	74	17	40	57	56	32	88
Kazi	Gol	185.91	185.91	33	118	122	240	82	71	153	36	51	87	45	60	105	73	62	135
Mohp	Gol	222.47	0.00	104	264	265	529	121	105	226	143	160	303	22	154	176	242	111	353
Koho2	Gol	225.52	0.00	126	312	360	672	155	114	269	157	246	403	19	141	160	293	219	512
Panb	Gol	7.66	7.66	7	7	18	25	0	0	0	7	18	25	0	14	14	7	4	11
Hati	Gol	601.13	0.00	968	2245	2374	4619	1354	1051	2405	891	1323	2214	813	1289	2102	1432	1085	2517
Baga	Nag	145.52	0.00	278	602	621	1223	265	195	460	337	426	763	97	349	446	505	272	777
Harm	Nag	128.16	0.00	259	663	727	1390	399	346	745	264	381	645	111	402	513	552	325	877
Nanc	Nag	16.83	0.00	46	132	130	262	75	73	148	57	57	114	10	70	80	122	60	182
Naja	Nag	124.27	0.00	442	1067	1067	2134	480	389	869	587	678	1265	253	617	870	814	450	1264
Bagh	Nag	137.93	0.00	145	334	369	703	114	94	208	220	275	495	101	215	316	233	154	387
Kawa	Nag	227.27	213.16	5	18	14	32	6	8	14	12	6	18	5	6	11	13	8	21
Band	Nag	300.46	0.00	224	636	650	1286	430	422	852	206	228	434	45	263	308	591	387	978
Deop	Nag	521.95	369.63	155	415	417	832	240	174	414	175	243	418	73	200	273	342	217	559
Nahr	Nag	42.97	0.00	76	159	176	335	101	65	166	58	111	169	41	95	136	118	81	199
Bura1	Nag	14.31	0.00	12	26	28	54	13	9	22	13	19	32	11	15	26	15	13	28
Kanc	Nag	104.69	0.00	59	127	121	248	57	29	86	70	92	162	29	73	102	98	48	146
Pacg	Soni	255.83	0.00	195	469	508	977	77	64	141	392	444	836	114	335	449	355	173	528
Katb	Soni	50.64	0.00	52	102	110	212	47	40	87	55	70	125	5	74	79	97	36	133
Total		6916.94	1141.68	4980	11944	12648	24592	6307	4947	11254	5637	7701	13338	3393	6868	10261	8551	5780	14331

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, Gol- Golaghat, Nag-Nagaon, Soni-Sonitpur and No.- number.

Appendix Table 6.3. Census (2011) based secondary information on facilities available in villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Facilities		Villages (n=31)					
		Yes		No		Available within <5 to >10 km	
		Total	%	Total	%	Total	%
Education	Government primary school	28	90.32	3	9.68	0	0.00
	Government middle school	9	29.03	22	70.97	0	0.00
	Government secondary school	2	6.45	29	93.55	0	0.00
	Government senior secondary school	0	0.00	31	100	0	0.00
Health	Primary health centre	0	0.00	0	0.00	31	100
	Family welfare centre	0	0.00	6	19.35	25	80.65
	Maternity and child welfare centre	0	0.00	2	6.45	29	93.55
	Mobile health clinic	0	0.00	4	12.90	27	87.10
	Veterinary hospital	0	0.00	0	0.00	31	100
Others	Post office	0	0.00	2	6.45	29	93.55
	Sub-post office	4	12.90	9	29.03	18	58.07
	Agricultural credit society	1	3.23	0	0.00	30	96.77
	Agricultural marketing society	4	12.90	0	0.00	27	87.10
	Accredited social health activist (ASHA)	18	58.06	0	0.00	13	41.94
	Self-help group (SHG)	19	61.29	0	0.00	12	38.71
	Anganwadi centre	24	77.42	0	0.00	7	22.58
	Integrated child development services	17	54.84	0	0.00	14	45.16
	Public distribution system (PDS)	11	35.48	0	0.00	20	64.52
	Drainage system	4	12.90	27	87.10	0	0.00
	Total sanitation campaign (TSC)	1	3.23	30	96.77	0	0.00

n- number of villages.

Appendix Table 6.4. Distance from home to Reserve, National Highway and nearby River/beel of selected villages for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Household (in No.)	Distance (in km)						Survey (15%)	Remarks
		Home to Reserve		Home to Highway		Home to River/beel			
		Total	Mean±SE	Total	Mean±SE	Total	Mean±SE		
Bamg	9	4.20	0.47±0.02	41.65	4.63±0.12	4.30	0.48±0.01	Complete	
Belo	26	9.44	0.36±0.05	81.97	3.15±0.07	9.44	0.36±0.05	Complete	
Tamp	20	4.40	0.22±0.01	64.60	3.23±0.10	4.40	0.22±0.01	Complete	
Japp	13	2.70	0.21±0.05	35.18	2.71±0.04	8.10	0.62±0.08	Complete	
Meth	76	77.70	1.02±0.02	10.00	0.13±0.01	34.50	0.45±0.01	Complete	
Borj	49	61.00	1.24±0.05	53.82	1.10±0.03	43.40	0.89±0.06	Complete	
Hali	14	1.03	0.07±0.01	0.37	0.03±0.01	4.70	0.34±0.12	Complete	
Silj	28	5.25	0.19±0.02	17.54	0.63±0.10	3.80	0.14±0.01	Complete	
Sild1	21	3.60	0.17±0.02	25.40	1.21±0.03	9.50	0.45±0.01	Complete	
Sild2	17	4.20	0.25±0.02	0.81	0.05±0.00	4.10	0.24±0.02	Complete	

Village	Household (in No.)	Distance (in km)						Survey (15%)	Remarks
		Home to Reserve		Home to Highway		Home to River/beel			
		Total	Mean±SE	Total	Mean±SE	Total	Mean±SE		
Gosh	44	15.15	0.34±0.03	39.75	0.90±0.03	37.40	0.85±0.09	Complete	
Domj1	14	5.00	0.36±0.02	12.30	0.88±0.02	10.55	0.75±0.07	Complete	
Domj2	6	2.20	0.37±0.01	2.90	0.48±0.03	3.30	0.55±0.16	Complete	
Kazi	7	2.50	0.36±0.04	7.45	1.06±0.05	1.90	0.27±0.02	Complete	
Mohp	21	10.60	0.50±0.01	35.63	1.70±0.04	10.30	0.49±0.02	Complete	
Koho2	25	16.70	0.67±0.05	17.00	0.68±0.02	17.00	0.68±0.04	Complete	
Panb	7	3.60	0.51±0.03	1.00	0.14±0.02	1.30	0.19±0.03	Complete	
Hati	18	18.20	1.01±0.08	0.60	0.03±0.00	21.30	1.18±0.05	Incomplete	ESZ
Baga	51	23.60	0.46±0.01	1.24	0.02±0.00	37.30	0.73±0.03	Complete	
Harm	32	15.40	0.48±0.03	7.20	0.23±0.01	15.40	0.48±0.03	Complete	
Nanc	9	1.15	0.13±0.01	3.00	0.33±0.02	1.70	0.19±0.03	Complete	
Naja	33	13.40	0.41±0.02	1.96	0.06±0.00	14.30	0.43±0.02	Incomplete	ESZ
Bagh	24	10.00	0.42±0.04	10.90	0.45±0.03	10.00	0.42±0.04	Complete	
Kawa	3	0.50	0.17±0.02	0.90	0.30±0.06	0.45	0.15±0.00	Complete	
Band	10	1.40	0.14±0.02	8.70	0.87±0.03	2.20	0.22±0.04	Incomplete	ESZ/Eviction
Deop	26	10.30	0.40±0.02	5.30	0.20±0.01	6.30	0.24±0.02	Complete	
Nahr	15	6.40	0.43±0.04	3.80	0.25±0.02	6.40	0.43±0.04	Complete	
Bura1	2	0.25	0.13±0.03	0.70	0.35±0.05	0.90	0.45±0.05	Complete	
Kanc	10	1.30	0.13±0.02	0.40	0.04±0.00	2.80	0.28±0.03	Complete	
Pacg	19	4.65	0.24±0.02	169.30	8.91±0.22	15.00	0.79±0.11	Incomplete	No response
Katb	14	4.10	0.29±0.03	43.80	3.13±0.15	6.40	0.46±0.01	Complete	
Total	663	339.92	0.51±0.01	705.17	1.06±0.07	348.44	0.53±0.01		

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, Gol- Golaghat, Nag-Nagaon, Soni-Sonitpur, No.- number, km- kilometres, SE- standard error and ESZ- eco-sensitive zone issue.

Appendix Table 6.5. Kruskal-Wallis significance test among village parameters selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Parameters	χ^2	df	P
Distance from home to Reserve (in km)	491.14	30	0.00*
Distance from home to National highway (in km)	632.35	30	0.00*
Distance from home to nearby River/beel (in km)	361.77	30	0.00*
Family size	40.46	30	0.10
Household total area (in katha)	214.80	30	0.00*
Household total buildup area (in katha)	223.56	30	0.00*
Own agriculture land (in ha)	77.38	29	0.00*

Parameters	χ^2	df	P
Agriculture sharecropping land (in ha)	37.54	23	0.03*
Rice annual production quantity (in kg)	131.49	29	0.00*
Rice annual production quantity (in quintal)	131.49	29	0.00*
Rice annual sale quantity (in quintal)	44.89	29	0.03*
Rice annual self-consumption quantity (in quintal)	127.11	29	0.00*
Annual income from Rice sale (INR/annum)	127.11	29	0.00*
Mustard annual production quantity (in kg)	47.58	22	0.00*
Mustard annual production quantity (in quintal)	47.58	22	0.00*
Mustard annual sale quantity (in quintal)	23.03	22	0.40
Mustard annual self-consumption quantity (in quintal)	47.58	22	0.00*
Annual income from Mustard sale (INR/annum)	47.58	22	0.00*
Tea annual production quantity (in kg)	0.58	1	0.45
Tea annual production quantity (in quintal)	0.58	1	0.45
Tea annual sale quantity (in quintal)	0.01	1	0.90
Tea annual self-consumption quantity (in quintal)	0.57	1	0.45
Annual income from Tea sale (INR/annum)	0.57	1	0.45
Annual income from Agriculture (INR/annum)	139.95	29	0.00*
Annual income from Wage labour (INR/annum)	50.81	29	0.01*
Annual income from Private Job (INR/annum)	34.77	24	0.07
Annual income from Government Job (INR/annum)	15.33	16	0.50
Annual income from Small business (INR/annum)	20.55	24	0.67
Annual income from Handicrafts (INR/annum)	5.00	5	0.42
Annual income from Mekhela weaving (INR/annum)	20.53	13	0.08
Annual income from Tourism (INR/annum)	16.09	12	0.19
Home gardening area (in katha)	147.37	29	0.00*
Annual income from home gardening (INR/annum)	32.16	27	0.23
Total number of Livestock	112.90	30	0.00*
Animal Husbandry Milk production (litres/day)	58.48	28	0.00*
Animal Husbandry Milk production (litres/annum)	53.95	28	0.00*
Animal Husbandry Milk self-consumption quantity (litres/annum)	39.43	28	0.07
Animal Husbandry Milk sale quantity (litres/annum)	35.89	24	0.06
Annual income from Milk sale (INR/annum)	35.89	24	0.06
Annual income from Pig/Goat/Poultry product sale (INR/annum)	50.08	28	0.01*
Annual income from Animal Husbandry (INR/annum)	61.07	28	0.00*
Annual income from Other sources (INR/annum)	25.99	20	0.17
Total annual income from occupation (INR/annum)	123.91	30	0.00*
Thatch annual purchase quantity (in kg)	34.22	26	0.13
Thatch material annual purchase expenditure (in INR)	34.05	26	0.13
Thatch extraction quantity inside Reserve (day/kg)	54.53	27	0.00*
Thatch extraction inside Reserve self-consumption quantity (day/kg)	43.62	27	0.02*
Thatch extraction inside Reserve sale quantity (day/kg)	17.41	22	0.74

Parameters	χ^2	df	P
Thatch extraction quantity inside Reserve (kg/annum)	34.76	27	0.15
Thatch extraction inside Reserve self-consumption quantity (kg/annum)	25.42	27	0.55
Thatch extraction inside Reserve sale quantity (kg/annum)	18.94	22	0.65
Thatch extraction quantity outside Reserve (day/kg)	158.62	30	0.00*
Thatch extraction outside Reserve self-consumption quantity (day/kg)	102.92	30	0.00*
Thatch extraction outside Reserve sale quantity (day/kg)	48.15	25	0.00*
Thatch extraction quantity outside Reserve (kg/annum)	98.09	30	0.00*
Thatch extraction outside Reserve self-consumption quantity (kg/annum)	66.85	30	0.00*
Thatch extraction quantity outside Reserve sale (kg/annum)	35.96	25	0.07
Total thatch extraction quantity (kg/annum)	77.54	30	0.00*
Total thatch extraction self-consumption quantity (kg/annum)	57.28	30	0.00*
Total thatch extraction sale quantity (kg/annum)	44.58	28	0.02*
Annual income from thatch sale (INR/annum)	42.45	28	0.04*
Fodder annual purchase quantity (in kg)	15.07	11	0.18
Fodder material annual purchase expenditure (in INR)	11.45	11	0.41
Fodder extraction quantity inside Reserve (day/kg)	5.78	6	0.45
Fodder extraction inside Reserve self-consumption quantity (day/kg)	8.29	6	0.22
Fodder extraction inside Reserve sale quantity (day/kg)	4.06	5	0.54
Fodder extraction quantity inside Reserve (kg/annum)	7.53	6	0.27
Fodder extraction inside Reserve self-consumption quantity (kg/annum)	7.08	6	0.31
Fodder extraction inside Reserve sale quantity (kg/annum)	2.90	5	0.72
Fodder extraction quantity outside Reserve (day/kg)	63.50	28	0.00*
Fodder extraction outside Reserve self-consumption quantity (day/kg)	41.50	28	0.05*
Fodder extraction outside Reserve sale quantity (day/kg)	6.40	10	0.78
Fodder extraction quantity outside Reserve (kg/annum)	88.21	28	0.00*
Fodder extraction outside Reserve self-consumption quantity (kg/annum)	86.89	28	0.00*
Fodder extraction outside Reserve sale quantity (kg/annum)	15.15	10	0.13
Total Fodder extraction quantity (kg/annum)	92.79	28	0.00*
Total Fodder extraction self-consumption quantity (kg/annum)	86.41	28	0.00*
Total Fodder extraction sale quantity (kg/annum)	17.09	14	0.25
Annual income from fodder sale (INR/annum)	17.28	14	0.24
Fuelwood annual purchase quantity (in kg)	60.90	26	0.00*
Fuelwood material annual purchase expenditure (in INR)	59.01	26	0.00*
Fuelwood extraction quantity inside Reserve (day/kg)	73.36	29	0.00*
Fuelwood extraction inside Reserve self-consumption quantity (day/kg)	73.66	29	0.00*
Fuelwood extraction inside Reserve sale quantity (day/kg)	58.86	27	0.00*
Fuelwood extraction quantity inside Reserve (kg/annum)	50.20	29	0.01*
Fuelwood extraction inside Reserve self-consumption quantity (kg/annum)	56.16	29	0.00*
Fuelwood extraction inside Reserve sale quantity (kg/annum)	40.00	27	0.05*
Fuelwood extraction quantity outside Reserve (day/kg)	149.99	30	0.00*
Fuelwood extraction outside Reserve self-consumption quantity (day/kg)	85.47	30	0.00*

Parameters	χ^2	df	P
Fuelwood extraction outside Reserve sale quantity (day/kg)	113.15	29	0.00*
Fuelwood extraction quantity outside Reserve (kg/annum)	127.05	30	0.00*
Fuelwood extraction outside Reserve self-consumption quantity (kg/annum)	113.66	30	0.00*
Fuelwood extraction outside Reserve sale quantity (kg/annum)	93.67	29	0.00*
Total Fuelwood extraction quantity (kg/annum)	137.39	30	0.00*
Total Fuelwood extraction self-consumption quantity (kg/annum)	109.82	30	0.00*
Total Fuelwood extraction sale quantity (kg/annum)	75.60	29	0.00*
Annual income from fuelwood sale (INR/annum)	76.70	29	0.00*
Fish annual purchase quantity (in kg)	43.01	30	0.06
Fish material annual purchase expenditure (in INR)	47.84	30	0.02*
Fish extraction quantity inside Reserve (day/kg)	14.83	20	0.79
Fish extraction inside Reserve self-consumption quantity (day/kg)	28.35	20	0.10
Fish extraction inside Reserve sale quantity (day/kg)	11.84	15	0.69
Fish extraction quantity inside Reserve (kg/annum)	11.97	20	0.92
Fish extraction inside Reserve self-consumption quantity (kg/annum)	31.54	20	0.05*
Fish extraction inside Reserve sale quantity (kg/annum)	11.79	15	0.70
Fish extraction quantity outside Reserve (day/kg)	71.49	29	0.00*
Fish extraction outside Reserve self-consumption quantity (day/kg)	73.09	29	0.00*
Fish extraction outside Reserve sale quantity (day/kg)	23.99	23	0.40
Fish extraction quantity outside Reserve (kg/annum)	143.99	29	0.00*
Fish extraction outside Reserve self-consumption quantity (kg/annum)	146.38	29	0.00*
Fish extraction outside Reserve sale quantity (kg/annum)	40.57	23	0.01*
Total Fish extraction quantity (kg/annum)	107.17	29	0.00*
Total Fish extraction self-consumption quantity (kg/annum)	119.64	29	0.00*
Total Fish extraction sale quantity (kg/annum)	38.34	24	0.03*
Annual income from fish sale (INR/annum)	38.40	24	0.03*

Ha- hectare, km- kilometres, kg-kilogram, INR-Indian stand rupees, χ^2 -chi square value, df- degree of freedom and *indicates significant result at $P>0.05$.

Appendix Table 6.6. Respondent details (gender, age, qualification and religion) of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Respondent details																			
	Gender				Age (in years)						Qualification				Religion					
	Female		Male		18-30		31-60		≤61		Illiterate		Literate		Christian		Hindu		Muslim	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	5	55.56	4	44.44	6	66.67	2	22.22	1	11.11	5	55.56	4	44.44	0	0.00	9	100	0	0.00
Belo	8	30.77	18	69.23	10	38.46	14	53.85	2	7.69	13	50.00	13	50.00	0	0.00	26	100	0	0.00
Tamp	7	35.00	13	65.00	5	25.00	10	50.00	5	25.00	6	30.00	14	70.00	0	0.00	20	100	0	0.00
Japp	4	30.77	9	69.23	2	15.38	10	76.92	1	7.69	5	38.46	8	61.54	0	0.00	13	100	0	0.00
Meth	30	39.47	46	60.53	37	48.68	34	44.74	5	6.58	39	51.32	37	48.68	4	5.26	72	94.74	0	0.00

Village	Respondent details																			
	Gender				Age (in years)						Qualification				Religion					
	Female		Male		18-30		31-60		≤61		Illiterate		Literate		Christian		Hindu		Muslim	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Borj	15	30.61	34	69.39	22	44.90	23	46.94	4	8.16	25	51.02	24	48.98	0	0.00	49	100	0	0.00
Hali	5	35.71	9	64.29	5	35.71	9	64.29	0	0.00	10	71.43	4	28.57	0	0.00	13	92.86	1	7.14
Silj	15	53.57	13	46.43	12	42.86	14	50.00	2	7.14	16	57.14	12	42.86	0	0.00	27	96.43	1	3.57
Sild1	11	52.38	10	47.62	6	28.57	12	57.14	3	14.29	10	47.62	11	52.38	0	0.00	21	100	0	0.00
Sild2	7	41.18	10	58.82	6	35.29	9	52.94	2	11.76	5	29.41	12	70.59	0	0.00	17	100	0	0.00
Gosh	12	27.27	32	72.73	13	29.55	30	68.18	1	2.27	26	59.09	18	40.91	0	0.00	44	100	0	0.00
Domj1	4	28.57	10	71.43	1	7.14	11	78.57	2	14.29	11	78.57	3	21.43	0	0.00	12	85.71	2	14.29
Domj2	2	33.33	4	66.67	4	66.67	2	33.33	0	0.00	2	33.33	4	66.67	0	0.00	6	100	0	0.00
Kazi	1	14.29	6	85.71	3	42.86	4	57.14	0	0.00	1	14.29	6	85.71	0	0.00	7	100	0	0.00
Mohp	8	38.10	13	61.90	6	28.57	13	61.90	2	9.52	5	23.81	16	76.19	0	0.00	21	100	0	0.00
Koho2	12	48.00	13	52.00	9	36.00	13	52.00	3	12.00	6	24.00	19	76.00	1	4.00	24	96.00	0	0.00
Panb	2	28.57	5	71.43	1	14.29	6	85.71	0	0.00	4	57.14	3	42.86	0	0.00	7	100	0	0.00
Hati	10	55.56	8	44.44	7	38.89	9	50.00	2	11.11	10	55.56	8	44.44	0	0.00	18	100	0	0.00
Baga	21	41.18	30	58.82	22	43.14	24	47.06	5	9.80	23	45.10	28	54.90	0	0.00	51	100	0	0.00
Harm	13	40.63	19	59.38	11	34.38	15	46.88	6	18.75	19	59.38	13	40.63	0	0.00	15	46.88	17	53.13
Nanc	5	55.56	4	44.44	4	44.44	4	44.44	1	11.11	3	33.33	6	66.67	0	0.00	0	0.00	9	100
Naja	19	57.58	14	42.42	15	45.45	16	48.48	2	6.06	10	30.30	23	69.70	0	0.00	9	27.27	24	72.73
Bagh	13	54.17	11	45.83	8	33.33	16	66.67	0	0.00	7	29.17	17	70.83	0	0.00	18	75.00	6	25.00
Kawa	0	0.00	3	100	0	0.00	3	100	0	0.00	1	33.33	2	66.67	0	0.00	0	0.00	3	100
Band	3	30.00	7	70.00	4	40.00	4	40.00	2	20.00	5	50.00	5	50.00	0	0.00	0	0.00	10	100
Deop	13	50.00	13	50.00	12	46.15	13	50.00	1	3.85	6	23.08	20	76.92	0	0.00	3	11.54	23	88.46
Nahr	9	60.00	6	40.00	5	33.33	9	60.00	1	6.67	11	73.33	4	26.67	0	0.00	15	100	0	0.00
Bura1	2	100	0	0.00	2	100	0	0.00	0	0.00	2	100	0	0.00	0	0.00	2	100	0	0.00
Kanc	5	50.00	5	50.00	3	30.00	7	70.00	0	0.00	4	40.00	6	60.00	0	0.00	10	100	0	0.00
Pacg	9	47.37	10	52.63	1	5.26	16	84.21	2	10.53	8	42.11	11	57.89	0	0.00	15	78.95	4	21.05
Katb	3	21.43	11	78.57	3	21.43	11	78.57	0	0.00	3	21.43	11	78.57	0	0.00	13	92.86	1	7.14
Total	273	41.18	390	58.82	245	36.95	363	54.75	55	8.30	301	45.40	362	54.60	5	0.75	557	84.01	101	15.23

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, ≤- greater than equals to and %- in percentages.

Appendix Table 6.7. Respondent details (caste) of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Respondent details											
	Caste											
	General		Minority		Other Backward Class		Scheduled Castes		Scheduled Tribes		Tea Tribes	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	0	0.00	0	0.00	0	0.00	0	0.00	9	100	0	0.00
Belo	8	30.77	0	0.00	1	3.85	0	0.00	17	65.38	0	0.00
Tamp	0	0.00	0	0.00	18	90.00	2	10.00	0	0.00	0	0.00
Japp	0	0.00	0	0.00	7	53.85	4	30.77	0	0.00	2	15.38
Meth	10	13.16	0	0.00	9	11.84	0	0.00	1	1.32	56	73.68
Borj	3	6.12	0	0.00	2	4.08	2	4.08	0	0.00	42	85.71
Hali	0	0.00	1	7.14	6	42.86	1	7.14	0	0.00	6	42.86
Silj	6	21.43	1	3.57	2	7.14	0	0.00	0	0.00	19	67.86
Sild1	6	28.57	0	0.00	5	23.81	4	19.05	0	0.00	6	28.57
Sild2	4	23.53	0	0.00	0	0.00	0	0.00	7	41.18	6	35.29
Gosh	11	25.00	0	0.00	0	0.00	0	0.00	0	0.00	33	75.00
Domj1	6	42.86	2	14.29	4	28.57	2	14.29	0	0.00	0	0.00
Domj2	1	16.67	0	0.00	3	50.00	0	0.00	0	0.00	2	33.33
Kazi	0	0.00	0	0.00	2	28.57	0	0.00	5	71.43	0	0.00
Mohp	5	23.81	0	0.00	14	66.67	0	0.00	0	0.00	2	9.52
Koho2	9	36.00	0	0.00	7	28.00	0	0.00	1	4.00	8	32.00
Panb	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	7	100
Hati	0	0.00	0	0.00	0	0.00	3	16.67	0	0.00	15	83.33
Baga	4	7.84	0	0.00	4	7.84	0	0.00	0	0.00	43	84.31
Harm	10	31.25	17	53.13	1	3.13	0	0.00	0	0.00	4	12.50
Nanc	0	0.00	9	100	0	0.00	0	0.00	0	0.00	0	0.00
Naja	7	21.21	24	72.73	2	6.06	0	0.00	0	0.00	0	0.00
Bagh	7	29.17	6	25.00	11	45.83	0	0.00	0	0.00	0	0.00
Kawa	0	0.00	3	100	0	0.00	0	0.00	0	0.00	0	0.00
Band	0	0.00	10	100	0	0.00	0	0.00	0	0.00	0	0.00
Deop	0	0.00	23	88.46	3	11.54	0	0.00	0	0.00	0	0.00
Nahr	0	0.00	0	0.00	2	13.33	0	0.00	4	26.67	9	60.00
Bura1	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	2	100
Kanc	0	0.00	0	0.00	0	0.00	0	0.00	9	90.00	1	10.00
Pacg	5	26.32	4	21.05	10	52.63	0	0.00	0	0.00	0	0.00
Katb	5	35.71	1	7.14	8	57.14	0	0.00	0	0.00	0	0.00
Total	107	16.14	101	15.23	121	18.25	18	2.71	53	7.99	263	39.67

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.8. Respondent family characteristics (family type and size) and details (total members and their qualification) of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Family type				Family size		Family members				Family members qualification											
	Joint		Nuclear				Female		Male		Illiterate				Literate				Total			
											Female		Male		Female		Male		Illiterate		Literate	
	Total	%	Total	%	Total	Mean±SE	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	7	77.78	2	22.22	58	6.44±0.80	30	51.72	28	48.28	18	60.00	10	35.71	12	40.00	18	64.29	28	48.28	30	51.72
Belo	8	30.77	18	69.23	126	4.85±0.23	64	50.79	62	49.21	40	62.50	30	48.39	24	37.50	32	51.61	70	55.56	56	44.44
Tamp	17	85.00	3	15.00	126	6.30±0.43	61	48.41	65	51.59	22	36.07	14	21.54	39	63.93	51	78.46	36	28.57	90	71.43
Japp	7	53.85	6	46.15	76	5.85±0.63	37	48.68	39	51.32	21	56.76	9	23.08	16	43.24	30	76.92	30	39.47	46	60.53
Meth	25	32.89	51	67.11	387	5.09±0.19	203	52.45	184	47.55	107	52.71	60	32.61	96	47.29	124	67.39	167	43.15	220	56.85
Borj	18	36.73	31	63.27	264	5.39±0.25	135	51.14	129	48.86	67	49.63	53	41.09	68	50.37	76	58.91	120	45.45	144	54.55
Hali	5	35.71	9	64.29	66	4.71±0.24	30	45.45	36	54.55	18	60.00	15	41.67	12	40.00	21	58.33	33	50.00	33	50.00
Silj	6	21.43	22	78.57	138	4.93±0.35	69	50.00	69	50.00	37	53.62	21	30.43	32	46.38	48	69.57	58	42.03	80	57.97
Sild1	9	42.86	12	57.14	113	5.38±0.33	59	52.21	54	47.79	27	45.76	22	40.74	32	54.24	32	59.26	49	43.36	64	56.64
Sild2	8	47.06	9	52.94	100	5.88±0.54	52	52.00	48	48.00	31	59.62	21	43.75	21	40.38	27	56.25	52	52.00	48	48.00
Gosh	14	31.82	30	68.18	222	5.05±0.22	106	47.75	116	52.25	57	53.77	35	30.17	49	46.23	81	69.83	92	41.44	130	58.56
Domj1	3	21.43	11	78.57	65	4.64±0.40	35	53.85	30	46.15	18	51.43	14	46.67	17	48.57	16	53.33	32	49.23	33	50.77
Domj2	1	16.67	5	83.33	25	4.17±0.40	15	60.00	10	40.00	6	40.00	6	60.00	9	60.00	4	40.00	12	48.00	13	52.00
Kazi	2	28.57	5	71.43	38	5.43±1.23	19	50.00	19	50.00	6	31.58	6	31.58	13	68.42	13	68.42	12	31.58	26	68.42
Mohp	11	52.38	10	47.62	119	5.67±0.44	54	45.38	65	54.62	21	38.89	17	26.15	33	61.11	48	73.85	38	31.93	81	68.07
Koho2	11	44.00	14	56.00	125	5.00±0.45	56	44.80	69	55.20	20	35.71	17	24.64	36	64.29	52	75.36	37	29.60	88	70.40
Panb	4	57.14	3	42.86	40	5.71±0.92	18	45.00	22	55.00	10	55.56	7	31.82	8	44.44	15	68.18	17	42.50	23	57.50
Hati	6	33.33	12	66.67	97	5.39±0.34	54	55.67	43	44.33	23	42.59	11	25.58	31	57.41	32	74.42	34	35.05	63	64.95
Baga	15	29.41	36	70.59	233	4.57±0.18	111	47.64	122	52.36	54	48.65	60	49.18	57	51.35	62	50.82	114	48.93	119	51.07
Harm	12	37.50	20	62.50	166	5.19±0.35	90	54.22	76	45.78	49	54.44	38	50.00	41	45.56	38	50.00	87	52.41	79	47.59
Nanc	3	33.33	6	66.67	48	5.33±0.50	23	47.92	25	52.08	13	56.52	10	40.00	10	43.48	15	60.00	23	47.92	25	52.08
Naja	10	30.30	23	69.70	164	4.97±0.32	88	53.66	76	46.34	36	40.91	23	30.26	52	59.09	53	69.74	59	35.98	105	64.02
Bagh	13	54.17	11	45.83	147	6.13±0.44	74	50.34	73	49.66	27	36.49	22	30.14	47	63.51	51	69.86	49	33.33	98	66.67
Kawa	1	33.33	2	66.67	19	6.33±0.88	9	47.37	10	52.63	3	33.33	3	30.00	6	66.67	7	70.00	6	31.58	13	68.42
Band	4	40.00	6	60.00	48	4.80±0.51	24	50.00	24	50.00	13	54.17	12	50.00	11	45.83	12	50.00	25	52.08	23	47.92
Deop	9	34.62	17	65.38	141	5.42±0.40	70	49.65	71	50.35	32	45.71	36	50.70	38	54.29	35	49.30	68	48.23	73	51.77
Nahr	4	26.67	11	73.33	78	5.20±0.65	36	46.15	42	53.85	29	80.56	22	52.38	7	19.44	20	47.62	51	65.38	27	34.62
Bura1	1	50.00	1	50.00	11	5.50±0.50	5	45.45	6	54.55	5	100	1	16.67	0	0.00	5	83.33	6	54.55	5	45.45
Kanc	3	30.00	7	70.00	54	5.40±0.52	22	40.74	32	59.26	6	27.27	8	25.00	16	72.73	24	75.00	14	25.93	40	74.07
Pacg	10	52.63	9	47.37	99	5.21±0.38	50	50.51	49	49.49	17	34.00	15	30.61	33	66.00	34	69.39	32	32.32	67	67.68
Katb	7	50.00	7	50.00	85	6.07±0.65	38	44.71	47	55.29	12	31.58	8	17.02	26	68.42	39	82.98	20	23.53	65	76.47
Total	254	38.31	409	61.69	3478	5.25±0.07	1737	49.94	1741	50.06	845	48.65	626	35.96	892	51.35	1115	64.04	1471	42.29	2007	57.71

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, SE- standard error and %- in percentages.

Appendix Table 6.9. Respondent family members age group (male and female) of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Family members age group (in years)																			
	Female										Male									
	1-15		16-30		31-45		46-60		≤61		1-15		16-30		31-45		46-60		≤61	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	12	40.00	10	33.33	4	13.33	3	10.00	1	3.33	9	32.14	9	32.14	6	21.43	3	10.71	1	3.57
Belo	24	37.50	25	39.06	7	10.94	8	12.50	0	0.00	17	27.42	27	43.55	8	12.90	6	9.68	4	6.45
Tamp	14	22.95	26	42.62	12	19.67	4	6.56	5	8.20	19	29.23	19	29.23	13	20.00	6	9.23	8	12.31
Japp	14	37.84	11	29.73	6	16.22	3	8.11	3	8.11	11	28.21	12	30.77	9	23.08	5	12.82	2	5.13
Meth	61	30.05	89	43.84	27	13.30	20	9.85	6	2.96	52	28.26	68	36.96	36	19.57	22	11.96	6	3.26
Borj	46	34.07	46	34.07	26	19.26	13	9.63	4	2.96	35	27.13	52	40.31	24	18.60	11	8.53	7	5.43
Hali	8	26.67	11	36.67	3	10.00	8	26.67	0	0.00	11	30.56	15	41.67	4	11.11	6	16.67	0	0.00
Silj	24	34.78	23	33.33	14	20.29	6	8.70	2	2.90	29	42.03	15	21.74	17	24.64	7	10.14	1	1.45
Sild1	25	42.37	13	22.03	14	23.73	4	6.78	3	5.08	18	33.33	15	27.78	11	20.37	5	9.26	5	9.26
Sild2	23	44.23	15	28.85	8	15.38	4	7.69	2	3.85	15	31.25	14	29.17	8	16.67	6	12.50	5	10.42
Gosh	40	37.74	37	34.91	17	16.04	11	10.38	1	0.94	48	41.38	31	26.72	25	21.55	11	9.48	1	0.86
Domj1	11	31.43	12	34.29	6	17.14	4	11.43	2	5.71	8	26.67	8	26.67	7	23.33	3	10.00	4	13.33
Domj2	6	40.00	5	33.33	3	20.00	1	6.67	0	0.00	2	20.00	5	50.00	2	20.00	1	10.00	0	0.00
Kazi	6	31.58	9	47.37	3	15.79	1	5.26	0	0.00	6	31.58	7	36.84	2	10.53	4	21.05	0	0.00
Mohp	14	25.93	19	35.19	12	22.22	7	12.96	2	3.70	23	35.38	12	18.46	20	30.77	5	7.69	5	7.69
Koho2	16	28.57	19	33.93	15	26.79	5	8.93	1	1.79	17	24.64	27	39.13	16	23.19	5	7.25	4	5.80
Panb	7	38.89	6	33.33	0	0.00	5	27.78	0	0.00	7	31.82	7	31.82	4	18.18	3	13.64	1	4.55
Hati	23	42.59	15	27.78	12	22.22	4	7.41	0	0.00	14	32.56	12	27.91	11	25.58	3	6.98	3	6.98
Baga	43	38.74	41	36.94	16	14.41	10	9.01	1	0.90	44	36.07	36	29.51	22	18.03	10	8.20	10	8.20
Harm	37	41.11	28	31.11	15	16.67	5	5.56	5	5.56	25	32.89	22	28.95	14	18.42	8	10.53	7	9.21
Nanc	10	43.48	6	26.09	6	26.09	1	4.35	0	0.00	10	40.00	7	28.00	2	8.00	5	20.00	1	4.00
Naja	30	34.09	32	36.36	18	20.45	7	7.95	1	1.14	22	28.95	27	35.53	14	18.42	10	13.16	3	3.95
Bagh	27	36.49	20	27.03	19	25.68	5	6.76	3	4.05	25	34.25	22	30.14	13	17.81	10	13.70	3	4.11
Kawa	2	22.22	3	33.33	3	33.33	1	11.11	0	0.00	3	30.00	3	30.00	2	20.00	1	10.00	1	10.00
Band	6	25.00	10	41.67	7	29.17	1	4.17	0	0.00	7	29.17	8	33.33	2	8.33	5	20.83	2	8.33
Deop	28	40.00	23	32.86	14	20.00	4	5.71	1	1.43	24	33.80	31	43.66	7	9.86	8	11.27	1	1.41
Nahr	14	38.89	12	33.33	6	16.67	2	5.56	2	5.56	18	42.86	7	16.67	11	26.19	3	7.14	3	7.14
Bura1	2	40.00	2	40.00	0	0.00	1	20.00	0	0.00	4	66.67	0	0.00	2	33.33	0	0.00	0	0.00
Kanc	9	40.91	6	27.27	7	31.82	0	0.00	0	0.00	13	40.63	8	25.00	7	21.88	3	9.38	1	3.13
Pacg	21	42.00	7	14.00	12	24.00	8	16.00	2	4.00	10	20.41	20	40.82	12	24.49	4	8.16	3	6.12
Katb	12	31.58	12	31.58	11	28.95	0	0.00	3	7.89	19	40.43	10	21.28	9	19.15	7	14.89	2	4.26
Total	615	35.41	593	34.14	323	18.60	156	8.98	50	2.88	565	32.45	556	31.94	340	19.53	186	10.68	94	5.40

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, ≤- more than equals to and %- in percentages.

Appendix Table 6.10. Respondent family members age group of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Family members age group (in years)									
	Total (female and male)									
	1-15		16-30		31-45		46-60		≤61	
	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	21	36.21	19	32.76	10	17.24	6	10.34	2	3.45
Belo	41	32.54	52	41.27	15	11.90	14	11.11	4	3.17
Tamp	33	26.19	45	35.71	25	19.84	10	7.94	13	10.32
Japp	25	32.89	23	30.26	15	19.74	8	10.53	5	6.58
Meth	113	29.20	157	40.57	63	16.28	42	10.85	12	3.10
Borj	81	30.68	98	37.12	50	18.94	24	9.09	11	4.17
Hali	19	28.79	26	39.39	7	10.61	14	21.21	0	0.00
Silj	53	38.41	38	27.54	31	22.46	13	9.42	3	2.17
Sild1	43	38.05	28	24.78	25	22.12	9	7.96	8	7.08
Sild2	38	38.00	29	29.00	16	16.00	10	10.00	7	7.00
Gosh	88	39.64	68	30.63	42	18.92	22	9.91	2	0.90
Domj1	19	29.23	20	30.77	13	20.00	7	10.77	6	9.23
Domj2	8	32.00	10	40.00	5	20.00	2	8.00	0	0.00
Kazi	12	31.58	16	42.11	5	13.16	5	13.16	0	0.00
Mohp	37	31.09	31	26.05	32	26.89	12	10.08	7	5.88
Koho2	33	26.40	46	36.80	31	24.80	10	8.00	5	4.00
Panb	14	35.00	13	32.50	4	10.00	8	20.00	1	2.50
Hati	37	38.14	27	27.84	23	23.71	7	7.22	3	3.09
Baga	87	37.34	77	33.05	38	16.31	20	8.58	11	4.72
Harm	62	37.35	50	30.12	29	17.47	13	7.83	12	7.23
Nanc	20	41.67	13	27.08	8	16.67	6	12.50	1	2.08
Naja	52	31.71	59	35.98	32	19.51	17	10.37	4	2.44
Bagh	52	35.37	42	28.57	32	21.77	15	10.20	6	4.08
Kawa	5	26.32	6	31.58	5	26.32	2	10.53	1	5.26
Band	13	27.08	18	37.50	9	18.75	6	12.50	2	4.17
Deop	52	36.88	54	38.30	21	14.89	12	8.51	2	1.42
Nahr	32	41.03	19	24.36	17	21.79	5	6.41	5	6.41
Bura1	6	54.55	2	18.18	2	18.18	1	9.09	0	0.00
Kanc	22	40.74	14	25.93	14	25.93	3	5.56	1	1.85
Pacg	31	31.31	27	27.27	24	24.24	12	12.12	5	5.05
Katb	31	36.47	22	25.88	20	23.53	7	8.24	5	5.88
Total	1180	33.93	1149	33.04	663	19.06	342	9.83	144	4.14

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari,

Village	Family members age group (in years)									
	Total (female and male)									
	1-15		16-30		31-45		46-60		≥61	
	Total	%	Total	%	Total	%	Total	%	Total	%

Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, ≤- more than equals to and %- in percentages.

Appendix Table 6.11. Total number of visitors and extracted resources details of villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Total visitors (No.)	Extracted resources							
		Thatching		Fodder		Fuelwood		Fish	
		Total	%	Total	%	Total	%	Total	%
Bamg	224	61	27.23	38	16.96	44	19.64	81	36.16
Belo	311	79	25.40	44	14.15	73	23.47	115	36.98
Tamp	236	52	22.03	35	14.83	63	26.69	86	36.44
Japp	268	73	27.24	40	14.93	44	16.42	111	41.42
Meth	119	31	26.05	19	15.97	29	24.37	40	33.61
Borj	127	25	19.69	20	15.75	33	25.98	49	38.58
Hali	221	37	16.74	28	12.67	55	24.89	101	45.70
Silj	278	45	16.19	34	12.23	71	25.54	128	46.04
Sild1	176	45	25.57	28	15.91	44	25.00	59	33.52
Sild2	206	33	16.02	22	10.68	40	19.42	111	53.88
Gosh	309	65	21.04	43	13.92	76	24.60	125	40.45
Domj1	145	32	22.07	20	13.79	38	26.21	55	37.93
Domj2	149	31	20.81	22	14.77	34	22.82	62	41.61
Kazi	202	42	20.79	27	13.37	48	23.76	85	42.08
Mohp	259	49	18.92	41	15.83	58	22.39	111	42.86
Koho2	200	48	24.00	24	12.00	52	26.00	76	38.00
Panb	115	28	24.35	19	16.52	25	21.74	43	37.39
Hati	127	26	20.47	19	14.96	32	25.20	50	39.37
Baga	226	46	20.35	26	11.50	38	16.81	116	51.33
Harm	186	33	17.74	25	13.44	41	22.04	87	46.77
Nanc	174	33	18.97	23	13.22	40	22.99	78	44.83
Naja	185	32	17.30	21	11.35	49	26.49	83	44.86
Bagh	211	51	24.17	31	14.69	58	27.49	71	33.65
Kawa	206	48	23.30	31	15.05	49	23.79	78	37.86
Band	316	64	20.25	42	13.29	89	28.16	121	38.29
Deop	257	52	20.23	29	11.28	65	25.29	111	43.19
Nahr	211	52	24.64	28	13.27	49	23.22	82	38.86
Bura1	197	45	22.84	27	13.71	66	33.50	59	29.95

Village	Total visitors (No.)	Extracted resources							
		Thatching		Fodder		Fuelwood		Fish	
		Total	%	Total	%	Total	%	Total	%
Kanc	193	43	22.28	28	14.51	84	43.52	38	19.69
Pacg	218	28	12.84	19	8.72	51	23.39	120	55.05
Katb	268	45	16.79	28	10.45	59	22.01	136	50.75
Total	6520	1374	21.07	881	13.51	1597	24.49	2668	40.92

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.12. Respondent details (gender, age, qualification) of villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Respondent details													
	Gender				Age group						Qualification			
	Female		Male		10-30		31-60		≤61		Illiterate		Literate	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	52	23.21	172	76.79	96	42.86	116	51.79	12	5.36	145	64.73	79	35.27
Belo	80	25.72	231	74.28	118	37.94	169	54.34	24	7.72	197	63.34	114	36.66
Tamp	49	20.76	187	79.24	98	41.53	133	56.36	5	2.12	149	63.14	87	36.86
Japp	56	20.90	212	79.10	115	42.91	138	51.49	15	5.60	182	67.91	86	32.09
Meth	26	21.85	93	78.15	55	46.22	58	48.74	6	5.04	79	66.39	40	33.61
Borj	24	18.90	103	81.10	46	36.22	73	57.48	8	6.30	79	62.20	48	37.80
Hali	41	18.55	180	81.45	80	36.20	128	57.92	13	5.88	152	68.78	69	31.22
Silj	52	18.71	226	81.29	116	41.73	140	50.36	22	7.91	199	71.58	79	28.42
Sild1	37	21.02	139	78.98	68	38.64	98	55.68	10	5.68	117	66.48	59	33.52
Sild2	43	20.87	163	79.13	83	40.29	113	54.85	10	4.85	139	67.48	67	32.52
Gosh	64	20.71	245	79.29	115	37.22	175	56.63	19	6.15	216	69.90	93	30.10
Domj1	32	22.07	113	77.93	69	47.59	68	46.90	8	5.52	101	69.66	44	30.34
Domj2	30	20.13	119	79.87	56	37.58	83	55.70	10	6.71	101	67.79	48	32.21
Kazi	43	21.29	159	78.71	90	44.55	104	51.49	8	3.96	144	71.29	58	28.71
Mohp	55	21.24	204	78.76	109	42.08	139	53.67	11	4.25	186	71.81	73	28.19
Koho2	38	19.00	162	81.00	74	37.00	109	54.50	17	8.50	134	67.00	66	33.00
Panb	23	20.00	92	80.00	46	40.00	65	56.52	4	3.48	80	69.57	35	30.43
Hati	25	19.69	102	80.31	52	40.94	70	55.12	5	3.94	88	69.29	39	30.71
Baga	46	20.35	180	79.65	85	37.61	127	56.19	14	6.19	156	69.03	70	30.97
Harm	34	18.28	152	81.72	70	37.63	106	56.99	10	5.38	123	66.13	63	33.87
Nanc	40	22.99	134	77.01	71	40.80	96	55.17	7	4.02	120	68.97	54	31.03
Naja	35	18.92	150	81.08	75	40.54	100	54.05	10	5.41	132	71.35	53	28.65

Village	Respondent details													
	Gender				Age group						Qualification			
	Female		Male		10-30		31-60		≤61		Illiterate		Literate	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bagh	42	19.91	169	80.09	91	43.13	111	52.61	9	4.27	147	69.67	64	30.33
Kawa	39	18.93	167	81.07	81	39.32	111	53.88	14	6.80	142	68.93	64	31.07
Band	68	21.52	248	78.48	120	37.97	177	56.01	19	6.01	215	68.04	101	31.96
Deop	49	19.07	208	80.93	99	38.52	139	54.09	19	7.39	175	68.09	82	31.91
Nahr	45	21.33	166	78.67	92	43.60	115	54.50	4	1.90	145	68.72	66	31.28
Bura1	40	20.30	157	79.70	76	38.58	110	55.84	11	5.58	135	68.53	62	31.47
Kanc	41	21.24	152	78.76	85	44.04	102	52.85	6	3.11	135	69.95	58	30.05
Pacg	39	17.89	179	82.11	80	36.70	125	57.34	13	5.96	154	70.64	64	29.36
Katb	56	20.90	212	79.10	117	43.66	142	52.99	9	3.36	181	67.54	87	32.46
Total	1344	20.61	5176	79.39	2628	40.31	3540	54.29	352	5.40	4448	68.22	2072	31.78

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, km- kilometres, ≤- more than equals to and %- in percentages.

Appendix Table 6.13. Respondent details (religion and caste) of villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Respondent details																	
	Religion						Caste											
	Christian		Hindu		Muslim		General		Minority		Other Backward Class		Scheduled Castes		Scheduled Tribes		Tea Tribes	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	0	0.00	224	100	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	224	100	0	0.00
Belo	0	0.00	311	100	0	0.00	27	8.68	0	0.00	39	12.54	16	5.14	229	73.63	0	0.00
Tamp	0	0.00	236	100	0	0.00	0	0.00	0	0.00	211	89.41	24	10.17	1	0.42	0	0.00
Japp	0	0.00	268	100	0	0.00	0	0.00	0	0.00	44	16.42	202	75.37	7	2.61	15	5.60
Meth	12	10.08	107	89.92	0	0.00	4	3.36	0	0.00	5	4.20	22	18.49	11	9.24	77	64.71
Borj	0	0.00	127	100	0	0.00	8	6.30	0	0.00	12	9.45	6	4.72	0	0.00	101	79.53
Hali	0	0.00	209	94.57	12	5.43	0	0.00	12	5.43	130	58.82	0	0.00	0	0.00	79	35.75
Silj	0	0.00	267	96.04	11	3.96	6	2.16	11	3.96	111	39.93	0	0.00	0	0.00	150	53.96
Sild1	0	0.00	169	96.02	7	3.98	12	6.82	7	3.98	11	6.25	0	0.00	0	0.00	146	82.95
Sild2	0	0.00	206	100	0	0.00	10	4.85	0	0.00	0	0.00	0	0.00	141	68.45	55	26.70
Gosh	0	0.00	309	100	0	0.00	59	19.09	0	0.00	0	0.00	0	0.00	10	3.24	240	77.67
Domj1	0	0.00	136	93.79	9	6.21	12	8.28	9	6.21	88	60.69	2	1.38	0	0.00	34	23.45
Domj2	0	0.00	145	97.32	4	2.68	11	7.38	4	2.68	110	73.83	4	2.68	0	0.00	20	13.42
Kazi	0	0.00	202	100	0	0.00	0	0.00	0	0.00	46	22.77	0	0.00	156	77.23	0	0.00

Village	Respondent details																	
	Religion						Caste											
	Christian		Hindu		Muslim		General		Minority		Other Backward Class		Scheduled Castes		Scheduled Tribes		Tea Tribes	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Mohp	0	0.00	259	100	0	0.00	41	15.83	0	0.00	181	69.88	0	0.00	0	0.00	37	14.29
Koho2	18	9.00	182	91.00	0	0.00	28	14.00	0	0.00	118	59.00	0	0.00	0	0.00	54	27.00
Panb	0	0.00	115	100	0	0.00	0	0.00	0	0.00	0	0.00	31	26.96	0	0.00	84	73.04
Hati	0	0.00	127	100	0	0.00	0	0.00	0	0.00	0	0.00	36	28.35	6	4.72	85	66.93
Baga	0	0.00	218	96.46	8	3.54	13	5.75	8	3.54	34	15.04	7	3.10	0	0.00	164	72.57
Harm	0	0.00	63	33.87	123	66.13	26	13.98	123	66.13	18	9.68	5	2.69	0	0.00	14	7.53
Nanc	0	0.00	2	1.15	172	98.85	2	1.15	172	98.85	0	0.00	0	0.00	0	0.00	0	0.00
Naja	0	0.00	45	24.32	140	75.68	15	8.11	140	75.68	26	14.05	0	0.00	4	2.16	0	0.00
Bagh	0	0.00	137	64.93	74	35.07	57	27.01	74	35.07	56	26.54	24	11.37	0	0.00	0	0.00
Kawa	0	0.00	0	0.00	206	100	0	0.00	206	100	0	0.00	0	0.00	0	0.00	0	0.00
Band	0	0.00	0	0.00	316	100	0	0.00	316	100	0	0.00	0	0.00	0	0.00	0	0.00
Deop	0	0.00	49	19.07	208	80.93	0	0.00	208	80.93	26	10.12	8	3.11	4	1.56	11	4.28
Nahr	0	0.00	202	95.73	9	4.27	0	0.00	9	4.27	9	4.27	13	6.16	43	20.38	137	64.93
Bura1	0	0.00	197	100	0	0.00	0	0.00	0	0.00	0	0.00	23	11.68	7	3.55	167	84.77
Kanc	0	0.00	190	98.45	3	1.55	1	0.52	3	1.55	5	2.59	0	0.00	170	88.08	14	7.25
Pacg	0	0.00	182	83.49	36	16.51	34	15.60	36	16.51	145	66.51	0	0.00	2	0.92	1	0.46
Katb	0	0.00	253	94.40	15	5.60	54	20.15	15	5.60	180	67.16	19	7.09	0	0.00	0	0.00
Total	30	0.46	5137	78.79	1353	20.75	420	6.44	1353	20.75	1605	24.62	442	6.78	1015	15.57	1685	25.84

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.14. Resource extraction duration, time and awareness about species among villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Resource extraction															
	Duration (in min)						Time (in 24 hours)						Aware of collected species			
	≥30		≥31-60		≤61		6:00-9:00		9:01-12:00		12:01-17:00		No		Yes	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	89	39.73	106	47.32	29	12.95	78	34.82	112	50.00	34	15.18	40	17.86	184	82.14
Belo	68	21.86	115	36.98	128	41.16	106	34.08	154	49.52	51	16.40	60	19.29	251	80.71
Tamp	69	29.24	92	38.98	75	31.78	86	36.44	115	48.73	35	14.83	47	19.92	189	80.08
Japp	67	25.00	116	43.28	85	31.72	93	34.70	132	49.25	43	16.04	55	20.52	213	79.48
Meth	83	69.75	36	30.25	0	0.00	44	36.97	52	43.70	23	19.33	16	13.45	103	86.55
Bori	71	55.91	55	43.31	1	0.79	47	37.01	67	52.76	13	10.24	25	19.69	102	80.31

Village	Resource extraction															
	Duration (in min)						Time (in 24 hours)						Aware of collected species			
	≥30		≥31-60		≤61		6:00-9:00		9:01-12:00		12:01-17:00		No		Yes	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Hali	77	34.84	62	28.05	82	37.10	72	32.58	107	48.42	42	19.00	47	21.27	174	78.73
Silj	54	19.42	66	23.74	158	56.83	103	37.05	134	48.20	41	14.75	56	20.14	222	79.86
Sild1	77	43.75	80	45.45	19	10.80	63	35.80	90	51.14	23	13.07	27	15.34	149	84.66
Sild2	62	30.10	66	32.04	78	37.86	67	32.52	99	48.06	40	19.42	42	20.39	164	79.61
Gosh	64	20.71	78	25.24	167	54.05	107	34.63	155	50.16	47	15.21	64	20.71	245	79.29
Domj1	70	48.28	65	44.83	10	6.90	44	30.34	76	52.41	25	17.24	24	16.55	121	83.45
Domj2	67	44.97	73	48.99	9	6.04	52	34.90	77	51.68	20	13.42	26	17.45	123	82.55
Kazi	79	39.11	73	36.14	50	24.75	66	32.67	106	52.48	30	14.85	37	18.32	165	81.68
Mohp	71	27.41	93	35.91	95	36.68	88	33.98	133	51.35	38	14.67	45	17.37	214	82.63
Koho2	64	32.00	81	40.50	55	27.50	63	31.50	98	49.00	39	19.50	33	16.50	167	83.50
Panb	69	60.00	44	38.26	2	1.74	41	35.65	55	47.83	19	16.52	19	16.52	96	83.48
Hati	77	60.63	49	38.58	1	0.79	36	28.35	73	57.48	18	14.17	24	18.90	103	81.10
Baga	63	27.88	78	34.51	85	37.61	82	36.28	108	47.79	36	15.93	50	22.12	176	77.88
Harm	73	39.25	72	38.71	41	22.04	64	34.41	94	50.54	28	15.05	42	22.58	144	77.42
Nanc	92	52.87	66	37.93	16	9.20	57	32.76	88	50.57	29	16.67	39	22.41	135	77.59
Naja	69	37.30	87	47.03	29	15.68	71	38.38	85	45.95	29	15.68	38	20.54	147	79.46
Bagh	94	44.55	82	38.86	35	16.59	76	36.02	101	47.87	34	16.11	41	19.43	170	80.57
Kawa	86	41.75	94	45.63	26	12.62	66	32.04	106	51.46	34	16.50	49	23.79	157	76.21
Band	72	22.78	88	27.85	156	49.37	112	35.44	147	46.52	57	18.04	57	18.04	259	81.96
Deop	54	21.01	93	36.19	110	42.80	92	35.80	131	50.97	34	13.23	44	17.12	213	82.88
Nahr	59	27.96	106	50.24	46	21.80	70	33.18	103	48.82	38	18.01	39	18.48	172	81.52
Bura1	68	34.52	82	41.62	47	23.86	81	41.12	97	49.24	19	9.64	34	17.26	163	82.74
Kanc	78	40.41	46	23.83	69	35.75	76	39.38	86	44.56	31	16.06	41	21.24	152	78.76
Pacg	44	20.18	57	26.15	117	53.67	67	30.73	109	50.00	42	19.27	54	24.77	164	75.23
Katb	64	23.88	53	19.78	151	56.34	94	35.07	137	51.12	37	13.81	70	26.12	198	73.88
Total	2194	33.65	2354	36.10	1972	30.25	2264	34.72	3227	49.49	1029	15.78	1285	19.71	5235	80.29

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C., Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, ≥- less than equals to, ≤- more than equals to and %- in percentages.

Appendix Table 6.15. Respondent household characteristics (area, type and rooftop structure) of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	House area (in katha)				House type						Rooftop			
	Total		Built-up		Kaccha		Pucca		Semi Pucca		Tin		Thatching	
	Total	Mean±SE	Total	Mean±SE	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	26.10	2.90±0.24	14.60	1.62±0.06	9	100	0	0.00	0	0.00	7	77.78	8	88.89
Belo	48.00	1.85±0.14	35.00	1.35±0.07	24	92.31	2	7.69	0	0.00	26	100	22	84.62
Tamp	60.40	3.02±0.43	27.00	1.35±0.11	14	70.00	4	20.00	2	10.00	20	100	15	75.00
Japp	28.60	2.20±0.24	15.00	1.15±0.09	13	100	0	0.00	0	0.00	11	84.62	13	100
Meth	94.00	1.24±0.05	73.10	0.96±0.02	40	52.63	16	21.05	20	26.32	76	100	57	75.00
Borj	64.20	1.31±0.07	49.20	1.00±0.02	28	57.14	16	32.65	5	10.20	48	97.96	32	65.31
Hali	30.30	2.16±0.51	10.80	0.77±0.07	10	71.43	2	14.29	2	14.29	11	78.57	9	64.29
Silj	61.90	2.21±0.20	34.10	1.22±0.05	23	82.14	4	14.29	1	3.57	26	92.86	27	96.43
Sild1	34.80	1.66±0.19	22.30	1.06±0.05	21	100	0	0.00	0	0.00	20	95.24	21	100
Sild2	20.20	1.19±0.16	15.30	0.90±0.05	17	100	0	0.00	0	0.00	12	70.59	17	100
Gosh	59.90	1.36±0.06	45.50	1.03±0.02	40	90.91	2	4.55	2	4.55	40	90.91	39	88.64
Domj1	33.40	2.39±0.21	17.40	1.24±0.08	10	71.43	2	14.29	2	14.29	14	100	12	85.71
Domj2	18.00	3.00±0.22	7.50	1.25±0.11	6	100	0	0.00	0	0.00	6	100	6	100
Kazi	7.60	1.09±0.16	6.40	0.91±0.04	7	100	0	0.00	0	0.00	6	85.71	7	100
Mohp	49.50	2.36±0.29	26.50	1.26±0.07	14	66.67	5	23.81	2	9.52	21	100	15	71.43
Koho2	76.30	3.05±0.28	39.30	1.57±0.07	24	96.00	0	0.00	1	4.00	25	100	23	92.00
Panb	9.70	1.39±0.17	8.70	1.24±0.14	3	42.86	4	57.14	0	0.00	7	100	2	28.57
Hati	33.40	1.86±0.13	26.40	1.47±0.08	8	44.44	7	38.89	3	16.67	18	100	10	55.56
Baga	64.40	1.26±0.05	53.90	1.06±0.03	46	90.20	1	1.96	4	7.84	50	98.04	50	98.04
Harm	43.10	1.35±0.14	35.40	1.11±0.05	28	87.50	1	3.13	3	9.38	30	93.75	31	96.88
Nanc	14.00	1.56±0.19	11.50	1.28±0.12	4	44.44	3	33.33	2	22.22	8	88.89	3	33.33
Naja	54.40	1.65±0.13	42.50	1.29±0.07	11	33.33	14	42.42	8	24.24	33	100	18	54.55
Bagh	53.00	2.21±0.32	35.80	1.49±0.13	9	37.50	9	37.50	6	25.00	23	95.83	15	62.50
Kawa	11.50	3.83±0.44	4.00	1.33±0.17	1	33.33	1	33.33	1	33.33	3	100	1	33.33
Band	23.30	2.33±0.52	11.10	1.11±0.05	4	40.00	1	10.00	5	50.00	10	100	9	90.00
Deop	46.00	1.77±0.32	30.90	1.19±0.09	16	61.54	4	15.38	6	23.08	25	96.15	21	80.77
Nahr	18.70	1.25±0.14	16.20	1.08±0.09	8	53.33	2	13.33	5	33.33	15	100	12	80.00
Bura1	1.60	0.80±0.00	1.60	0.80±0.00	2	100	0	0.00	0	0.00	2	100	2	100
Kanc	22.80	2.28±0.40	13.80	1.38±0.13	6	60.00	3	30.00	1	10.00	10	100	7	70.00
Pacg	49.00	2.58±0.41	27.00	1.42±0.09	15	78.95	3	15.79	1	5.26	19	100	16	84.21
Katb	34.70	2.48±0.50	18.70	1.34±0.10	6	42.86	7	50.00	1	7.14	14	100	7	50.00
Total	1192.80	1.80±0.04	776.50	1.17±0.01	467	70.44	113	17.04	83	12.52	636	95.93	527	79.49

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, SE- standard error and %- in percentages.

Appendix Table 6.16. Respondent household amenities (electricity, mobile, television, vehicle and sanitation facilities) of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Amenities															
	Electricity		Mobile		Television		Vehicle								Sanitation facility	
							Vehicle (Yes)		Cycle		Two-wheeler		Car/Auto			
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	9	100	4	44.44	2	22.22	8	88.89	8	100	1	12.50	0	0.00	1	11.11
Belo	23	88.46	12	46.15	4	15.38	8	30.77	6	75.00	4	50.00	0	0.00	4	15.38
Tamp	20	100	20	100	12	60.00	20	100	19	95.00	5	25.00	1	5.00	20	100
Japp	11	84.62	9	69.23	3	23.08	10	76.92	9	90.00	3	30.00	0	0.00	4	30.77
Meth	68	89.47	60	78.95	27	35.53	18	23.68	16	88.89	5	27.78	0	0.00	18	23.68
Borj	42	85.71	30	61.22	10	20.41	30	61.22	25	83.33	4	13.33	1	3.33	10	20.41
Hali	9	64.29	3	21.43	3	21.43	4	28.57	3	75.00	2	50.00	0	0.00	3	21.43
Silj	20	71.43	15	53.57	10	35.71	10	35.71	7	70.00	2	20.00	2	20.00	9	32.14
Sild1	19	90.48	13	61.90	0	0.00	5	23.81	4	80.00	2	40.00	0	0.00	15	71.43
Sild2	10	58.82	9	52.94	2	11.76	3	17.65	1	33.33	2	66.67	0	0.00	1	5.88
Gosh	33	75.00	29	65.91	16	36.36	32	72.73	32	100	3	9.38	0	0.00	26	59.09
Domj1	14	100	9	64.29	7	50.00	9	64.29	9	100	2	22.22	1	11.11	7	50.00
Domj2	6	100	6	100	5	83.33	3	50.00	3	100	0	0.00	0	0.00	5	83.33
Kazi	5	71.43	3	42.86	0	0.00	3	42.86	3	100	1	33.33	0	0.00	4	57.14
Mohp	20	95.24	20	95.24	15	71.43	16	76.19	16	100	8	50.00	3	18.75	10	47.62
Koho2	24	96.00	19	76.00	13	52.00	19	76.00	19	100	3	15.79	0	0.00	17	68.00
Panb	6	85.71	6	85.71	4	57.14	3	42.86	3	100	0	0.00	0	0.00	3	42.86
Hati	15	83.33	11	61.11	10	55.56	9	50.00	9	100	1	11.11	0	0.00	9	50.00
Baga	34	66.67	21	41.18	5	9.80	12	23.53	9	75.00	3	25.00	1	8.33	8	15.69
Harm	20	62.50	6	18.75	4	12.50	15	46.88	14	93.33	1	6.67	1	6.67	7	21.88
Nanc	9	100	8	88.89	3	33.33	3	33.33	3	100	1	33.33	0	0.00	5	55.56
Naja	32	96.97	25	75.76	18	54.55	19	57.58	16	84.21	4	21.05	2	10.53	16	48.48
Bagh	22	91.67	20	83.33	13	54.17	15	62.50	15	100	6	40.00	3	20.00	9	37.50
Kawa	2	66.67	2	66.67	2	66.67	2	66.67	1	50.00	1	50.00	0	0.00	2	66.67
Band	10	100	7	70.00	2	20.00	7	70.00	2	28.57	1	14.29	4	57.14	1	10.00
Deop	21	80.77	16	61.54	6	23.08	7	26.92	7	100	2	28.57	2	28.57	6	23.08
Nahr	13	86.67	7	46.67	3	20.00	5	33.33	4	80.00	1	20.00	0	0.00	2	13.33
Bura1	2	100	1	50.00	1	50.00	1	50.00	1	100	0	0.00	0	0.00	0	0.00
Kanc	10	100	10	100	5	50.00	4	40.00	4	100	2	50.00	0	0.00	6	60.00
Pacg	16	84.21	15	78.95	7	36.84	11	57.89	9	81.82	4	36.36	0	0.00	15	78.95
Katb	14	100	13	92.86	9	64.29	13	92.86	12	92.31	4	30.77	1	7.69	12	85.71
Total	559	84.31	429	64.71	221	33.33	324	48.87	289	89.20	78	24.07	22	6.79	255	38.46

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari,

Village	Amenities													
	Electricity		Mobile		Television		Vehicle						Sanitation facility	
	Total	%	Total	%	Total	%	Vehicle (Yes)	%	Cycle	%	Two-wheeler	%	Car/Auto	%

Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.17. Respondent household amenities (health visit and water resources) of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Amenities															
	Health visit (ASHA)						Water resource									
	Yes		Permanent		Temporary		Community Tap/Handpump		Handpump		Natural River/Stream/Beel		Tap		Well	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	4	44.44	3	75.00	1	25.00	1	11.11	9	100	4	44.44	2	22.22	0	0.00
Belo	8	30.77	7	87.50	1	12.50	5	19.23	26	100	10	38.46	0	0.00	1	3.85
Tamp	8	40.00	7	87.50	1	12.50	5	25.00	20	100	5	25.00	1	5.00	1	5.00
Japp	6	46.15	5	83.33	1	16.67	3	23.08	13	100	5	38.46	1	7.69	0	0.00
Meth	44	57.89	39	88.64	5	11.36	26	34.21	43	56.58	24	31.58	10	13.16	2	2.63
Borj	21	42.86	20	95.24	1	4.76	17	34.69	35	71.43	17	34.69	1	2.04	2	4.08
Hali	5	35.71	4	80.00	1	20.00	7	50.00	7	50.00	4	28.57	1	7.14	0	0.00
Silj	12	42.86	10	83.33	2	16.67	8	28.57	22	78.57	10	35.71	3	10.71	1	3.57
Sild1	11	52.38	8	72.73	3	27.27	7	33.33	21	100	8	38.10	1	4.76	1	4.76
Sild2	6	35.29	5	83.33	1	16.67	4	23.53	17	100	6	35.29	2	11.76	1	5.88
Gosh	21	47.73	18	85.71	3	14.29	11	25.00	34	77.27	18	40.91	3	6.82	2	4.55
Domj1	5	35.71	3	60.00	2	40.00	6	42.86	14	100	5	35.71	1	7.14	0	0.00
Domj2	2	33.33	2	100	0	0.00	2	33.33	6	100	3	50.00	0	0.00	0	0.00
Kazi	2	28.57	1	50.00	1	50.00	2	28.57	6	85.71	3	42.86	0	0.00	1	14.29
Mohp	14	66.67	10	71.43	4	28.57	2	9.52	21	100	9	42.86	1	4.76	0	0.00
Koho2	16	64.00	12	75.00	4	25.00	2	8.00	23	92.00	11	44.00	0	0.00	1	4.00
Panb	2	28.57	2	100	0	0.00	1	14.29	6	85.71	1	14.29	0	0.00	1	14.29
Hati	14	77.78	11	78.57	3	21.43	5	27.78	7	38.89	3	16.67	6	33.33	0	0.00
Baga	11	21.57	9	81.82	2	18.18	18	35.29	21	41.18	18	35.29	0	0.00	2	3.92
Harm	17	53.13	14	82.35	3	17.65	4	12.50	25	78.13	7	21.88	0	0.00	2	6.25
Nanc	5	55.56	4	80.00	1	20.00	2	22.22	7	77.78	1	11.11	0	0.00	0	0.00
Naja	22	66.67	19	86.36	3	13.64	6	18.18	27	81.82	6	18.18	1	3.03	1	3.03
Bagh	15	62.50	11	73.33	4	26.67	5	20.83	11	45.83	7	29.17	7	29.17	2	8.33
Kawa	1	33.33	1	100	0	0.00	1	33.33	3	100	1	33.33	0	0.00	0	0.00
Band	7	70.00	6	85.71	1	14.29	0	0.00	10	100	1	10.00	0	0.00	1	10.00
Deop	16	61.54	12	75.00	4	25.00	4	15.38	18	69.23	8	30.77	2	7.69	1	3.85

Village	Amenities															
	Health visit (ASHA)						Water resource									
	Yes		Permanent		Temporary		Community Tap/Handpump		Handpump		Natural River/Stream/Beel		Tap		Well	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Nahr	8	53.33	7	87.50	1	12.50	14	93.33	1	6.67	4	26.67	0	0.00	1	6.67
Bura1	2	100	2	100	0	0.00	1	50.00	1	50.00	0	0.00	0	0.00	0	0.00
Kanc	5	50.00	5	100	0	0.00	10	100	0	0.00	3	30.00	0	0.00	0	0.00
Pacg	5	26.32	5	100	0	0.00	3	15.79	16	84.21	5	26.32	1	5.26	0	0.00
Katb	4	28.57	3	75.00	1	25.00	2	14.29	13	92.86	2	14.29	2	14.29	1	7.14
Total	319	48.11	265	83.07	54	16.93	184	27.75	483	72.85	209	31.52	46	6.94	25	3.77

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.18. Respondent household amenities (cooking sources) of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Amenities									
	Cooking source									
	Biogas		Dung		Fuelwood		Kerosene		Liquid petroleum gas	
	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	0	0.00	1	11.11	9	100	1	11.11	0	0.00
Belo	1	3.85	9	34.62	26	100	4	15.38	2	7.69
Tamp	0	0.00	6	30.00	20	100	2	10.00	7	35.00
Japp	0	0.00	5	38.46	12	92.31	2	15.38	1	7.69
Meth	0	0.00	16	21.05	73	96.05	11	14.47	5	6.58
Borj	0	0.00	10	20.41	48	97.96	7	14.29	3	6.12
Hali	0	0.00	3	21.43	13	92.86	2	14.29	1	7.14
Silj	0	0.00	7	25.00	26	92.86	4	14.29	2	7.14
Sild1	0	0.00	4	19.05	21	100	2	9.52	0	0.00
Sild2	0	0.00	2	11.76	17	100	4	23.53	0	0.00
Gosh	0	0.00	9	20.45	44	100	6	13.64	0	0.00
Domj1	0	0.00	3	21.43	13	92.86	4	28.57	2	14.29
Domj2	0	0.00	1	16.67	6	100	2	33.33	0	0.00
Kazi	0	0.00	2	28.57	7	100	1	14.29	0	0.00
Mohp	0	0.00	4	19.05	18	85.71	3	14.29	5	23.81
Koho2	0	0.00	6	24.00	25	100	4	16.00	2	8.00
Panb	1	14.29	2	28.57	7	100	0	0.00	0	0.00
Hati	0	0.00	2	11.11	18	100	3	16.67	2	11.11

Village	Amenities									
	Cooking source									
	Biogas		Dung		Fuelwood		Kerosene		Liquid petroleum gas	
	Total	%	Total	%	Total	%	Total	%	Total	%
Baga	0	0.00	8	15.69	49	96.08	9	17.65	2	3.92
Harm	0	0.00	6	18.75	32	100	3	9.38	0	0.00
Nanc	0	0.00	1	11.11	7	77.78	1	11.11	3	33.33
Naja	0	0.00	4	12.12	27	81.82	4	12.12	10	30.30
Bagh	0	0.00	3	12.50	20	83.33	2	8.33	7	29.17
Kawa	0	0.00	0	0.00	3	100	0	0.00	0	0.00
Band	0	0.00	1	10.00	10	100	2	20.00	1	10.00
Deop	0	0.00	4	15.38	23	88.46	2	7.69	3	11.54
Nahr	0	0.00	3	20.00	15	100	2	13.33	0	0.00
Bura1	0	0.00	0	0.00	2	100	0	0.00	0	0.00
Kanc	0	0.00	2	20.00	10	100	1	10.00	2	20.00
Pacg	0	0.00	2	10.53	18	94.74	2	10.53	6	31.58
Katb	0	0.00	2	14.29	11	78.57	1	7.14	6	42.86
Total	2	0.30	128	19.31	630	95.02	91	13.73	72	10.86

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.19. Respondent occupation and income source details (agriculture, wage labour, private job, government job, animal husbandry and small business) of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Occupation/income source											
	Agriculture		Wage labour		Private job		Government job		Animal husbandry		Small business	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	8	88.89	6	66.67	1	11.11	2	22.22	5	55.56	1	11.11
Belo	25	96.15	19	73.08	0	0.00	4	15.38	5	19.23	3	11.54
Tamp	19	95.00	16	80.00	3	15.00	0	0.00	7	36.84	7	35.00
Japp	13	100	8	61.54	2	15.38	0	0.00	9	75.00	0	0.00
Meth	49	64.47	74	97.37	5	6.58	2	2.63	16	28.07	3	3.95
Borj	34	69.39	44	89.80	4	8.16	1	2.04	12	31.58	4	8.16
Hali	6	42.86	9	64.29	4	28.57	1	7.14	3	30.00	1	7.14
Silj	23	82.14	27	96.43	1	3.57	1	3.57	16	72.73	1	3.57
Sild1	12	57.14	17	80.95	3	14.29	0	0.00	16	80.00	3	14.29
Sild2	7	41.18	14	82.35	1	5.88	0	0.00	14	82.35	1	5.88
Gosh	38	86.36	40	90.91	5	11.36	1	2.27	33	78.57	1	2.27
Domj1	14	100	10	71.43	0	0.00	1	7.14	6	42.86	4	28.57

Village	Occupation/income source											
	Agriculture		Wage labour		Private job		Government job		Animal husbandry		Small business	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Domj2	5	83.33	5	83.33	1	16.67	2	33.33	3	50.00	0	0.00
Kazi	3	42.86	5	71.43	2	28.57	0	0.00	4	66.67	0	0.00
Mohp	17	80.95	9	42.86	1	4.76	3	14.29	13	65.00	3	14.29
Koho2	21	84.00	20	80.00	7	28.00	2	8.00	16	66.67	3	12.00
Panb	5	71.43	7	100	0	0.00	0	0.00	0	0.00	0	0.00
Hati	14	77.78	17	94.44	2	11.11	0	0.00	4	30.77	1	5.56
Baga	30	58.82	43	84.31	6	11.76	2	3.92	17	36.17	1	1.96
Harm	23	71.88	25	78.13	1	3.13	0	0.00	12	42.86	3	9.38
Nanc	6	66.67	6	66.67	1	11.11	0	0.00	1	12.50	2	22.22
Naja	19	57.58	15	45.45	3	9.09	0	0.00	7	28.00	18	54.55
Bagh	22	91.67	10	41.67	8	33.33	3	12.50	4	20.00	9	37.50
Kawa	3	100	0	0.00	0	0.00	0	0.00	1	33.33	0	0.00
Band	10	100	7	70.00	1	10.00	0	0.00	4	40.00	2	20.00
Deop	23	88.46	17	65.38	3	11.54	1	3.85	8	33.33	5	19.23
Nahr	6	40.00	14	93.33	1	6.67	0	0.00	4	33.33	1	6.67
Bura1	0	0.00	2	100	0	0.00	0	0.00	0	0.00	0	0.00
Kanc	7	70.00	5	50.00	1	10.00	1	10.00	4	40.00	3	30.00
Pacg	13	68.42	10	52.63	6	31.58	5	26.32	4	23.53	2	10.53
Katb	10	71.43	2	14.29	0	0.00	1	7.14	5	38.46	1	7.14
Total	485	73.15	503	75.87	73	11.01	33	4.98	253	43.77	83	12.52

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.20. Respondent occupation and income source details (handicrafts, mekhela weaving, tourism, home gardening and others) of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Occupation/income source									
	Handicrafts		Mekhela weaving		Tourism		Home gardening		Others	
	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	0	0.00	9	100	0	0.00	2	25.00	1	11.11
Belo	0	0.00	15	57.69	8	30.77	3	20.00	4	15.38
Tamp	1	5.00	9	45.00	0	0.00	4	23.53	0	0.00
Japp	0	0.00	6	46.15	0	0.00	5	45.45	1	7.69
Meth	1	1.32	0	0.00	30	39.47	12	35.29	2	2.63
Borj	1	2.04	0	0.00	0	0.00	6	28.57	5	10.20
Hali	0	0.00	0	0.00	5	35.71	7	70.00	2	14.29

Village	Occupation/income source									
	Handicrafts		Mekhela weaving		Tourism		Home gardening		Others	
	Total	%	Total	%	Total	%	Total	%	Total	%
Silj	0	0.00	0	0.00	0	0.00	3	13.04	1	3.57
Sild1	0	0.00	0	0.00	2	9.52	2	18.18	3	14.29
Sild2	0	0.00	8	47.06	2	11.76	2	40.00	2	11.76
Gosh	0	0.00	0	0.00	0	0.00	8	38.10	18	40.91
Domj1	0	0.00	1	7.14	0	0.00	5	41.67	1	7.14
Domj2	1	16.67	1	16.67	1	16.67	1	16.67	0	0.00
Kazi	0	0.00	5	71.43	0	0.00	0	0.00	0	0.00
Mohp	1	4.76	5	23.81	15	71.43	3	21.43	1	4.76
Koho2	0	0.00	0	0.00	13	52.00	2	11.11	6	24.00
Panb	0	0.00	0	0.00	0	0.00	1	50.00	0	0.00
Hati	0	0.00	2	11.11	0	0.00	1	8.33	0	0.00
Baga	0	0.00	0	0.00	6	11.76	5	20.00	6	11.76
Harm	0	0.00	0	0.00	3	9.38	2	20.00	5	15.63
Nanc	0	0.00	0	0.00	0	0.00	1	25.00	0	0.00
Naja	0	0.00	1	3.03	3	9.09	2	14.29	3	9.09
Bagh	1	4.17	3	12.50	2	8.33	3	21.43	1	4.17
Kawa	0	0.00	0	0.00	0	0.00	3	100	0	0.00
Band	0	0.00	0	0.00	0	0.00	3	37.50	4	40.00
Deop	0	0.00	0	0.00	2	7.69	3	27.27	3	11.54
Nahr	0	0.00	5	33.33	0	0.00	0	0.00	2	13.33
Bura1	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Kanc	0	0.00	8	80.00	0	0.00	3	60.00	2	20.00
Pacg	0	0.00	0	0.00	0	0.00	4	40.00	0	0.00
Katb	0	0.00	0	0.00	0	0.00	6	66.67	0	0.00
Total	6	0.90	78	11.76	92	13.88	102	28.33	73	11.01

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.21. Total mean annual income generated from occupation (agriculture, wage labour, private job, government job, animal husbandry and small business) of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Annual income from occupation (INR/annum)											
	Agriculture		Wage labour		Private job		Government job		Animal husbandry		Small business	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	304620	38077.50±4154.21	223100	37183.33±8067.23	40000	40000.00±0.00	432000	216000.00±36000.00	119800	23960.00±10394.31	144000	144000.00±0.00
Belo	371920	14876.80±2642.76	871550	45871.05±6369.42	0	0.00	660000	165000.00±69346.95	87800	17560.00±6507.96	564000	188000.00±86625.63
Tamp	729220	38380.00±5841.54	1327500	82968.75±6233.08	294000	98000.00±29866.37	0	0.00	55600	7942.86±2512.72	660000	94285.71±15140.16

Village	Annual income from occupation (INR/annum)											
	Agriculture		Wage labour		Private job		Government job		Animal husbandry		Small business	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Japp	471960	36304.62±4201.10	476400	59550.00±13119.76	324000	162000.00±78000.00	0	0.00	131800	14644.44±2515.68	0	0.00
Meth	679920	13875.92±1776.78	3505870	47376.62±2356.85	258000	51600.00±12237.65	266400	133200.00±130800.00	94100	5881.25±1320.77	240000	80000.00±28844.41
Borj	558600	16429.41±2601.17	2577670	58583.41±5294.09	276000	69000.00±17916.47	120000	120000.00±0.00	137500	11458.33±3022.60	653000	163250.00±41043.42
Hali	151000	25166.67±2197.22	470400	52266.67±8375.63	348000	87000.00±14798.65	36000	36000.00±0.00	29300	9766.67±7518.05	144000	144000.00±0.00
Silj	397000	17260.87±3368.19	1403590	51984.81±6143.67	216000	216000.00±0.00	144000	144000.00±0.00	165570	10348.13±2374.27	180000	180000.00±0.00
Sild1	164480	13706.67±2477.27	944280	55545.88±8891.05	264000	88000.00±25534.29	0	0.00	213800	13362.50±2145.87	220000	73333.33±19641.23
Sild2	136120	19445.71±4782.77	807320	57665.71±7160.81	84000	84000.00±0.00	0	0.00	191400	13671.43±1479.77	150000	150000.00±0.00
Gosh	853420	22458.42±2756.17	1688640	42216.00±3797.06	510000	102000.00±16757.09	48000	48000.00±0.00	219100	6639.39±977.60	60000	60000.00±0.00
Domj1	274660	19618.57±4280.43	657250	65725.00±9822.20	0	0.00	120000	120000.00±0.00	38350	6391.67±2585.23	605000	151250.00±37769.86
Domj2	108000	21600.00±2315.17	307000	61400.00±5979.97	120000	120000.00±0.00	240000	120000.00±96000.00	14000	4666.67±1666.67	0	0.00
Kazi	25000	8333.33±4841.95	465980	93196.00±13641.13	114000	57000.00±3000.00	0	0.00	45000	11250.00±750.00	0	0.00
Mohp	408080	24004.71±5980.64	421750	46861.11±9857.39	280000	280000.00±0.00	612000	204000.00±31749.02	328350	25257.69±6323.88	588000	196000.00±90421.24
Koho2	541420	25781.90±4263.26	1056650	52832.50±9232.09	600000	85714.29±22131.33	516000	258000.00±78000.00	159500	9968.75±1374.22	410000	136666.67±55477.72
Panb	29000	5800.00±1157.58	292800	41828.57±6328.54	0	0.00	0	0.00	0	0.00	0	0.00
Hati	228000	16285.71±3209.58	782900	46052.94±5893.33	180000	90000.00±30000.00	0	0.00	35200	8800.00±1704.89	192000	192000.00±0.00
Baga	297040	9901.33±1299.41	2048080	47629.77±3472.03	396000	66000.00±6928.20	288000	144000.00±132000.00	137750	8102.94±2016.07	45000	45000.00±0.00
Harm	422450	18367.39±2556.74	1394020	55760.80±5414.33	108000	108000.00±0.00	0	0.00	103900	8658.33±1492.53	558000	186000.00±27495.45
Nanc	211720	35286.67±6889.76	271000	45166.67±7643.81	84000	84000.00±0.00	0	0.00	17900	17900.00±0.00	288000	144000.00±36000.00
Naja	510160	26850.53±2828.97	843900	56260.00±8565.41	468000	156000.00±54111.00	0	0.00	34450	4921.43±717.29	2802000	155666.67±19837.41
Bagh	1074220	48828.18±12622.03	539500	53950.00±12016.76	864000	108000.00±10875.92	1200000	400000.00±102137.16	28800	7200±3302.52	1368000	152000.00±59396.97
Kawa	59540	19846.67±5661.64	0	0.00	0	0.00	0	0.00	2000	2000±0.00	0	0.00
Band	386160	38616.00±6875.05	424000	60571.43±11803.67	168000	168000.00±0.00	0	0.00	26500	6625±2461.16	288000	144000.00±24000.00
Deop	765820	33296.52±7008.47	974000	57294.12±9439.44	384000	128000.00±8000.00	336000	336000.00±0.00	27400	3425±462.04	748000	149600.00±47423.20
Nahr	101000	16833.33±4384.95	548000	39142.86±3709.37	108000	108000.00±0.00	0	0.00	34500	8625±3693.32	180000	180000.00±0.00
Bura1	0	0.00	79200	39600.00±8400.00	0	0.00	0	0.00	0	0	0	0.00
Kanc	2397820	342545.71±126472.04	253500	50700.00±13251.04	96000	96000.00±0.00	21600	21600.00±0.00	50000	12500±1848.42	380000	126666.67±36829.94
Pacg	305300	23484.62±3496.73	620250	62025.00±12980.78	792000	132000.00±33799.41	712200	142440.00±132437.77	33900	8475±4626.26	300000	150000.00±90000.00
Katb	5083220	508322.00±123630.13	105000	52500.00±7500.00	0	0.00	1800	1800.00±0.00	44100	8820±1914.26	96000	96000.00±0.00
Total	18046870	37210.04±4732.42	26381100	52447.51±1306.83	7376000	101041.10±6605.32	5754000	174363.64±29031.14	2607370	10305.81±629.26	11863000	142927.71±10232.64

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, INR- Indian Rupee and SE- standard error.

Appendix Table 6.22. Total mean annual income generated from occupation (handicrafts, mekhela weaving, tourism, home gardening and other) of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Annual income from occupation (INR/annum)									
	Handicraft		Mekhela weaving		Tourism		Home gardening		Others	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	0	0.00	204000	22666.67±2962.73	0	0.00	17000	8500.00±500.00	10000	10000.00±0.00
Belo	0	0.00	347000	23133.33±1921.97	1945000	243125.00±24255.66	29000	9666.67±333.33	29500	7375.00±850.86
Tamp	4000	4000.00±0.00	230000	25555.56±3947.96	0	0.00	128000	32000.00±14370.11	0	0.00

Village	Annual income from occupation (INR/annum)									
	Handicraft		Mekhela weaving		Tourism		Home gardening		Others	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Japp	0	0.00	199000	33166.67±3320.81	0	0.00	122000	24400.00±11548.16	4000	4000.00±0.00
Meth	10000	10000.00±0.00	0	0.00	7455000	248500.00±10230.31	144000	12000.00±1403.46	12000	6000.00±1000.00
Borj	1000	1000.00±0.00	0	0.00	0	0.00	80000	13333.33±2170.51	33500	6700.00±1200.00
Hali	0	0.00	0	0.00	1215000	243000.00±16852.30	92000	13142.86±670.06	10000	5000.00±2000.00
Silj	0	0.00	0	0.00	0	0.00	43000	14333.33±3179.80	5000	5000.00±0.00
Sild1	0	0.00	0	0.00	789000	394500.00±10500.00	25000	12500.00±2500.00	26000	8666.67±1092.91
Sild2	0	0.00	275000	34375.00±3707.80	385000	192500.00±17500.00	30000	15000.00±5000.00	12000	6000.00±1000.00
Gosh	0	0.00	0	0.00	0	0.00	110000	13750.00±1250.00	84400	4688.89±537.54
Domj1	0	0.00	30000	30000.00±0.00	0	0.00	70000	14000.00±1870.83	5000	5000.00±0.00
Domj2	700	700.00±0.00	28000	28000.00±0.00	315000	315000.00±0.00	10000	10000.00±0.00	0	0.00
Kazi	0	0.00	132000	26400.00±400.00	0	0.00	0	0.00	0	0.00
Mohp	25000	25000.00±0.00	98000	19600.00±3264.97	3424000	228266.67±19185.18	43000	14333.33±2185.81	5000	5000.00±0.00
Koho2	0	0.00	0	0.00	3059000	235307.69±19030.81	30000	15000.00±0.00	38600	6433.33±849.18
Panb	0	0.00	0	0.00	0	0.00	7000	7000.00±0.00	0	0.00
Hati	0	0.00	58000	29000.00±1000.00	0	0.00	10000	10000.00±0.00	0	0.00
Baga	0	0.00	0	0.00	1595000	265833.33±21713.92	81000	16200.00±2727.64	30300	5050.00±478.71
Harm	0	0.00	0	0.00	757000	252333.33±31750.77	25000	12500.00±2500.00	40000	8000.00±1303.84
Nanc	0	0.00	0	0.00	0	0.00	20000	20000.00±0.00	0	0.00
Naja	0	0.00	24000	24000.00±0.00	588000	196000.00±29484.46	26000	13000.00±3000.00	12300	4100.00±665.83
Bagh	5000	5000.00±0.00	71000	23666.67±4333.33	371000	185500.00±10500.00	85000	28333.33±15898.99	2500	2500.00±0.00
Kawa	0	0.00	0	0.00	0	0.00	195000	65000.00±7637.63	0	0.00
Band	0	0.00	0	0.00	0	0.00	37000	12333.33±333.33	23500	5875.00±1687.89
Deop	0	0.00	0	0.00	418000	209000.00±1000.00	44500	14833.33±2587.36	26800	8933.33±66.67
Nahr	0	0.00	175000	35000.00±5385.16	0	0.00	0	0.00	12200	6100.00±2100.00
Bura1	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Kanc	0	0.00	168000	21000.00±2659.22	0	0.00	44000	14666.67±333.33	13500	6750.00±2250.00
Pacg	0	0.00	0	0.00	0	0.00	92000	23000.00±9255.63	0	0.00
Katb	0	0.00	0	0.00	0	0.00	162000	27000.00±10181.68	0	0.00
Total	45700	7616.67±3739.02	2039000	26141.03±1071.80	22316000	242565.22±6647.79	1801500	17661.76±1483.41	436100	5973.97±285.12

Bang- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, INR- Indian Rupee and SE- standard error.

Appendix Table 6.23. Total mean annual income generated from various types of occupation from villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Total annual income from occupation (INR/annum)	
	Total	Mean±SE
Bamg	1494520	166057.78±49719.45
Belo	4905770	188683.46±32371.79
Tamp	3428320	171416.00±14356.97
Japp	1729160	133012.31±23058.11
Meth	12665290	166648.55±15331.54
Borj	4437270	90556.53±10586.17
Hali	2495700	178264.29±39933.15
Silj	2554160	91220.00±18829.02
Sild1	2646560	126026.67±30111.45
Sild2	2070840	121814.12±19551.73
Gosh	3573560	81217.27±7045.38
Domj1	1800260	128590.00±24009.26
Domj2	1142700	190450.00±64692.88
Kazi	781980	111711.43±14389.46
Mohp	6233180	296818.10±39690.66
Koho2	6411170	256446.80±36454.59
Panb	328800	46971.43±6490.65
Hati	1486100	82561.11±13032.12
Baga	4918170	96434.71±14854.48
Harm	3408370	106511.56±12954.19
Nanc	892620	99180.00±15375.18
Naja	5308810	160873.03±26923.17
Bagh	5609020	233709.17±49185.19
Kawa	256540	85513.33±11075.54
Band	1353160	135316.00±17868.80
Deop	3724520	143250.77±30096.92
Nahr	1158700	77246.67±16958.25
Bura1	79200	39600.00±8400.00
Kanc	3424420	342442.00±97594.19
Pacg	2855650	150297.37±37610.37
Katb	5492120	392294.29±107908.60
Total	98666640	148818.46±5984.75

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, INR- Indian Rupee and SE- standard error.

Appendix Table 6.24. Agriculture occupation details (landholding, sharecropping land and season) of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Agriculture land (in hectare)		Agriculture sharing land (in hectare)				Agriculture season							
			Yes		Area		Summer		Monsoon		Winter		Throughout the year	
	Total	Mean±SE	Total	%	Total	Mean±SE	Total	%	Total	%	Total	%	Total	%
Bamg	5.08	0.64±0.11	0	0.00	0.00	0.00	5	62.50	8	100	8	100	5	62.50
Belo	17.53	0.70±0.08	4	16.00	1.47	0.37±0.03	5	20.00	25	100	14	56.00	4	16.00
Tamp	21.67	1.14±0.20	0	0.00	0.00	0.00	3	15.79	16	84.21	19	100	1	5.26
Japp	16.32	1.26±0.17	0	0.00	0.00	0.00	1	7.69	5	38.46	12	92.31	0	0.00
Meth	32.84	0.67±0.05	4	8.16	3.34	0.84±0.11	6	12.24	49	100	9	18.37	2	4.08
Borj	26.89	0.79±0.11	0	0.00	0.00	0.00	5	14.71	33	97.06	7	20.59	1	2.94
Hali	4.95	0.82±0.21	1	16.67	0.80	0.80±0.00	1	16.67	2	33.33	6	100	0	0.00
Silj	15.79	0.69±0.10	4	17.39	1.61	0.40±0.09	3	13.04	23	100	8	34.78	2	8.70
Sild1	10.30	0.86±0.17	3	25.00	2.27	0.76±0.04	1	8.33	12	100	4	33.33	0	0.00
Sild2	7.76	1.11±0.20	2	28.57	1.61	0.80±0.27	1	14.29	7	100	3	42.86	0	0.00
Gosh	48.56	1.28±0.10	23	60.53	20.33	0.88±0.11	8	21.05	38	100	21	55.26	4	10.53
Domj1	16.86	1.20±0.13	6	42.86	3.61	0.60±0.15	4	28.57	13	92.86	3	21.43	2	14.29
Domj2	6.69	1.34±0.17	5	100	3.88	0.78±0.17	1	20.00	5	100	1	20.00	1	20.00
Kazi	1.61	0.54±0.15	1	33.33	0.40	0.40±0.00	0	0.00	2	66.67	1	33.33	0	0.00
Mohp	22.48	1.32±0.30	1	5.88	2.41	2.41±0.00	2	11.76	17	100	3	17.65	0	0.00
Koho2	27.22	1.30±0.22	1	4.76	0.27	0.27±0.00	2	9.52	21	100	9	42.86	1	4.76
Panb	5.08	1.02±0.29	2	40.00	0.80	0.40±0.00	2	40.00	5	100	0	0.00	0	0.00
Hati	6.35	0.45±0.07	2	14.29	0.80	0.40±0.00	2	14.29	9	64.29	8	57.14	0	0.00
Baga	23.61	0.79±0.10	11	36.67	5.08	0.46±0.05	5	16.67	5	16.67	28	93.33	0	0.00
Harm	16.99	0.74±0.10	8	34.78	3.88	0.48±0.06	5	21.74	17	73.91	15	65.22	1	4.35
Nanc	8.83	1.47±0.21	3	50.00	2.01	0.67±0.20	2	33.33	4	66.67	3	50.00	0	0.00
Naja	15.79	0.83±0.11	7	36.84	3.34	0.48±0.08	4	21.05	19	100	1	5.26	0	0.00
Bagh	35.05	1.59±0.54	8	36.36	21.54	2.69±1.17	4	18.18	22	100	6	27.27	2	9.09
Kawa	2.27	0.76±0.19	0	0.00	0.00	0.00	0	0.00	3	100	0	0.00	0	0.00
Band	8.83	0.88±0.15	3	30.00	1.87	0.62±0.04	2	20.00	10	100	2	20.00	1	10.00
Deop	28.50	1.24±0.28	9	39.13	11.77	1.31±0.42	6	26.09	23	100	8	34.78	4	17.39
Nahr	2.27	0.38±0.08	1	16.67	0.40	0.40±0.00	2	33.33	6	100	1	16.67	0	0.00
Bura1	0.00	0.00	0	0.00	0.00	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Kanc	6.82	0.97±0.21	0	0.00	0.00	0.00	2	28.57	2	28.57	6	85.71	1	14.29
Pacg	10.70	0.82±0.15	3	23.08	2.94	0.98±0.09	3	23.08	10	76.92	8	61.54	1	7.69
Katb	10.84	1.08±0.28	2	20.00	1.07	0.54±0.00	5	50.00	8	80.00	6	60.00	2	20.00
Total	464.48	0.96±0.04	114	23.51	97.53	0.86±0.10	92	18.97	419	86.39	220	45.36	35	7.22

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari,

Village	Agriculture land (in hectare)		Agriculture sharing land (in hectare)				Agriculture season							
			Yes		Area		Summer		Monsoon		Winter		Throughout the year	
	Total	Mean±SE	Total	%	Total	Mean±SE	Total	%	Total	%	Total	%	Total	%

Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, SE- standard error and %- in percentages.

Appendix Table 6.25. Rice cultivation and production details of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Crop		Rice production (in quintal)							
	Rice (Yes)		Annual production qty		Annual self-cons qty		Annual sale qty (@1000/quintal)		Annual income (in INR)	
	Total	%	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	8	100	345	43.13±4.02	45	5.63±0.89	300	37.50±4.34	300000	37500.00±4338.37
Belo	25	100	437	17.48±2.84	97	3.88±0.23	340	13.60±2.72	340000	13600.00±2721.52
Tamp	19	100	763	40.16±5.23	100	5.26±0.45	663	34.89±5.07	663000	34894.74±5074.24
Japp	13	100	470	36.15±4.17	63	4.85±0.63	407	33.92±3.54	407000	33916.67±3538.66
Meth	49	100	888	18.12±1.77	212	4.33±0.24	676	13.80±1.74	676000	13795.92±1742.57
Borj	34	100	691	20.32±2.67	145	4.26±0.32	546	16.06±2.54	546000	16058.82±2535.29
Hali	6	100	177	29.50±2.43	26	4.33±0.33	151	25.17±2.20	151000	25166.67±2197.22
Silj	23	100	490	21.30±3.39	93	4.04±0.42	397	17.26±3.37	397000	17260.87±3368.19
Sild1	12	100	192	16.00±2.46	46	3.83±0.42	146	12.17±2.37	146000	12166.67±2370.38
Sild2	7	100	165	23.57±4.44	37	5.29±0.57	128	18.29±4.40	128000	18285.71±4395.42
Gosh	38	100	981	25.82±2.75	156	4.11±0.25	825	21.71±2.68	825000	21710.53±2676.99
Domj1	14	100	316	22.57±4.53	51	3.64±0.40	265	20.38±4.32	265000	20384.62±4319.81
Domj2	5	100	124	24.80±1.96	16	3.20±0.49	108	21.60±2.32	108000	21600.00±2315.17
Kazi	3	100	35	11.67±4.18	10	3.33±0.67	25	8.33±4.84	25000	8333.33±4841.95
Mohp	17	100	481	28.29±5.96	83	4.88±0.51	398	23.41±5.96	398000	23411.76±5960.07
Koho2	21	100	588	28.00±4.21	75	3.57±0.36	513	24.43±4.07	513000	24428.57±4073.47
Panb	5	100	55	11.00±2.02	26	5.20±1.16	29	5.80±1.16	29000	5800.00±1157.58
Hati	14	100	286	20.43±3.40	58	4.14±0.38	228	16.29±3.21	228000	16285.71±3209.58
Baga	30	100	399	13.30±1.35	107	3.57±0.25	292	9.73±1.26	292000	9733.33±1261.21
Harm	23	100	494	21.48±2.30	95	4.13±0.36	399	17.35±2.28	399000	17347.83±2280.36
Nanc	6	100	235	39.17±7.08	30	5.00±0.37	205	34.17±7.25	205000	34166.67±7249.90
Naja	19	100	542	28.53±2.45	73	3.84±0.47	469	24.68±2.47	469000	24684.21±2469.76
Bagh	22	100	1070	48.64±10.89	118	5.36±0.45	952	43.27±10.70	952000	43272.73±10698.18
Kawa	3	100	74	24.67±6.23	16	5.33±0.88	58	19.33±5.46	58000	19333.33±5456.90
Band	10	100	369	36.90±5.79	38	3.80±0.51	331	33.10±5.62	331000	33100.00±5622.28
Deop	23	100	839	36.48±7.28	103	4.48±0.40	736	32.00±7.09	736000	32000.00±7094.51
Nahr	6	100	126	21.00±4.44	25	4.17±0.79	101	16.83±4.38	101000	16833.33±4384.95
Bura1	0	0	0	0.00	0	0.00	0	0.00	0	0.00

Village	Crop		Rice production (in quintal)							
	Rice (Yes)		Annual production qty		Annual self-cons qty		Annual sale qty (@1000/quintal)		Annual income (in INR)	
	Total	%	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Kanc	7	100	82	11.71±2.13	34	4.86±0.67	48	9.60±1.47	48000	9600.00±1469.69
Pacg	13	100	254	19.54±2.99	56	4.31±0.47	198	18.00±2.53	198000	18000.00±2529.82
Katb	10	100	122	12.20±3.10	50	5.00±0.83	72	14.40±3.56	72000	14400.00±3558.09
Total	485	100	12090	24.93±0.95	2084	4.30±0.08	10006	21.11±0.94	10006000	21109.70±940.01

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, cons-consumption, qty- quantity, INR- Indian Rupee, SE- standard error and %- in percentages.

Appendix Table 6.26. Mustard cultivation and production details of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Crop		Mustard production (in quintal)							
	Mustard (Yes)		Annual production qty		Annual self-cons qty		Annual sale qty (@1400/quintal)		Annual income (in INR)	
	Total	%	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	1	12.50	3.50	3.50±0.00	0.20	0.20±0.00	3.30	3.30±0.00	4620.00	4620.00±0.00
Belo	12	48.00	25.00	2.08±0.29	2.20	0.18±0.01	22.80	1.90±0.29	31920.00	2660.00±400.82
Tamp	16	84.21	50.30	3.14±0.68	3.00	0.19±0.01	47.30	2.96±0.68	66220.00	4138.75±955.10
Japp	5	38.46	47.40	9.48±1.62	1.00	0.20±0.00	46.40	9.28±1.62	64960.00	12992.00±2261.94
Meth	1	2.04	3.00	3.00±0.00	0.20	0.20±0.00	2.80	2.80±0.00	3920.00	3920.00±0.00
Borj	2	5.88	9.40	4.70±3.30	0.40	0.20±0.00	9.00	4.50±3.30	12600.00	6300.00±4620.00
Hali	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Silj	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sild1	4	33.33	14.00	3.50±0.65	0.80	0.20±0.00	13.20	3.30±0.65	18480.00	4620.00±903.70
Sild2	1	14.29	6.00	6.00±0.00	0.20	0.20±0.00	5.80	5.80±0.00	8120.00	8120.00±0.00
Gosh	16	42.11	23.00	1.44±0.14	2.70	0.17±0.01	20.30	1.27±0.13	28420.00	1776.25±180.16
Domj1	2	14.29	7.30	3.65±1.25	0.40	0.20±0.00	6.90	3.45±1.25	9660.00	4830.00±1750.00
Domj2	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kazi	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mohp	3	17.65	7.70	2.57±0.70	0.50	0.17±0.03	7.20	2.40±0.67	10080	3360.00±932.17
Koho2	7	33.33	21.60	3.09±0.76	1.30	0.19±0.01	20.30	2.90±0.75	28420	4060.00±1050.78
Panb	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hati	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Baga	2	6.67	4.00	2.00±0.00	0.40	0.20±0.00	3.60	1.80±0.00	5040	2520.00±0.00
Harm	6	26.09	17.85	2.98±0.57	1.10	0.18±0.02	16.75	2.79±0.56	23450	3908.33±786.25
Nanc	1	16.67	5.00	5.00±0.00	0.20	0.20±0.00	4.80	4.80±0.00	6720	6720.00±0.00
Naja	8	42.11	31.00	3.88±0.44	1.60	0.20±0.00	29.40	3.68±0.44	41160	5145.00±616.95

Village	Crop		Mustard production (in quintal)							
	Mustard (Yes)		Annual production qty		Annual self-cons qty		Annual sale qty (@1400/quintal)		Annual income (in INR)	
	Total	%	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bagh	12	54.55	89.40	7.45±4.82	2.10	0.18±0.01	87.30	7.28±4.81	122220	10185.00±6737.00
Kawa	2	66.67	1.30	0.65±0.05	0.20	0.10±0.00	1.10	0.55±0.05	1540	770.00±70.00
Band	8	80.00	41.00	5.13±1.04	1.60	0.20±0.00	39.40	4.93±1.04	55160	6895.00±1459.67
Deop	9	39.13	22.80	2.53±0.56	1.50	0.17±0.02	21.30	2.37±0.55	29820	3313.33±772.82
Nahr	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bura1	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kanc	1	14.29	1.50	1.50±0.00	0.20	0.20±0.00	1.30	1.30±0.00	1820	1820.00±0.00
Pacg	3	23.08	7.50	2.50±0.87	0.50	0.17±0.03	7.00	2.33±0.84	9800	3266.67±1172.25
Katb	1	10.00	2.50	2.50±0.00	0.20	0.20±0.00	2.30	2.30±0.00	3220	3220.00±0.00
Total	123	25.36	442.05	3.59±0.51	22.50	0.18±0.00	419.55	3.41±0.51	587370	4775.37±716.60

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, cons-consumption, qty- quantity, INR- Indian Rupee, SE- standard error and %- in percentages.

Appendix Table 6.27. Jute cultivation and production details of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Crop		Jute production (in quintal)							
	Jute		Annual production qty		Annual self-cons qty		Annual sale qty (@3000/quintal)		Annual income (in INR)	
	Total	%	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Belo	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tamp	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Japp	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Meth	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Borj	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hali	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Silj	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sild1	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sild2	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gosh	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Domj1	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Domj2	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kazi	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mohp	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Koho2	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Village	Crop		Jute production (in quintal)							
	Jute		Annual production qty		Annual self-cons qty		Annual sale qty (@3000/quintal)		Annual income (in INR)	
	Total	%	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Panb	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hati	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Baga	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Harm	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nanc	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Naja	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bagh	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kawa	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Band	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Deop	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nahr	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bura1	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kanc	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pacg	3	23.08	32.50	10.83±1.67	0.00	0.00	32.50	10.83±1.67	97500.00	32500.00±5000.00
Katb	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	3	0.62	32.50	10.83±1.67	0.00	0.00	32.50	10.83±1.67	97500.00	32500.00±5000.00

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, cons-consumption, qty- quantity, INR- Indian Rupee, SE- standard error and %- in percentages.

Appendix Table 6.28. Tea cultivation and production details of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Crop		Tea production (in quintal)							
	Tea		Annual production qty		Annual self-cons qty		Annual sale qty (@4000/quintal)		Annual income (in INR)	
	Total	%	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Belo	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tamp	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Japp	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Meth	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Borj	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hali	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Silj	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sild1	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sild2	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Village	Crop		Tea production (in quintal)							
	Tea		Annual production qty		Annual self-cons qty		Annual sale qty (@4000/quintal)		Annual income (in INR)	
	Total	%	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Gosh	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Domj1	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Domj2	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kazi	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mohp	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Koho2	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Panb	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hati	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Baga	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Harm	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nanc	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Naja	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bagh	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kawa	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Band	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Deop	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nahr	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bura1	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kanc	4	57.14	610.00	152.50±20.56	23.00	5.75±0.75	587.00	146.75±21.21	2348000.00	587000.00±84827.28
Pacg	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Katb	7	70.00	1290.00	184.29±22.87	38.00	5.43±0.30	1252.00	178.86±22.90	5008000.00	715428.57±91590.93
Total	11	2.27	1900.00	172.73±16.41	61.00	5.55±0.31	1839.00	167.18±16.53	7356000.00	668727.27±66103.65

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, cons-consumption, qty- quantity, INR- Indian Rupee, SE- standard error and %- in percentages.

Appendix Table 6.29. Tourism occupation details of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Tourism season						Benefited from tourism						Tourism remarks							
	Summer		Monsoon		Winter		Yes		No		Unsure		Seasonal activity		Less income		High maintenance (gypsy/petrol)		Livelihood/Income	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Belo	6	75.00	0	0.00	8	100	5	62.50	3	37.50	0	0.00	8	100	3	37.50	3	37.50	5	62.50
Tamp	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00

Village	Tourism season						Benefited from tourism						Tourism remarks							
	Summer		Monsoon		Winter		Yes		No		Unsure		Seasonal activity		Less income		High maintenance (gypsy/petrol)		Livelihood/Income	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Japp	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Meth	21	70.00	4	13.33	26	86.67	23	76.67	6	20.00	1	3.33	30	100	7	23.33	6	20.00	23	76.67
Borj	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Hali	3	60.00	1	20.00	4	80.00	3	60.00	2	40.00	0	0.00	5	100	2	40.00	2	40.00	3	60.00
Silj	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Sild1	1	50.00	1	50.00	2	100	2	100	0	0.00	0	0.00	2	100	0	0.00	0	0.00	2	100
Sild2	2	100	0	0.00	2	100	2	100	0	0.00	0	0.00	2	100	0	0.00	0	0.00	2	100
Gosh	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Domj1	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Domj2	1	100	0	0.00	1	100	1	100	0	0.00	0	0.00	1	100	0	0.00	0	0.00	1	100
Kazi	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Mohp	10	66.67	3	20.00	14	93.33	12	80.00	3	20.00	0	0.00	15	100	3	20.00	3	20.00	12	80.00
Koho2	10	76.92	1	7.69	12	92.31	9	69.23	2	15.38	2	15.38	13	100	4	30.77	2	15.38	9	69.23
Panb	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Hati	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Baga	5	83.33	1	16.67	6	100	5	83.33	1	16.67	0	0.00	6	100	1	16.67	1	16.67	5	83.33
Harm	2	66.67	1	33.33	3	100	2	66.67	1	33.33	0	0.00	3	100	1	33.33	1	33.33	2	66.67
Nanc	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Naja	2	66.67	1	33.33	3	100	3	100	0	0.00	0	0.00	3	100	0	0.00	0	0.00	3	100
Bagh	1	50.00	0	0.00	2	100	2	100	0	0.00	0	0.00	2	100	0	0.00	0	0.00	2	100
Kawa	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Band	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Deop	2	100	0	0.00	2	100	1	50.00	1	50.00	0	0.00	2	100	1	50.00	1	50.00	1	50.00
Nahr	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Bura1	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Kanc	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Pacg	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Katb	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Total	66	71.74	13	14.13	85	92.39	70	76.09	19	20.65	3	3.26	92	100	22	23.91	19	20.65	70	76.09

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.30. Home gardening details (area and season) of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Home gardening													
	Home gardening (Yes)		Area (Katha)		Self-cons (Yes)		Summer		Monsoon		Winter		Throughout the year	
	Total	%	Total	Mean±SE	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	8	88.89	11.50	1.44±0.22	8	100	4	50.00	8	100	5	62.50	4	50.00
Belo	15	57.69	13.00	0.87±0.13	15	100	7	46.67	14	93.33	8	53.33	7	46.67
Tamp	17	85.00	33.40	1.96±0.36	17	100	9	52.94	16	94.12	12	70.59	9	52.94
Japp	11	84.62	13.60	1.24±0.21	11	100	4	36.36	10	90.91	7	63.64	4	36.36
Meth	34	44.74	20.90	0.61±0.06	34	100	18	52.94	32	94.12	25	73.53	18	52.94
Borj	21	42.86	15.00	0.71±0.10	21	100	9	42.86	18	85.71	14	66.67	8	38.10
Hali	10	71.43	19.50	1.95±0.66	10	100	6	60.00	10	100	7	70.00	6	60.00
Silj	23	82.14	27.80	1.21±0.20	23	100	15	65.22	22	95.65	17	73.91	14	60.87
Sild1	11	52.38	12.50	1.14±0.22	11	100	7	63.64	11	100	8	72.73	7	63.64
Sild2	5	29.41	4.90	0.98±0.36	5	100	3	60.00	5	100	4	80.00	3	60.00
Gosh	21	47.73	14.40	0.69±0.06	21	100	9	42.86	18	85.71	15	71.43	8	38.10
Domj1	12	85.71	16.00	1.33±0.11	12	100	7	58.33	11	91.67	9	75.00	7	58.33
Domj2	6	100	10.50	1.75±0.17	6	100	3	50.00	5	83.33	4	66.67	3	50.00
Kazi	2	28.57	1.20	0.60±0.40	2	100	1	50.00	2	100	1	50.00	1	50.00
Mohp	14	66.67	23.00	1.64±0.30	14	100	7	50.00	10	71.43	12	85.71	7	50.00
Koho2	18	72.00	37.00	2.06±0.26	18	100	11	61.11	17	94.44	14	77.78	11	61.11
Panb	2	28.57	1.00	0.50±0.00	2	100	1	50.00	1	50.00	2	100	0	0.00
Hati	12	66.67	7.00	0.58±0.06	12	100	5	41.67	9	75.00	9	75.00	5	41.67
Baga	25	49.02	10.50	0.42±0.05	25	100	10	40.00	17	68.00	15	60.00	7	28.00
Harm	10	31.25	7.70	0.77±0.26	10	100	4	40.00	9	90.00	6	60.00	4	40.00
Nanc	4	44.44	2.50	0.63±0.13	4	100	2	50.00	2	50.00	4	100	2	50.00
Naja	14	42.42	11.90	0.85±0.12	14	100	3	21.43	8	57.14	10	71.43	3	21.43
Bagh	14	58.33	17.20	1.23±0.32	14	100	7	50.00	11	78.57	11	78.57	7	50.00
Kawa	3	100	7.50	2.50±0.50	3	100	0	0.00	2	66.67	1	33.33	0	0.00
Band	8	80.00	12.20	1.53±0.58	8	100	7	87.50	8	100	8	100	7	87.50
Deop	11	42.31	15.10	1.37±0.55	11	100	7	63.64	10	90.91	10	90.91	7	63.64
Nahr	5	33.33	2.50	0.50±0.14	5	100	0	0.00	5	100	1	20.00	0	0.00
Bura1	0	0.00	0.00	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Kanc	5	50.00	9.00	1.80±0.37	5	100	3	60.00	3	60.00	4	80.00	2	40.00
Pacg	10	52.63	22.00	2.20±0.52	10	100	3	30.00	8	80.00	4	40.00	2	20.00
Katb	9	64.29	16.00	1.78±0.73	9	100	4	44.44	5	55.56	7	77.78	3	33.33
Total	360	54.30	416.30	1.16±0.06	360	100	176	48.89	307	85.28	254	70.56	166	46.11

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, SE- standard error and %- in percentages.

Appendix Table 6.31. Ecosystem services provided by home gardens recorded from villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Home gardening ecosystem services									
	Provisioning		Economical		Cultural		Regulating		Supporting	
	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	8	100	4	50.00	2	25.00	5	62.50	1	12.50
Belo	13	86.67	3	20.00	3	20.00	5	33.33	2	13.33
Tamp	12	70.59	6	35.29	3	17.65	9	52.94	4	23.53
Japp	10	90.91	5	45.45	3	27.27	6	54.55	1	9.09
Meth	26	76.47	13	38.24	13	38.24	12	35.29	5	14.71
Borj	19	90.48	10	47.62	7	33.33	9	42.86	2	9.52
Hali	8	80.00	8	80.00	3	30.00	5	50.00	1	10.00
Silj	21	91.30	6	26.09	7	30.43	7	30.43	2	8.70
Sild1	6	54.55	3	27.27	2	18.18	2	18.18	6	54.55
Sild2	2	40.00	2	40.00	2	40.00	1	20.00	2	40.00
Gosh	14	66.67	10	47.62	6	28.57	3	14.29	4	19.05
Domj1	12	100	6	50.00	3	25.00	3	25.00	0	0.00
Domj2	6	100	1	16.67	1	16.67	1	16.67	0	0.00
Kazi	2	100	2	100	0	0.00	0	0.00	0	0.00
Mohp	13	92.86	3	21.43	5	35.71	4	28.57	1	7.14
Koho2	15	83.33	3	16.67	8	44.44	4	22.22	2	11.11
Panb	2	100	1	50.00	1	50.00	1	50.00	0	0.00
Hati	10	83.33	2	16.67	2	16.67	7	58.33	1	8.33
Baga	15	60.00	6	24.00	5	20.00	7	28.00	6	24.00
Harm	9	90.00	4	40.00	2	20.00	3	30.00	1	10.00
Nanc	3	75.00	1	25.00	0	0.00	1	25.00	0	0.00
Naja	12	85.71	4	28.57	2	14.29	5	35.71	2	14.29
Bagh	11	78.57	4	28.57	1	7.14	7	50.00	4	28.57
Kawa	2	66.67	3	100	1	33.33	1	33.33	0	0.00
Band	7	87.50	5	62.50	3	37.50	5	62.50	0	0.00
Deop	9	81.82	4	36.36	6	54.55	7	63.64	3	27.27
Nahr	4	80.00	3	60.00	1	20.00	1	20.00	1	20.00
Bura1	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Kanc	5	100	3	60.00	1	20.00	1	20.00	0	0.00
Pacg	8	80.00	5	50.00	2	20.00	3	30.00	1	10.00
Katb	9	100	6	66.67	2	22.22	4	44.44	0	0.00
Total	293	81.39	136	37.78	97	26.94	129	35.83	52	14.44

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C., Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg-

Village	Home gardening ecosystem services									
	Provisioning		Economical		Cultural		Regulating		Supporting	
	Total	%	Total	%	Total	%	Total	%	Total	%

Pachi Gaon, Katb- Kathani Basti and %- in percentages. (Ecosystem services include pollination, flood control, improves water quality, prevent soil erosion, maintaining environment balance, improve air quality, enhance crop production, manure, fodder, food, medicinal value, worship, feels good, decoration, hobby and reduce expenses).

Appendix Table 6.32. List of plant species recorded from home gardens of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Scientific name	Family	Use	Total	%
<i>Abelmoschus esculentus</i> (L.) Moench	Malvaceae	Vegetable	105	29.17
<i>Allium cepa</i> L.	Amaryllidaceae	Vegetable	126	35.00
<i>Allium sativum</i> L.	Amaryllidaceae	Vegetable	143	39.72
<i>Allium tuberosum</i> Rottler ex Spreng.	Amaryllidaceae	Vegetable	21	5.83
<i>Asparagus officinalis</i> L.	Asparagaceae	Vegetable	7	1.94
<i>Benincasa hispida</i> (Thunb.) Cogn.	Cucurbitaceae	Vegetable	52	14.44
<i>Beta vulgaris</i> L.	Amaranthaceae	Vegetable	48	13.33
<i>Brassica cretica</i> Lam.	Brassicaceae	Vegetable	83	23.06
<i>Brassica nigra</i> (L.) K.Koch	Brassicaceae	Vegetable	124	34.44
<i>Brassica oleracea</i> L.	Brassicaceae	Vegetable	124	34.44
<i>Brassica oleracea</i> L.	Brassicaceae	Vegetable	56	15.56
<i>Brassica rapa</i> L.	Brassicaceae	Vegetable	47	13.06
<i>Cannabis sativa</i> L.	Cannabaceae	Vegetable	24	6.67
<i>Capsicum annuum</i> L.	Solanaceae	Vegetable	170	47.22
<i>Capsicum annuum</i> L.	Solanaceae	Vegetable	29	8.06
<i>Capsicum chinense</i> Jacq.	Solanaceae	Vegetable	167	46.39
<i>Coccinia grandis</i> (L.) Voigt	Cucurbitaceae	Vegetable	41	11.39
<i>Colocasia esculenta</i> (L.) Schott	Araceae	Vegetable	48	13.33
<i>Coriandrum sativum</i> L.	Apiaceae	Vegetable	147	40.83
<i>Cucumis sativus</i> L.	Cucurbitaceae	Vegetable	32	8.89
<i>Cucurbita moschata</i> Duchesne	Cucurbitaceae	Vegetable	104	28.89
<i>Cucurbita pepo</i> L.	Cucurbitaceae	Vegetable	49	13.61
<i>Curcuma longa</i> L.	Zingiberaceae	Vegetable	51	14.17
<i>Daucus carota</i> L.	Apiaceae	Vegetable	40	11.11
<i>Dioscorea alata</i> L.	Dioscoreaceae	Vegetable	33	9.17
<i>Eryngium foetidum</i> L.	Apiaceae	Vegetable	101	28.06
<i>Foeniculum vulgare</i> Mill.	Apiaceae	Vegetable	44	12.22
<i>Hibiscus sabdariffa</i> L.	Malvaceae	Vegetable	25	6.94
<i>Ipomoea aquatica</i> Forssk.	Convolvulaceae	Vegetable	20	5.56
<i>Ipomoea batatas</i> (L.) Lam.	Convolvulaceae	Vegetable	35	9.72
<i>Lablab purpureus</i> (L.) Sweet	Leguminosae	Vegetable	26	7.22

Scientific name	Family	Use	Total	%
<i>Lagenaria siceraria</i> (Molina) Standl.	Cucurbitaceae	Vegetable	127	35.28
<i>Luffa acutangula</i> (L.) Roxb.	Cucurbitaceae	Vegetable	55	15.28
<i>Luffa cylindrica</i> (L.) M.Roem.	Cucurbitaceae	Vegetable	73	20.28
<i>Mentha arvensis</i> L.	Lamiaceae	Vegetable	102	28.33
<i>Momordica charantia</i> L.	Cucurbitaceae	Vegetable	77	21.39
<i>Momordica dioica</i> Roxb. ex Willd.	Cucurbitaceae	Vegetable	53	14.72
<i>Murraya koenigii</i> (L.) Spreng.	Rutaceae	Vegetable	47	13.06
<i>Phaseolus vulgaris</i> L.	Leguminosae	Vegetable	86	23.89
<i>Pisum sativum</i> L.	Leguminosae	Vegetable	44	12.22
<i>Raphanus sativus</i> L.	Brassicaceae	Vegetable	43	11.94
<i>Sechium edule</i> (Jacq.) Sw.	Cucurbitaceae	Vegetable	11	3.06
<i>Solanum ptychanthum</i> Dunal	Solanaceae	Vegetable	12	3.33
<i>Solanum lycopersicum</i> L.	Solanaceae	Vegetable	139	38.61
<i>Solanum melongena</i> L.	Solanaceae	Vegetable	140	38.89
<i>Solanum ovigerum</i> Dunal	Solanaceae	Vegetable	24	6.67
<i>Solanum pimpinellifolium</i> L.	Solanaceae	Vegetable	60	16.67
<i>Spinacia oleracea</i> L.	Amaranthaceae	Vegetable	152	42.22
<i>Solanum tuberosum</i> L.	Solanaceae	Vegetable	80	22.22
<i>Trichosanthes cucumerina</i> L.	Cucurbitaceae	Vegetable	55	15.28
<i>Trichosanthes dioica</i> Roxb.	Cucurbitaceae	Vegetable	31	8.61
<i>Cicer arietinum</i> L.	Leguminosae	Vegetable	38	10.56
<i>Vigna unguiculata</i> (L.) Walp.	Leguminosae	Vegetable	76	21.11
<i>Zea mays</i> L.	Poaceae	Vegetable	36	10.00
<i>Zingiber officinale</i> Roscoe	Zingiberaceae	Vegetable	62	17.22
<i>Lablab purpureus</i> (L.) Sweet	Leguminosae	Vegetable	61	16.94
<i>Lagenaria siceraria</i> (Molina) Standl.	Cucurbitaceae	Vegetable	129	35.83
<i>Vigna mungo</i> (L.) Hepper	Leguminosae	Vegetable	51	14.17
<i>Acalypha hispida</i> Burm.f.	Euphorbiaceae	Ornamental	56	15.56
<i>Justicia adhatoda</i> L.	Acanthaceae	Ornamental	77	21.39
<i>Agave americana</i> L.	Asparagaceae	Ornamental	21	5.83
<i>Allamanda cathartica</i> L.	Apocynaceae	Ornamental	66	18.33
<i>Aloe</i> spp.	Asphodelaceae	Ornamental	87	24.17
<i>Asplenium nidus</i> L.	Aspleniaceae	Ornamental	24	6.67
<i>Bougainvillea</i> spp.	Nyctaginaceae	Ornamental	106	29.44
<i>Caladium bicolor</i> (Aiton) Vent.	Araceae	Ornamental	88	24.44
<i>Callistemon</i> spp.	Myrtaceae	Ornamental	35	9.72
<i>Canna</i> spp.	Cannaceae	Ornamental	61	16.94
<i>Catharanthus</i> spp.	Apocynaceae	Ornamental	113	31.39
<i>Cheilocostus speciosus</i> (J.Koenig) C.D.Specht	Costaceae	Ornamental	53	14.72
<i>Clitoria</i> spp.	Fabaceae	Ornamental	57	15.83
<i>Combretum indicum</i> (L.) DeFilipps	Combretaceae	Ornamental	82	22.78

Scientific name	Family	Use	Total	%
<i>Cosmos</i> spp.	Asteraceae	Ornamental	60	16.67
<i>Crinum</i> spp.	Amaryllidaceae	Ornamental	104	28.89
<i>Cymbidium aloifolium</i> (L.) Sw.	Orchidaceae	Ornamental	26	7.22
<i>Cyperus alternifolius</i> L.	Cyperaceae	Ornamental	44	12.22
<i>Datura</i> spp.	Solanaceae	Ornamental	62	17.22
<i>Dendrobium aphyllum</i> (Roxb.) C.E.C.Fisch.	Orchidaceae	Ornamental	25	6.94
<i>Dianella</i> spp.	Asphodelaceae	Ornamental	46	12.78
<i>Dianthus chinensis</i> L.	Caryophyllaceae	Ornamental	68	18.89
<i>Euphorbia milii</i> Des Moul.	Euphorbiaceae	Ornamental	52	14.44
<i>Helianthus annuus</i> L.	Compositae	Ornamental	67	18.61
<i>Heliconia rostrata</i> Ruiz & Pav.	Heliconiaceae	Ornamental	27	7.50
<i>Hibiscus</i> spp.	Malvaceae	Ornamental	111	30.83
<i>Hippeastrum</i> spp.	Amaryllidaceae	Ornamental	55	15.28
<i>Hymenocallis littoralis</i> (Jacq.) Salisb.	Amaryllidaceae	Ornamental	90	25.00
<i>Impatiens balsamina</i> L.	Balsaminaceae	Ornamental	48	13.33
<i>Ipomoea</i> spp.	Convolvulaceae	Ornamental	98	27.22
<i>Ixora coccinea</i> L.	Rubiaceae	Ornamental	64	17.78
<i>Mirabilis jalapa</i> L.	Nyctaginaceae	Ornamental	79	21.94
<i>Monstera deliciosa</i> Liebm.	Araceae	Ornamental	39	10.83
<i>Nyctanthes arbor-tristis</i> L.	Oleaceae	Ornamental	36	10.00
<i>Ocimum gratissimum</i> L.	Lamiaceae	Ornamental	26	7.22
<i>Ocimum tenuiflorum</i> L.	Lamiaceae	Ornamental	127	35.28
<i>Papaver</i> spp.	Papaveraceae	Ornamental	73	20.28
<i>Papilionanthe teres</i> (Roxb.) Schltr.	Orchidaceae	Ornamental	47	13.06
<i>Plumeria</i> spp.	Apocynaceae	Ornamental	33	9.17
<i>Rhynchostylis retusa</i> (L.) Blume	Orchidaceae	Ornamental	62	17.22
<i>Rosa indica</i> L.	Rosaceae	Ornamental	94	26.11
<i>Salvia</i> spp.	Lamiaceae	Ornamental	55	15.28
<i>Scadoxus multiflorus</i> (Martyn) Raf.	Amaryllidaceae	Ornamental	26	7.22
<i>Tagetes erecta</i> L.	Compositae	Ornamental	110	30.56
<i>Thevetia</i> spp.	Apocynaceae	Ornamental	49	13.61
<i>Wedelia</i> spp.	Asteraceae	Ornamental	93	25.83
<i>Zephyranthes</i> spp.	Amaryllidaceae	Ornamental	43	11.94
<i>Zinnia elegans</i> L.	Compositae	Ornamental	43	11.94
<i>Aegle marmelos</i> (L.) Corrêa	Rutaceae	Fruit	74	20.56
<i>Ananas comosus</i> (L.) Merr.	Bromeliaceae	Fruit	65	18.06
<i>Annona reticulata</i> L.	Annonaceae	Fruit	33	9.17
<i>Areca catechu</i> L.	Arecaceae	Fruit	148	41.11
<i>Artocarpus chama</i> Buch.-Ham.	Moraceae	Fruit/Firewood	35	9.72
<i>Artocarpus heterophyllus</i> Lam.	Moraceae	Fruit/Firewood	122	33.89
<i>Carica papaya</i> L.	Caricaceae	Fruit	73	20.28

Scientific name	Family	Use	Total	%
<i>Citrus maxima</i> (Burm.) Merr.	Rutaceae	Fruit	55	15.28
<i>Citrus</i> spp.	Rutaceae	Fruit	106	29.44
<i>Cocos nucifera</i> L.	Arecaceae	Fruit	134	37.22
<i>Dillenia indica</i> L.	Dilleniaceae	Fruit/Firewood	48	13.33
<i>Phyllanthus emblica</i> L.	Phyllanthaceae	Fruit	59	16.39
<i>Fragaria vesca</i> L.	Rosaceae	Fruit	43	11.94
<i>Mangifera indica</i> L.	Anacardiaceae	Fruit/Firewood	107	29.72
<i>Musa acuminata</i> Colla	Musaceae	Fruit	58	16.11
<i>Musa balbisiana</i> Colla	Musaceae	Fruit	132	36.67
<i>Piper betle</i> L.	Piperaceae	Fruit	111	30.83
<i>Prunus domestica</i> L.	Rosaceae	Fruit	12	3.33
<i>Psidium guajava</i> L.	Myrtaceae	Fruit	69	19.17
<i>Prunus persica</i> (L.) Batsch	Rosaceae	Fruit	10	2.78
<i>Punica granatum</i> L.	Lythraceae	Fruit	96	26.67
<i>Saccharum officinarum</i> L.	Poaceae	Fruit	103	28.61
<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	Fruit	66	18.33
<i>Tamarindus indica</i> L.	Leguminosae	Fruit/Firewood	44	12.22
<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Combretaceae	Fruit/Firewood	57	15.83
<i>Terminalia chebula</i> Retz.	Combretaceae	Fruit/Firewood	63	17.50
<i>Ziziphus jujuba</i> Mill.	Rhamnaceae	Fruit/Firewood	118	32.78
<i>Litchi chinensis</i> Sonn.	Sapindaceae	Fruit	24	6.67
<i>Azadirachta indica</i> A.Juss.	Meliaceae	Firewood	70	19.44
<i>Bambusa</i> spp.	Poaceae	Thatching	104	28.89
<i>Caryota urens</i> L.	Arecaceae	Firewood	40	11.11
<i>Gossypium herbaceum</i> L.	Malvaceae	Crop	35	9.72

Appendix Table 6.33. Livestock rearing details (type of livestock's) of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Livestock													
	Yes		Type											
			Cattle		Goat		Poultry		Buffalo		Pig		Total	
	Total	%	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	9	100	44	6.29±3.99	11	2.20±0.20	23	7.67±1.20	27	13.50±6.50	21	3.00±1.53	126	14.00±6.09
Belo	26	100	70	3.33±0.57	42	3.00±0.57	48	6.86±1.70	0	0.00	29	1.71±0.24	189	7.27±1.03
Tamp	19	95.00	79	4.16±0.46	53	3.79±0.24	101	7.77±1.02	0	0.00	0	0.00	233	12.26±1.29
Japp	12	92.31	56	5.60±0.95	30	3.33±0.29	59	7.38±1.53	3	3.00±0.00	3	1.50±0.50	151	12.58±2.13
Meth	57	75.00	108	2.40±0.20	85	3.04±0.51	250	5.81±0.59	2	2.00±0.00	7	1.40±0.40	452	7.93±0.79
Borj	38	77.55	80	2.76±0.31	98	3.50±0.44	216	6.75±0.70	11	2.75±0.48	7	1.75±0.48	412	10.84±1.20
Hali	10	71.43	22	3.67±1.20	28	3.11±0.59	53	6.63±0.94	0	0.00	1	1.00±0.00	104	10.40±2.49

Village	Livestock													
	Yes		Type											
			Cattle		Goat		Poultry		Buffalo		Pig		Total	
	Total	%	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Silj	22	78.57	73	3.65±0.58	74	4.35±1.17	162	8.53±1.03	5	5.00±0.00	6	1.00±0.00	320	14.55±1.95
Sild1	20	95.24	95	5.59±0.61	67	4.47±0.63	96	6.40±0.94	9	4.50±1.50	14	1.56±0.18	281	14.05±1.53
Sild2	17	100	72	4.24±0.67	32	3.20±0.36	127	9.07±1.26	0	0.00	21	1.62±0.21	252	14.82±2.06
Gosh	42	95.45	147	3.87±0.41	144	4.36±0.53	403	10.33±1.20	15	7.50±2.50	33	1.50±0.13	742	17.67±1.42
Domj1	14	100	34	3.09±0.46	27	3.00±0.29	136	10.46±2.35	0	0.00	4	1.33±0.33	201	14.36±2.58
Domj2	6	100	21	4.20±0.92	27	5.40±1.21	42	7.00±1.65	0	0.00	1	1.00±0.00	91	15.17±2.36
Kazi	6	85.71	5	2.50±1.50	11	3.67±0.88	4	4.00±0.00	0	0.00	12	2.40±0.75	32	5.33±1.41
Mohp	20	95.24	49	3.77±0.90	57	4.38±0.87	194	10.78±2.48	41	6.83±2.10	18	2.57±1.09	359	17.95±3.66
Koho2	24	96.00	92	4.18±0.63	52	3.25±0.39	178	7.74±1.09	0	0.00	32	2.46±0.42	354	14.75±1.58
Panb	5	71.43	13	3.25±0.25	8	2.67±0.67	12	6.00±1.00	0	0.00	0	0.00	33	6.60±1.50
Hati	13	72.22	23	3.29±0.87	23	3.83±1.28	76	8.44±1.62	0	0.00	1	1.00±0.00	123	9.46±2.25
Baga	47	92.16	87	2.90±0.29	61	3.21±0.36	175	6.25±0.76	0	0.00	19	2.38±0.84	342	7.28±0.91
Harm	28	87.50	49	3.06±0.50	86	3.58±0.38	174	14.50±3.67	0	0.00	6	2.00±0.00	315	11.25±2.39
Nanc	8	88.89	21	3.50±0.67	21	3.50±1.06	32	8.00±1.58	0	0.00	0	0.00	74	9.25±2.97
Naja	25	75.76	55	3.06±0.47	58	3.41±0.51	87	10.88±2.12	0	0.00	0	0.00	200	8.00±1.38
Bagh	20	83.33	62	3.44±0.57	61	4.36±0.78	46	7.67±0.88	0	0.00	0	0.00	169	8.45±1.16
Kawa	3	100	5	1.67±0.33	14	4.67±1.20	8	8.00±0.00	0	0.00	0	0.00	27	9.00±3.51
Band	10	100	20	3.33±1.15	27	3.00±0.33	55	13.75±3.38	0	0.00	0	0.00	102	10.20±2.91
Deop	24	92.31	52	2.89±0.33	64	4.00±0.49	63	9.00±2.05	0	0.00	0	0.00	179	7.46±1.04
Nahr	12	80.00	19	3.17±0.70	21	3.00±0.44	25	6.25±1.44	0	0.00	4	2.00±1.00	69	5.75±1.05
Bura1	1	50.00	7	7.00±0.00	0	0.00	0	0.00	0	0.00	2	2.00±0.00	9	9.00±0.00
Kanc	10	100	26	2.89±0.54	13	3.25±0.48	18	9.00±3.00	0	0.00	8	1.60±0.40	65	6.50±1.33
Pacg	17	89.47	77	5.92±1.22	24	2.67±0.50	75	7.50±1.82	6	2.00±0.00	0	0.00	182	10.71±2.41
Katb	13	92.86	80	6.15±1.17	23	2.88±0.61	25	12.50±2.50	0	0.00	0	0.00	128	9.85±1.64
Total	578	87.18	1643	3.65±0.13	1342	3.60±0.12	2963	8.21±0.32	119	5.41±1.01	249	1.84±0.13	6316	10.93±0.37

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, SE- standard error and %- in percentages.

Appendix Table 6.34. Livestock rearing activities details (milk production and pig/goat/poultry products) of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Livestock milk production												Pig/Goat/Poultry products			
	Milk activity (Yes)		Annual production qty (in Liters)		Annual self-cons qty (in Liters)		Sale (Yes)		Annual sale qty (in Liters)		Annual income (in INR)		Sale (Yes)		Annual income (in INR)	
	Total	%	Total	Mean±SE	Total	Mean±SE	Total	%	Total	Mean±SE	Total	Mean±SE	Total	%	Total	Mean±SE
Bamg	5	55.56	1810.00	362.00±139.76	390.00	78.00±13.47	3	60.00	1420.00	473.33±146.78	56800.00	18933.33±5871.21	4	80.00	63000.00	15750.00±6433.96

Village	Livestock milk production												Pig/Goat/Poultry products			
	Milk activity (Yes)		Annual production qty (in Liters)		Annual self-cons qty (in Liters)		Sale (Yes)		Annual sale qty (in Liters)		Annual income (in INR)		Sale (Yes)		Annual income (in INR)	
	Total	%	Total	Mean±SE	Total	Mean±SE	Total	%	Total	Mean±SE	Total	Mean±SE	Total	%	Total	Mean±SE
Belo	4	15.38	980.00	245.00±79.92	310.00	77.50±8.29	3	60.00	670.00	223.33±64.89	26800.00	8933.33±2595.72	4	80.00	61000.00	15250.00±5735.49
Tamp	4	21.05	1655.00	413.75±68.96	375.00	93.75±25.77	4	57.14	1280.00	320.00±48.13	51200.00	12800.00±1925.27	3	42.86	4400.00	1466.67±290.59
Japp	10	83.33	3397.50	339.75±55.45	877.50	87.75±10.30	9	100	2520.00	280.00±57.30	100800.00	11200.00±2292.02	3	33.33	31000.00	10333.33±2185.81
Meth	8	14.04	1307.50	163.44±30.53	442.50	55.31±5.98	8	50.00	865.00	108.13±25.53	34600.00	4325.00±1021.16	12	75.00	59500.00	4958.33±1000.87
Borj	6	15.79	2355.00	392.50±95.06	655.00	109.17±15.19	5	41.67	1700.00	340.00±95.24	68000.00	13600.00±3809.46	8	66.67	69500.00	8687.50±2388.47
Hali	1	10.00	390.00	390.00±0.00	120.00	120.00±0.00	1	33.33	270.00	270.00±0.00	10800.00	10800.00±0.00	3	100	18500.00	6166.67±3919.33
Silj	10	45.45	2505.00	250.50±63.96	1135.00	113.50±19.38	5	31.25	1370.00	274.00±93.52	54800.00	10960.00±3740.80	15	93.75	110770.00	7384.67±1382.78
Sild1	11	55.00	3785.00	344.09±57.02	1065.00	96.82±10.16	10	62.50	2720.00	272.00±60.70	108800.00	10880.00±2427.84	10	62.50	105000.00	10500.00±1231.53
Sild2	11	64.71	1977.50	179.77±29.99	1217.50	110.68±9.20	4	28.57	760.00	190.00±38.73	30400.00	7600.00±1549.19	14	100	161000.00	11500.00±1189.47
Gosh	4	9.52	1240.00	310.00±31.36	450.00	112.50±15.48	4	12.12	790.00	197.50±24.28	31600.00	7900.00±971.25	31	93.94	187500.00	6048.39±919.14
Domj1	2	14.29	295.00	147.50±2.50	295.00	147.50±2.50	0	0.00	0.00	0.00	0.00	0.00	6	100	38350.00	6391.67±2585.23
Domj2	2	33.33	250.00	125.00±5.00	250.00	125.00±5.00	0	0.00	0.00	0.00	0.00	0.00	3	100	14000.00	4666.67±1666.67
Kazi	1	16.67	150.00	150.00±0.00	75.00	75.00±0.00	1	25.00	75.00	75.00±0.00	3000.00	3000.00±0.00	4	100	42000.00	10500.00±500.00
Mohp	6	30.00	6435.00	1072.50±263.46	725.00	120.83±18.55	6	46.15	5710.00	951.67±245.23	228400.00	38066.67±9809.07	9	69.23	99950.00	11105.56±3149.48
Koho2	9	37.50	1280.00	142.22±18.26	1130.00	125.56±14.28	1	6.25	150.00	150.00±0.00	6000.00	6000.00±0.00	16	100	153500.00	9593.75±1351.87
Panb	1	20.00	70.00	70.00±0.00	70.00	70.00±0.00	0	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00
Hati	4	30.77	1000.00	250.00±58.74	420.00	105.00±24.66	3	75.00	580.00	193.33±47.02	23200.00	7733.33±1880.90	1	25.00	12000.00	12000.00±0.00
Baga	5	10.64	945.00	189.00±43.26	495.00	99.00±14.35	3	17.65	450.00	150.00±51.96	18000.00	6000.00±2078.46	17	100	119750.00	7044.12±1892.59
Harm	4	14.29	850.00	212.50±46.79	390.00	97.50±8.54	3	25.00	460.00	153.33±55.48	18400.00	6133.33±2219.11	12	100	85500.00	7125.00±1094.28
Nanc	2	25.00	315.00	157.50±92.50	155.00	77.50±12.50	1	100	160.00	160.00±0.00	6400.00	6400.00±0.00	1	100	11500.00	11500.00±0.00
Naja	2	8.00	342.50	171.25±108.75	162.50	81.25±18.75	1	14.29	180.00	180.00±0.00	7200.00	7200.00±0.00	6	85.71	27250.00	4541.67±720.00
Bagh	5	25.00	1165.00	233.00±72.64	645.00	129.00±25.27	2	50.00	520.00	260.00±160.00	20800.00	10400.00±6400.00	2	50.00	8000.00	4000.00±2000.00
Kawa	0	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	1	100	2000.00	2000.00±0.00
Band	3	30.00	437.50	145.83±59.87	287.50	95.83±19.38	1	25.00	150.00	150.00±0.00	6000.00	6000.00±0.00	4	100	20500.00	5125.00±965.55
Deop	4	16.67	560.00	140.00±18.71	400.00	100.00±13.54	2	25.00	160.00	80.00±10.00	6400.00	3200.00±400.00	6	75.00	21000.00	3500.00±619.14
Nahr	1	8.33	100.00	100.00±0.00	100.00	100.00±0.00	0	0.00	0.00	0.00	0.00	0.00	4	100	34500.00	8625.00±3693.32
Bura1	0	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00
Kanc	5	50.00	675.00	135.00±23.02	575.00	115.00±13.42	1	25.00	100.00	100.00±0.00	4000.00	4000.00±0.00	4	100	46000.00	11500.00±1443.38
Pacg	8	47.06	1480.00	185.00±38.73	970.00	121.25±8.54	3	75.00	510.00	170.00±66.58	20400.00	6800.00±2663.33	2	50.00	13500.00	6750.00±3750.00
Katb	8	61.54	1865.00	233.13±53.51	825.00	103.13±14.05	4	80.00	1040.00	260.00±34.88	41600.00	10400.00±1395.23	1	20.00	2500.00	2500.00±0.00
Total	146	25.26	39617.50	271.35±21.37	15007.50	102.79±3.19	88	34.78	24610.00	279.66±29.44	984400.00	11186.36±1177.58	206	81.42	1622970.00	7878.50±422.02

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, cons-consumption, qty- quantity, INR- Indian Rupee, SE- standard error and %-in percentages.

Appendix Table 6.35. Livestock rearing problems among villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Why less milk production?					
	No good fodder/nutrition		No good breed		Diseased/lack of healthcare facilities	
	Total	%	Total	%	Total	%
Bamg	3	60.00	4	80.00	1	20.00
Belo	3	75.00	3	75.00	2	50.00
Tamp	2	50.00	2	50.00	0	0.00
Japp	7	70.00	5	50.00	3	30.00
Meth	7	87.50	4	50.00	3	37.50
Borj	4	66.67	3	50.00	2	33.33
Hali	1	100	0	0.00	0	0.00
Silj	8	80.00	6	60.00	1	10.00
Sild1	6	54.55	5	45.45	2	18.18
Sild2	6	54.55	5	45.45	3	27.27
Gosh	4	100	2	50.00	2	50.00
Domj1	1	50.00	1	50.00	1	50.00
Domj2	2	100	0	0.00	0	0.00
Kazi	1	100	0	0.00	0	0.00
Mohp	5	83.33	3	50.00	1	16.67
Koho2	8	88.89	2	22.22	3	33.33
Panb	1	100	1	100	0	0.00
Hati	4	100	1	25.00	2	50.00
Baga	4	80.00	2	40.00	0	0.00
Harm	4	100	2	50.00	1	25.00
Nanc	2	100	1	50.00	0	0.00
Naja	2	100	1	50.00	1	50.00
Bagh	4	80.00	1	20.00	0	0.00
Kawa	0	0.00	0	0.00	0	0.00
Band	2	66.67	1	33.33	0	0.00
Deop	3	75.00	1	25.00	2	50.00
Nahr	1	100	0	0.00	0	0.00
Bura1	0	0.00	0	0.00	0	0.00
Kanc	4	80.00	1	20.00	2	40.00
Pacg	6	75.00	3	37.50	2	25.00
Katb	7	87.50	1	12.50	2	25.00
Total	112	76.71	61	41.78	36	24.66

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.36. Livestock grazing activities conducted by villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Grazing																	
	Yes		Grazing location						Location outside Reserve									
			Inside Reserve		Outside Reserve		Both		Karbi Anglong		National highway		Kaziranga fringe		Home/Field		All areas	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	9	100	2	22.22	9	100	2	22.22	0	0.00	7	77.78	4	44.44	6	66.67	0	0.00
Belo	23	88.46	12	52.17	20	86.96	9	39.13	0	0.00	10	50.00	5	25.00	17	85.00	0	0.00
Tamp	19	95.00	1	5.26	19	100	1	5.26	0	0.00	10	52.63	3	15.79	17	89.47	0	0.00
Japp	11	84.62	6	54.55	8	72.73	3	27.27	0	0.00	3	37.50	2	25.00	6	75.00	0	0.00
Meth	54	71.05	0	0.00	54	100	0	0.00	22	40.74	24	44.44	5	9.26	38	70.37	0	0.00
Borj	36	73.47	1	2.78	35	97.22	0	0.00	14	40.00	19	54.29	4	11.43	28	80.00	1	2.86
Hali	9	64.29	1	11.11	9	100	1	11.11	4	44.44	5	55.56	2	22.22	7	77.78	0	0.00
Silj	22	78.57	2	9.09	20	90.91	0	0.00	8	40.00	10	50.00	5	25.00	12	60.00	0	0.00
Sild1	19	90.48	19	100	1	5.26	1	5.26	0	0.00	1	100	0	0.00	0	0.00	0	0.00
Sild2	17	100	9	52.94	12	70.59	4	23.53	5	41.67	5	41.67	6	50.00	7	58.33	0	0.00
Gosh	42	95.45	2	4.76	42	100	2	4.76	15	35.71	22	52.38	12	28.57	31	73.81	2	4.76
Domj1	13	92.86	0	0.00	13	100	0	0.00	4	30.77	6	46.15	3	23.08	10	76.92	1	7.69
Domj2	6	100	0	0.00	6	100	0	0.00	1	16.67	3	50.00	0	0.00	6	100	0	0.00
Kazi	3	42.86	2	66.67	1	33.33	0	0.00	0	0.00	1	100	1	100	1	100	0	0.00
Mohp	20	95.24	1	5.00	20	100	1	5.00	6	30.00	9	45.00	4	20.00	12	60.00	0	0.00
Koho2	24	96.00	5	20.83	22	91.67	3	12.50	5	22.73	11	50.00	5	22.73	13	59.09	0	0.00
Panb	5	71.43	0	0.00	5	100	0	0.00	2	40.00	2	40.00	1	20.00	4	80.00	0	0.00
Hati	10	55.56	0	0.00	10	100	0	0.00	3	30.00	4	40.00	4	40.00	9	90.00	0	0.00
Baga	38	74.51	11	28.95	32	84.21	5	13.16	8	25.00	19	59.38	7	21.88	19	59.38	0	0.00
Harm	26	81.25	10	38.46	16	61.54	0	0.00	4	25.00	7	43.75	5	31.25	9	56.25	0	0.00
Nanc	8	88.89	2	25.00	8	100	2	25.00	1	12.50	3	37.50	2	25.00	4	50.00	0	0.00
Naja	23	69.70	9	39.13	16	69.57	2	8.70	4	25.00	7	43.75	4	25.00	8	50.00	0	0.00
Bagh	19	79.17	3	15.79	17	89.47	1	5.26	4	23.53	7	41.18	4	23.53	13	76.47	0	0.00
Kawa	3	100	3	100	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Band	10	100	8	80.00	3	30.00	1	10.00	0	0.00	2	66.67	2	66.67	2	66.67	0	0.00
Deop	23	88.46	4	17.39	19	82.61	0	0.00	4	21.05	7	36.84	6	31.58	9	47.37	0	0.00
Nahr	11	73.33	3	27.27	11	100	3	27.27	3	27.27	5	45.45	4	36.36	5	45.45	0	0.00
Bura1	1	50.00	0	0.00	1	100	0	0.00	0	0.00	0	0.00	0	0.00	1	100	0	0.00
Kanc	10	100	0	0.00	10	100	0	0.00	3	30.00	3	30.00	3	30.00	8	80.00	0	0.00
Pacg	16	84.21	15	93.75	5	31.25	4	25.00	0	0.00	0	0.00	0	0.00	5	100	0	0.00
Katb	13	92.86	13	100	2	15.38	2	15.38	0	0.00	0	0.00	0	0.00	2	100	0	0.00
Total	543	81.90	144	26.52	446	82.14	47	8.66	120	26.91	212	47.53	103	23.09	309	69.28	4	0.90

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari,

Village	Grazing																	
	Yes		Grazing location						Location outside Reserve									
			Inside Reserve		Outside Reserve		Both		Karbi Anglong		National highway		Kaziranga fringe		Home/Field		All areas	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%

Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.37. Livestock grazing season and duration of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Grazing													
	Season								Time spent (in hours)					
	Summer		Monsoon		Winter		Throughout the year		Summer		Monsoon		Winter	
	Total	%	Total	%	Total	%	Total	%	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	1	11.11	0	0.00	9	100	0	0.00	1	1.00±0.00	0	0.00	78	8.67±0.29
Belo	5	21.74	14	60.87	23	100	4	17.39	12	2.40±0.24	86	6.14±0.33	202	8.78±0.23
Tamp	5	26.32	6	31.58	19	100	3	15.79	10	2.0±0.32	34	5.67±0.49	169	8.89±0.26
Japp	2	18.18	3	27.27	11	100	1	9.09	7	3.50±0.50	16	5.33±1.45	99	9.00±0.27
Meth	13	24.07	34	62.96	51	94.44	7	12.96	44	3.38±0.21	202	5.94±0.26	448	8.78±0.15
Borj	5	13.89	17	47.22	36	100	4	11.11	15	3.00±0.32	104	6.12±0.37	317	8.81±0.19
Hali	2	22.22	2	22.22	9	100	2	22.22	5	2.50±0.50	13	6.50±0.50	80	8.89±0.42
Silj	3	13.64	8	36.36	22	100	1	4.55	11	3.67±0.33	49	6.13±0.48	200	9.09±0.24
Sild1	4	21.05	8	42.11	19	100	0	0.00	9	2.25±0.25	49	6.13±0.52	169	8.89±0.25
Sild2	4	23.53	7	41.18	17	100	2	11.76	13	3.25±0.25	41	5.86±0.51	151	8.88±0.31
Gosh	4	9.52	36	85.71	42	100	3	7.14	9	2.25±0.48	208	5.78±0.24	375	8.93±0.18
Domj1	1	7.69	5	38.46	13	100	1	7.69	1	1.00±0.00	34	6.80±0.58	117	9.00±0.36
Domj2	1	16.67	3	50.00	6	100	0	0.00	3	3.00±0.00	16	5.33±0.88	57	9.50±0.43
Kazi	0	0.00	3	100	3	100	0	0.00	0	0.00	21	7.00±1.00	25	8.33±0.88
Mohp	2	10.00	13	65.00	20	100	2	10.00	7	3.50±0.50	81	6.23±0.34	181	9.05±0.28
Koho2	3	12.50	0	0.00	24	100	0	0.00	7	2.33±0.33	0	0.00	210	8.75±0.24
Panb	1	20.00	3	60.00	5	100	1	20.00	2	2.00±0.00	19	6.33±0.33	47	9.40±0.40
Hati	1	10.00	8	80.00	10	100	0	0.00	2	2.00±0.00	49	6.13±0.52	88	8.80±0.33
Baga	5	13.16	24	63.16	37	97.37	4	10.53	10	2.00±0.45	139	5.79±0.32	329	8.89±0.21
Harm	3	11.54	21	80.77	25	96.15	3	11.54	5	1.67±0.33	125	5.95±0.38	218	8.72±0.23
Nanc	1	12.50	6	75.00	8	100	0	0.00	3	3.00±0.00	34	5.67±0.71	75	9.38±0.46
Naja	8	34.78	15	65.22	21	91.30	2	8.70	17	2.13±0.30	93	6.20±0.42	183	8.71±0.27
Bagh	9	47.37	15	78.95	18	94.74	8	42.11	22	2.44±0.18	102	6.80±0.31	163	9.06±0.29
Kawa	0	0.00	1	33.33	3	100	0	0.00	0	0.00	6	6.00±0.00	27	9.00±0.58
Band	1	10.00	4	40.00	10	100	0	0.00	4	4.00±0.00	23	5.75±0.85	84	8.40±0.40
Deop	4	17.39	10	43.48	21	91.30	1	4.35	11	2.75±0.48	54	5.40±0.54	190	9.05±0.28

Village	Grazing													
	Season								Time spent (in hours)					
	Summer		Monsoon		Winter		Throughout the year		Summer		Monsoon		Winter	
	Total	%	Total	%	Total	%	Total	%	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Nahr	1	9.09	6	54.55	11	100	1	9.09	2	2.00±0.00	33	5.50±0.43	97	8.82±0.35
Bura1	0	0.00	0	0.00	1	100	0	0.00	0	0.00	0	0.00	11	11.00±0.00
Kanc	2	20.00	9	90.00	8	80.00	1	10.00	6	3.00±1.00	50	5.56±0.58	71	8.88±0.40
Pacg	1	6.25	10	62.50	13	81.25	1	6.25	2	2.00±0.00	57	5.70±0.47	123	9.46±0.33
Katb	3	23.08	9	69.23	11	84.62	1	7.69	7	2.33±0.33	55	6.11±0.48	97	8.82±0.35
Total	95	17.50	300	55.25	526	96.87	53	9.76	247	2.60±0.09	1793	5.98±0.08	4681	8.90±0.05

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C., Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, SE- standard error and %- in percentages.

Appendix Table 6.38. Thatch material purchase total mean annual quantity and expenditure of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Thatching purchase							
	Purchase (Yes)		Annual qty (in kg)		INR/kg		Total annual expenditure (in INR)	
	Total	%	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	2	22.22	195.00	97.50±52.50	24.00	12.00±0.00	2340.00	1170.00±630.00
Belo	5	19.23	545.00	109.00±24.52	58.00	11.60±0.40	6450.00	1290.00±306.24
Tamp	4	20.00	415.00	103.75±24.27	48.00	12.00±0.00	4980.00	1245.00±291.25
Japp	2	15.38	190.00	95.00±45.00	24.00	12.00±0.00	2280.00	1140.00±540.00
Meth	15	19.74	1255.00	83.67±9.03	180.00	12.00±0.38	15070.00	1004.67±110.33
Borj	7	14.29	570.00	81.43±13.39	84.00	12.00±0.00	6840.00	977.14±160.74
Hali	2	14.29	330.00	165.00±35.00	27.00	13.50±1.50	4560.00	2280.00±720.00
Silj	5	17.86	645.00	129.00±23.04	63.00	12.60±0.60	8190.00	1638.00±309.68
Sild1	4	19.05	235.00	58.75±7.74	48.00	12.00±0.00	2820.00	705.00±92.87
Sild2	2	11.76	85.00	42.50±17.50	24.00	12.00±0.00	1020.00	510.00±210.00
Gosh	6	13.64	595.00	99.17±24.30	81.00	13.50±0.67	8355.00	1392.50±376.82
Domj1	1	7.14	140.00	140.00±0.00	12.00	12.00±0.00	1680.00	1680.00±0.00
Domj2	1	16.67	160.00	160.00±0.00	15.00	15.00±0.00	2400.00	2400.00±0.00
Kazi	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mohp	2	9.52	350.00	175.00±15.00	27.00	13.50±1.50	4770.00	2385.00±465.00
Koho2	3	12.00	190.00	63.33±38.44	34.00	11.33±0.67	2240.00	746.67±468.95
Panb	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hati	1	5.56	50.00	50.00±0.00	10.00	10.00±0.00	500.00	500.00±0.00
Baga	6	11.76	500.00	83.33±22.75	69.00	11.50±0.81	5760.00	960.00±266.08

Village	Thatching purchase							
	Purchase (Yes)		Annual qty (in kg)		INR/kg		Total annual expenditure (in INR)	
	Total	%	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Harm	4	12.50	345.00	86.25±31.71	48.00	12.00±0.00	4140.00	1035.00±380.56
Nanc	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Naja	2	6.06	295.00	147.50±17.50	24.00	12.00±0.00	3540.00	1770.00±210.00
Bagh	3	12.50	425.00	141.67±21.67	36.00	12.00±0.00	5100.00	1700.00±260.00
Kawa	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Band	1	10.00	150.00	150.00±0.00	12.00	12.00±0.00	1800.00	1800.00±0.00
Deop	4	15.38	530.00	132.50±4.79	48.00	12.00±0.00	6360.00	1590.00±57.45
Nahr	3	20.00	170.00	56.67±21.86	39.00	13.00±1.00	2160.00	720.00±249.80
Bura1	1	50.00	50.00	50.00±0.00	15.00	15.00±0.00	750.00	750.00±0.00
Kanc	1	10.00	120.00	120.00±0.00	12.00	12.00±0.00	1440.00	1440.00±0.00
Pacg	4	21.05	450.00	112.50±28.39	48.00	12.00±0.00	5400.00	1350.00±340.73
Katb	2	14.29	140.00	70.00±5.00	22.00	11.00±1.00	1530.00	765.00±15.00
Total	93	14.03	9125.00	98.12±5.12	1132.00	12.17±0.13	112475.00	1209.41±67.93

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, qty- quantity, kg- kilograms, INR- Indian Rupee, SE- standard error and %- in percentages.

Appendix Table 6.39. Thatch material extraction instrument and location of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Thatch extraction											
	Extraction (Yes)		Instrument				Location (area)					
			Hand sickle		Bolo knife		Inside Reserve		Outside Reserve		Both	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	6	66.67	5	83.33	1	16.67	3	50.00	4	66.67	1	16.67
Belo	17	65.38	13	76.47	4	23.53	5	29.41	14	82.35	2	11.76
Tamp	11	55.00	8	72.73	3	27.27	4	36.36	8	72.73	1	9.09
Japp	11	84.62	8	72.73	3	27.27	5	45.45	7	63.64	1	9.09
Meth	42	55.26	32	76.19	10	23.81	18	42.86	28	66.67	4	9.52
Borj	25	51.02	16	64.00	9	36.00	8	32.00	18	72.00	1	4.00
Hali	7	50.00	5	71.43	2	28.57	2	28.57	6	85.71	1	14.29
Silj	22	78.57	16	72.73	6	27.27	6	27.27	16	72.73	0	0.00
Sild1	17	80.95	12	70.59	5	29.41	4	23.53	14	82.35	1	5.88
Sild2	15	88.24	11	73.33	4	26.67	6	40.00	11	73.33	2	13.33
Gosh	33	75.00	24	72.73	9	27.27	11	33.33	23	69.70	1	3.03
Domj1	11	78.57	7	63.64	4	36.36	4	36.36	8	72.73	1	9.09
Domj2	5	83.33	4	80.00	1	20.00	2	40.00	3	60.00	0	0.00

Village	Thatch extraction											
	Extraction (Yes)		Instrument				Location (area)					
			Hand sickle		Bolo knife		Inside Reserve		Outside Reserve		Both	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Kazi	7	100	4	57.14	3	42.86	2	28.57	5	71.43	0	0.00
Mohp	13	61.90	9	69.23	4	30.77	4	30.77	10	76.92	1	7.69
Koho2	20	80.00	12	60.00	8	40.00	7	35.00	14	70.00	1	5.00
Panb	2	28.57	2	100	0	0.00	0	0.00	2	100	0	0.00
Hati	9	50.00	5	55.56	4	44.44	3	33.33	6	66.67	0	0.00
Baga	44	86.27	29	65.91	15	34.09	13	29.55	33	75.00	2	4.55
Harm	27	84.38	20	74.07	7	25.93	7	25.93	21	77.78	1	3.70
Nanc	3	33.33	2	66.67	1	33.33	1	33.33	2	66.67	0	0.00
Naja	16	48.48	11	68.75	5	31.25	5	31.25	12	75.00	1	6.25
Bagh	12	50.00	7	58.33	5	41.67	3	25.00	9	75.00	0	0.00
Kawa	1	33.33	1	100	0	0.00	0	0.00	1	100	0	0.00
Band	8	80.00	5	62.50	3	37.50	2	25.00	6	75.00	0	0.00
Deop	17	65.38	12	70.59	5	29.41	4	23.53	14	82.35	1	5.88
Nahr	9	60.00	6	66.67	3	33.33	2	22.22	7	77.78	0	0.00
Bura1	1	50.00	1	100	0	0.00	0	0.00	1	100	0	0.00
Kanc	6	60.00	4	66.67	2	33.33	1	16.67	5	83.33	0	0.00
Pacg	12	63.16	8	66.67	4	33.33	3	25.00	10	83.33	1	8.33
Katb	5	35.71	3	60.00	2	40.00	1	20.00	4	80.00	0	0.00
Total	434	65.46	302	69.59	132	30.41	136	31.34	322	74.19	24	5.53

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.40. Thatch material extraction location and season of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Thatch extraction													
	Location outside Reserve								Season					
	Karbi Anglong		National highway		Kaziranga fringe		Home/Field		Summer		Monsoon		Winter	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	0	0.00	0	0.00	4	100	2	50.00	2	33.33	1	16.67	5	83.33
Belo	0	0.00	0	0.00	12	85.71	5	35.71	7	41.18	2	11.76	15	88.24
Tamp	0	0.00	0	0.00	6	75.00	3	37.50	4	36.36	2	18.18	10	90.91
Japp	0	0.00	0	0.00	7	100	2	28.57	4	36.36	0	0.00	9	81.82
Meth	16	57.14	8	28.57	19	67.86	8	28.57	13	30.95	7	16.67	34	80.95

Village	Thatch extraction													
	Location outside Reserve								Season					
	Karbi Anglong		National highway		Kaziranga fringe		Home/Field		Summer		Monsoon		Winter	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Borj	9	50.00	4	22.22	11	61.11	6	33.33	8	32.00	5	20.00	20	80.00
Hali	4	66.67	2	33.33	3	50.00	2	33.33	1	14.29	1	14.29	5	71.43
Silj	7	43.75	3	18.75	12	75.00	3	18.75	7	31.82	5	22.73	18	81.82
Sild1	6	42.86	2	14.29	8	57.14	5	35.71	5	29.41	2	11.76	16	94.12
Sild2	4	36.36	2	18.18	8	72.73	2	18.18	4	26.67	1	6.67	14	93.33
Gosh	9	39.13	6	26.09	13	56.52	6	26.09	5	15.15	7	21.21	27	81.82
Domj1	2	25.00	2	25.00	8	100	2	25.00	3	27.27	2	18.18	8	72.73
Domj2	2	66.67	0	0.00	3	100	1	33.33	1	20.00	0	0.00	4	80.00
Kazi	1	20.00	1	20.00	4	80.00	1	20.00	2	28.57	0	0.00	6	85.71
Mohp	4	40.00	3	30.00	7	70.00	4	40.00	4	30.77	3	23.08	10	76.92
Koho2	5	35.71	4	28.57	9	64.29	4	28.57	4	20.00	2	10.00	18	90.00
Panb	1	50.00	0	0.00	1	50.00	2	100	0	0.00	1	50.00	2	100
Hati	3	50.00	1	16.67	6	100	1	16.67	3	33.33	1	11.11	8	88.89
Baga	13	39.39	6	18.18	23	69.70	11	33.33	11	25.00	8	18.18	36	81.82
Harm	9	42.86	4	19.05	15	71.43	6	28.57	6	22.22	5	18.52	19	70.37
Nanc	1	50.00	1	50.00	1	50.00	1	50.00	0	0.00	1	33.33	3	100
Naja	4	33.33	3	25.00	11	91.67	3	25.00	4	25.00	3	18.75	12	75.00
Bagh	4	44.44	2	22.22	9	100	2	22.22	3	25.00	2	16.67	10	83.33
Kawa	0	0.00	1	100	0	0.00	1	100	1	100	0	0.00	1	100
Band	3	50.00	2	33.33	3	50.00	1	16.67	1	12.50	1	12.50	7	87.50
Deop	6	42.86	3	21.43	12	85.71	4	28.57	4	23.53	3	17.65	15	88.24
Nahr	3	42.86	2	28.57	4	57.14	2	28.57	1	11.11	2	22.22	7	77.78
Bura1	1	100	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	100
Kanc	2	40.00	2	40.00	4	80.00	1	20.00	1	16.67	1	16.67	6	100
Pacg	0	0.00	0	0.00	8	80.00	3	30.00	2	16.67	2	16.67	11	91.67
Katb	0	0.00	0	0.00	4	100	2	50.00	1	20.00	0	0.00	4	80.00
Total	119	36.96	64	19.88	235	72.98	96	29.81	112	25.81	70	16.13	361	83.18

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.41. Daily and mean annual quantities of thatch material extraction from inside the Reserve by villages selected for a socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Thatch extraction inside Reserve											
	Extraction qty (day/kg)		Self-cons qty (day/kg)		Sale qty (day/kg)		Annual extraction qty (in kg)		Annual self-cons qty (in kg)		Annual sale qty (in kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	18.00	6.00±0.58	18.00	6.00±0.58	0.00	0.00	503.00	167.67±69.80	503.00	167.67±69.80	0.00	0.00
Belo	58.00	11.60±1.69	45.00	9.00±1.00	13.00	4.33±0.67	1518.00	303.60±90.69	1204.00	240.80±71.94	314.00	104.67±38.41
Tamp	63.00	15.75±1.25	49.00	12.25±1.93	14.00	7.00±2.0	2175.00	543.75±144.16	1740.00	435.00±139.61	435.00	217.50±142.50
Japp	56.00	11.20±1.32	39.00	7.80±1.24	17.00	5.67±2.33	1538.00	307.60±48.20	1150.00	230.00±63.21	388.00	129.33±57.33
Meth	210.00	11.67±1.09	165.00	9.17±0.95	45.00	6.43±1.23	4635.00	257.50±41.54	3661.00	203.39±32.95	974.00	139.14±35.43
Borj	105.00	13.13±0.85	85.00	10.63±1.50	20.00	6.67±1.67	3064.00	383.00±52.16	2304.00	288.00±40.76	760.00	253.33±74.24
Hali	29.00	14.50±0.50	24.00	12.00±30	5.00	5.00±0.00	393.00	196.50±28.50	333.00	166.50±58.50	60.00	60.00±0.00
Silj	48.00	8.00±2.56	38.00	6.33±1.41	10.00	10.00±0.00	1222.00	203.67±44.69	1022.00	170.33±27.52	200.00	200.00±0.00
Sild1	18.00	4.50±1.04	14.00	3.50±0.65	4.00	4.00±0.00	513.00	128.25±42.84	373.00	93.25±18.34	140.00	140.00±0.00
Sild2	68.00	11.33±0.61	64.00	10.67±0.95	4.00	4.00±0.00	1915.00	319.17±71.44	1855.00	309.17±76.29	60.00	60.00±0.00
Gosh	113.00	10.27±1.06	85.00	7.73±1.05	28.00	5.60±1.60	3236.00	294.18±27.91	2623.00	238.45±39.03	613.00	122.60±27.72
Domj1	50.00	12.50±2.10	43.00	10.75±2.39	7.00	7.00±0.00	1460.00	365.00±110.79	1355.00	338.75±125.21	105.00	105.00±0.00
Domj2	29.00	14.50±4.50	22.00	11.00±10	7.00	7.00±0.00	565.00	282.50±2.50	460.00	230.00±50.00	105.00	105.00±0.00
Kazi	23.00	11.50±0.50	17.00	8.50±3.50	6.00	6.00±0.00	700.00	350.00±130.00	580.00	290.00±190.00	120.00	120.00±0.00
Mohp	49.00	12.25±1.11	43.00	10.75±0.85	6.00	6.00±0.00	1307.00	326.75±45.15	1163.00	290.75±50.37	144.00	144.00±0.00
Koho2	86.00	12.29±0.71	73.00	10.43±1.41	13.00	6.50±1.50	2015.00	287.86±61.21	1737.00	248.14±65.31	278.00	139.00±11.00
Panb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hati	40.00	13.33±1.86	24.00	8.00±2.65	16.00	8.00±0.00	1461.00	487.00±62.31	957.00	319.00±146.77	504.00	252.00±28.00
Baga	154.00	11.85±0.54	126.00	9.69±0.87	28.00	5.60±1.17	4132.00	317.85±40.50	3364.00	258.77±36.88	768.00	153.60±26.50
Harm	64.00	9.14±1.12	60.00	8.57±1.11	4.00	4.00±0.00	1594.00	227.71±44.25	1434.00	204.86±29.38	160.00	160.00±0.00
Nanc	8.00	8.00±0.00	6.00	6.00±0.00	2.00	2.00±0.00	400.00	400.00±0.00	300.00	300.00±0.00	100.00	100.00±0.00
Naja	44.00	8.80±1.36	39.00	7.80±1.11	5.00	5.00±0.00	1364.00	272.80±93.83	1104.00	220.80±48.75	260.00	260.00±0.00
Bagh	23.00	7.67±1.86	23.00	7.67±1.86	0.00	0.00	610.00	203.33±37.56	610.00	203.33±37.56	0.00	0.00
Kawa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Band	26.00	13.00±3.00	21.00	10.50±5.50	5.00	5.00±0.00	400.00	200.00±40.00	280.00	140.00±20.00	120.00	120.00±0.00
Deop	50.00	12.50±0.65	50.00	12.50±0.65	0.00	0.00	1890.00	472.50±123.92	1890.00	472.50±123.92	0.00	0.00
Nahr	33.00	16.50±1.50	33.00	16.50±1.50	0.00	0.00	420.00	210.00±30.00	420.00	210.00±30.00	0.00	0.00
Bura1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kanc	13.00	13.00±0.00	9.00	9.00±0.00	4.00	4.00±0.00	104.00	104.00±0.00	72.00	72.00±0.00	32.00	32.00±0.00
Pacg	51.00	17.00±2.00	41.00	13.67±2.91	10.00	10.00±0.00	1144.00	381.33±154.73	944.00	314.67±168.75	200.00	200.00±0.00
Katb	20.00	20.00±0.00	20.00	20.00±0.00	0.00	0.00	320.00	320.00±0.00	320.00	320.00±0.00	0.00	0.00
Total	1549.00	11.39±0.34	1276.00	9.38±0.33	273.00	5.93±0.38	40598.00	298.51±14.27	33758.00	248.22±13.32	6840.00	148.70±12.36

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, cons-consumption, qty- quantity, kg- kilograms, INR- Indian Rupee and SE- standard error.

Appendix Table 6.42. Daily and mean annual quantities of thatch material extraction from outside the Reserve by villages selected for a socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Thatch extraction outside Reserve											
	Extraction qty (day/kg)		Self-cons qty (day/kg)		Sale qty (day/kg)		Annual extraction qty (in kg)		Annual self-cons qty (in kg)		Annual sale qty (in kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	65.00	16.25±3.75	40.00	10.00±2.04	25.00	12.50±2.50	1605.00	401.25±94.44	995.00	248.75±55.92	610.00	305.00±55.00
Belo	145.00	10.36±0.85	133.00	9.50±0.79	12.00	4.00±0.58	6247.00	446.21±74.48	5743.00	410.21±71.83	504.00	168.00±48.00
Tamp	107.00	13.38±1.81	87.00	10.88±0.83	20.00	6.67±1.67	5590.00	698.75±131.52	4640.00	580.00±89.54	950.00	316.67±142.40
Japp	79.00	11.29±0.97	74.00	10.57±0.75	5.00	5.00±0.00	2350.00	335.71±78.68	2290.00	327.14±81.90	60.00	60.00±0.00
Meth	223.00	7.96±0.43	207.00	7.39±0.43	16.00	4.00±0.58	10152.00	362.57±34.58	9732.00	347.57±35.25	420.00	105.00±27.23
Borj	145.00	8.06±0.69	142.00	7.89±0.69	3.00	3.00±0.00	6487.00	360.39±54.11	6403.00	355.72±54.72	84.00	84.00±0.00
Hali	115.00	19.17±2.71	75.00	12.50±1.12	40.00	13.33±4.41	4770.00	795.00±51.23	3680.00	613.33±133.33	1090.00	363.33±63.33
Silj	170.00	10.63±0.72	153.00	9.56±0.82	17.00	5.67±0.67	8512.00	532.00±102.95	7652.00	478.25±98.74	860.00	286.67±175.72
Sild1	138.00	9.86±1.03	116.00	8.29±0.67	22.00	7.33±1.45	5105.00	364.64±59.31	4524.00	323.14±57.15	581.00	193.67±77.72
Sild2	98.00	8.91±0.73	93.00	8.45±0.80	5.00	5.00±0.00	2938.00	267.09±58.88	2688.00	244.36±54.08	250.00	250.00±0.00
Gosh	309.00	13.43±1.40	219.00	9.52±0.78	90.00	10.00±2.20	15300.00	665.22±106.52	10130.00	440.43±51.16	5170.00	574.44±152.06
Domj1	74.00	9.25±0.80	70.00	8.75±0.88	4.00	4.00±0.00	3677.00	459.63±114.08	3397.00	424.63±108.79	280.00	280.00±0.00
Domj2	23.00	7.67±1.45	23.00	7.67±1.45	0.00	0.00	1928.00	642.67±178.38	1928.00	642.67±178.38	0.00	0.00
Kazi	36.00	7.20±1.16	36.00	7.20±1.16	0.00	0.00	1835.00	367.00±70.06	1835.00	367.00±70.06	0.00	0.00
Mohp	152.00	15.20±2.06	107.00	10.70±0.91	45.00	11.25±1.25	7920.00	792.00±136.48	5700.00	570.00±87.31	2220.00	555.00±89.58
Koho2	111.00	7.93±0.62	106.00	7.57±0.75	5.00	5.00±0.00	3292.00	235.14±37.83	3082.00	220.14±38.99	210.00	210.00±0.00
Panb	13.00	6.50±1.50	8.00	4.00±1.00	5.00	5.00±0.00	420.00	210.00±110.00	220.00	110.00±10.00	200.00	200.00±0.00
Hati	48.00	8.00±1.00	43.00	7.17±1.01	5.00	5.00±0.00	2463.00	410.50±93.12	2313.00	385.50±101.98	150.00	150.00±0.00
Baga	300.00	9.09±0.85	260.00	7.88±0.58	40.00	8.00±1.22	14965.00	453.48±44.51	13285.00	402.58±38.29	1680.00	336.00±64.23
Harm	229.00	10.90±0.86	207.00	9.86±0.69	22.00	11.00±1.00	10950.00	521.43±82.48	9942.00	473.43±79.55	1008.00	504.00±24.00
Nanc	11.00	5.50±0.50	11.00	5.50±0.50	0.00	0.00	493.00	246.50±78.50	493.00	246.50±78.50	0.00	0.00
Naja	171.00	14.25±1.21	111.00	9.25±0.63	60.00	10.00±1.29	6028.00	502.33±82.22	3673.00	306.08±34.84	2355.00	392.50±107.16
Bagh	116.00	12.89±0.63	112.00	12.44±0.69	4.00	4.00±0.00	6549.00	727.67±128.95	6309.00	701.00±128.80	240.00	240.00±0.00
Kawa	5.00	5.00±0.00	5.00	5.00±0.00	0.00	0.00	240.00	240.00±0.00	240.00	240.00±0.00	0.00	0.00
Band	155.00	25.83±2.39	70.00	11.67±1.67	85.00	14.17±2.71	7490.00	1248.33±190.41	3500.00	583.33±111.88	3990.00	665.00±120.82
Deop	322.00	23.00±2.18	205.00	14.64±1.68	117.00	10.64±1.26	15335.00	1095.36±153.70	9937.00	709.79±111.03	5398.00	490.73±88.77
Nahr	170.00	24.29±2.02	125.00	17.86±1.49	45.00	7.50±1.12	6960.00	994.29±153.59	5030.00	718.57±108.90	1930.00	321.67±55.04
Bura1	10.00	10.00±0.00	10.00	10.00±0.00	0.00	0.00	380.00	380.00±0.00	380.00	380.00±0.00	0.00	0.00
Kanc	60.00	12.00±1.22	56.00	11.20±1.71	4.00	4.00±0.00	2400.00	480.00±75.17	2320.00	464.00±90.26	80.00	80.00±0.00
Pacg	139.00	13.90±1.91	124.00	12.40±1.03	15.00	7.50±2.50	3286.00	328.60±98.11	2936.00	293.60±89.54	350.00	175.00±75.00
Katb	110.00	27.50±1.44	55.00	13.75±2.39	55.00	13.75±2.39	4525.00	1131.25±287.84	2225.00	556.25±189.95	2300.00	575.00±173.81
Total	3849.00	11.95±0.36	3083.00	9.57±0.21	766.00	9.01±0.53	170192.00	528.55±22.06	137222.00	426.16±16.05	32970.00	387.88±30.78

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari,

Village	Thatch extraction outside Reserve											
	Extraction qty (day/kg)		Self-cons qty (day/kg)		Sale qty (day/kg)		Annual extraction qty (in kg)		Annual self-cons qty (in kg)		Annual sale qty (in kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE

Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, cons-consumption, qty- quantity, kg- kilograms, INR- Indian Rupee and SE- standard error.

Appendix Table 6.43. Total mean annual quantities of thatch material extraction from both inside and outside the Reserve by villages selected for a socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Thatch extraction (both inside and outside Reserve)									
	Total annual extraction qty (in kg)		Total annual self-cons qty (in kg)		Total annual sale qty (in kg)		Sale @INR/kg		Total annual income generated (in INR)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	2108.00	351.33±128.97	1498.00	249.67±91.21	610.00	305.00±55.00	27.00	13.50±1.50	8070.00	4035.00±285.00
Belo	7765.00	456.76±64.77	6947.00	408.65±60.26	818.00	163.60±35.77	58.00	11.60±0.40	9576.00	1915.20±446.19
Tamp	7765.00	705.91±100.81	6380.00	580.00±74.50	1385.00	277.00±93.30	61.00	12.20±0.80	18020.00	3604.00±1462.33
Japp	3888.00	353.45±73.70	3440.00	312.73±79.93	448.00	112.00±44.09	42.00	10.50±0.50	4600.00	1150.00±430.00
Meth	14787.00	352.07±30.09	13393.00	318.88±29.77	1394.00	139.40±24.92	125.00	12.50±0.60	17580.00	1758.00±329.65
Borj	9551.00	382.04±40.89	8707.00	348.28±40.44	844.00	211.00±67.44	57.00	14.25±0.75	12060.00	3015.00±1030.64
Hali	5163.00	737.57±114.09	4013.00	573.29±150.96	1150.00	287.50±88.07	50.00	12.50±1.44	15750.00	3937.50±1462.50
Silj	9734.00	442.45±81.57	8674.00	394.27±77.52	1060.00	265.00±126.13	47.00	11.75±1.18	12110.00	3027.50±1535.50
Sild1	5618.00	330.47±55.73	4897.00	288.06±54.11	721.00	180.25±56.57	44.00	11.00±0.58	7890.00	1972.50±569.76
Sild2	4853.00	323.53±63.57	4543.00	302.87±63.21	310.00	155.00±95.00	22.00	11.00±1.00	3600.00	1800.00±1200.00
Gosh	18536.00	561.70±80.72	12753.00	386.45±41.50	5783.00	413.07±113.30	155.00	11.07±0.40	65452.00	4675.14±1339.30
Domj1	5137.00	467.00±94.66	4752.00	432.00±94.63	385.00	192.50±87.50	27.00	13.50±1.50	4935.00	2467.50±892.50
Domj2	2493.00	498.60±131.64	2388.00	477.60±141.47	105.00	105.00±0.00	10.00	10.00±0.00	1050.00	1050.00±0.00
Kazi	2535.00	362.14±56.14	2415.00	345.00±65.26	120.00	120.00±0.00	10.00	10.00±0.00	1200.00	1200.00±0.00
Mohp	9227.00	709.77±114.32	6863.00	527.92±71.29	2364.00	472.80±107.57	59.00	11.80±0.92	28440.00	5688.00±1377.44
Koho2	5307.00	265.35±37.17	4819.00	240.95±38.58	488.00	162.67±24.50	32.00	10.67±0.67	5136.00	1712.00±194.28
Panb	420.00	210.00±110.00	220.00	110.00±10.00	200.00	200.00±0.00	15.00	15.00±0.00	3000.00	3000.00±0.00
Hati	3924.00	436.00±64.02	3270.00	363.33±79.07	654.00	218.00±37.65	36.00	12.00±0.00	7848.00	2616.00±451.77
Baga	19097.00	434.02±39.47	16649.00	378.39±34.32	2448.00	244.80±44.69	120.00	12.00±0.00	29376.00	2937.60±536.27
Harm	12544.00	464.59±72.55	11376.00	421.33±66.92	1168.00	389.33±115.50	36.00	12.00±0.00	14016.00	4672.00±1386.01
Nanc	893.00	297.67±68.35	793.00	264.33±48.70	100.00	100.00±0.00	12.00	12.00±0.00	1200.00	1200.00±0.00
Naja	7392.00	462.00±75.08	4777.00	298.56±36.76	2615.00	373.57±92.52	74.00	10.57±0.37	27960.00	3994.29±1136.38
Bagh	7159.00	596.58±117.56	6919.00	576.58±115.48	240.00	240.00±0.00	15.00	15.00±0.00	3600.00	3600.00±0.00
Kawa	240.00	240.00±0.00	240.00	240.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00
Band	7890.00	986.25±221.18	3780.00	472.50±109.47	4110.00	587.14±128.41	82.00	11.71±0.89	49330.00	7047.14±1592.34
Deop	17225.00	1013.24±150.32	11827.00	695.71±102.52	5398.00	490.73±88.77	122.00	11.09±0.31	59380.00	5398.18±935.17
Nahr	7380.00	820.00±164.54	5450.00	605.56±111.94	1930.00	321.67±55.04	69.00	11.50±0.81	23100.00	3850.00±881.33
Bura1	380.00	380.00±0.00	380.00	380.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00

Village	Thatch extraction (both inside and outside Reserve)									
	Total annual extraction qty (in kg)		Total annual self-cons qty (in kg)		Total annual sale qty (in kg)		Sale @INR/kg		Total annual income generated (in INR)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Kanc	2504.00	417.33±87.71	2392.00	398.67±98.48	112.00	56.00±24.00	22.00	11.00±1.00	1280.00	640.00±320.00
Pacg	4430.00	369.17±109.85	3880.00	323.33±92.51	550.00	183.33±44.10	35.00	11.67±1.67	6750.00	2250.00±803.64
Katb	4845.00	969.00±275.75	2545.00	509.00±154.53	2300.00	575.00±173.81	52.00	13.00±1.22	31300.00	7825.00±2807.25
Total	210790.00	485.69±18.06	170980.00	393.96±13.56	39810.00	308.60±22.86	1516.00	11.75±0.15	473609.00	3671.39±280.93

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, cons-consumption, qty- quantity, kg- kilograms, INR- Indian Rupee and SE- standard error.

Appendix Table 6.44. List of extracted thatch plant species by villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Scientific name	Family	Use	Total	%
<i>Arundo donax</i> L.	Poaceae	Thatching	56	10.63
<i>Bambusa</i> spp.	Poaceae	Thatching	304	57.69
<i>Chrysopogon zizanioides</i> (L.) Roberty	Poaceae	Thatching	233	44.21
<i>Imperata cylindrica</i> (L.) Raeusch.	Poaceae	Thatching	179	33.97
<i>Phragmites karka</i> (Retz.) Trin. ex Steud.	Poaceae	Thatching	39	7.40
<i>Sachharum</i> spp.	Poaceae	Thatching	440	83.49
<i>Themeda</i> spp.	Poaceae	Thatching	144	27.32

Appendix Table 6.45. Details of respondents involved in thatch material extraction (travelling distance, gender, age and qualification) in the villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Total visitors	Distance home to extraction location (in km)		Distance travelled inside Reserve for extraction (in km)		Respondent details													
						Gender				Age group						Qualification			
						Female		Male		10-30		31-60		≤61		Illiterate		Literate	
		Total	Mean±SE	Total	Mean±SE	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%		
Bamg	61	3.12	0.31±0.01	1.34	0.13±0.01	17	27.87	44	72.13	26	42.62	34	55.74	1	1.64	38	62.30	23	37.70
Belo	79	15.23	1.52±0.02	3.65	0.36±0.02	20	25.32	59	74.68	24	30.38	48	60.76	7	8.86	48	60.76	31	39.24
Tamp	52	4.04	0.40±0.02	3.98	0.40±0.03	13	25.00	39	75.00	18	34.62	34	65.38	0	0.00	31	59.62	21	40.38
Japp	73	13.94	1.39±0.02	3.51	0.35±0.03	16	21.92	57	78.08	26	35.62	41	56.16	6	8.22	46	63.01	27	36.99
Meth	31	13.94	1.39±0.04	3.67	0.37±0.02	9	29.03	22	70.97	16	51.61	14	45.16	1	3.23	22	70.97	9	29.03
Borj	25	17.46	1.75±0.04	1.40	0.14±0.04	4	16.00	21	84.00	7	28.00	16	64.00	2	8.00	16	64.00	9	36.00
Hali	37	14.00	1.40±0.04	2.14	0.21±0.05	8	21.62	29	78.38	13	35.14	22	59.46	2	5.41	23	62.16	14	37.84
Sili	45	8.45	0.84±0.04	1.31	0.13±0.02	7	15.56	38	84.44	15	33.33	26	57.78	4	8.89	28	62.22	17	37.78

Village	Total visitors	Distance home to extraction location (in km)		Distance travelled inside Reserve for extraction (in km)		Respondent details													
						Gender				Age group						Qualification			
		Total	Mean±SE	Total	Mean±SE	Female		Male		10-30		31-60		≤61		Illiterate		Literate	
						Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Sild1	45	6.51	0.65±0.01	1.00	0.10±0.00	12	26.67	33	73.33	14	31.11	26	57.78	5	11.11	32	71.11	13	28.89
Sild2	33	15.17	1.52±0.05	2.06	0.21±0.04	7	21.21	26	78.79	11	33.33	20	60.61	2	6.06	22	66.67	11	33.33
Gosh	65	3.51	0.35±0.01	0.78	0.08±0.01	15	23.08	50	76.92	24	36.92	38	58.46	3	4.62	44	67.69	21	32.31
Domj1	32	8.07	0.81±0.02	1.14	0.11±0.02	8	25.00	24	75.00	16	50.00	14	43.75	2	6.25	23	71.88	9	28.13
Domj2	31	6.13	0.61±0.03	0.84	0.08±0.01	6	19.35	25	80.65	14	45.16	13	41.94	4	12.90	19	61.29	12	38.71
Kazi	42	11.29	1.13±0.03	1.11	0.11±0.01	10	23.81	32	76.19	20	47.62	21	50.00	1	2.38	28	66.67	14	33.33
Mohp	49	7.90	0.79±0.01	2.10	0.21±0.01	11	22.45	38	77.55	20	40.82	24	48.98	5	10.20	33	67.35	16	32.65
Koho2	48	17.53	1.75±0.02	4.53	0.45±0.02	10	20.83	38	79.17	15	31.25	30	62.50	3	6.25	32	66.67	16	33.33
Panb	28	15.40	1.54±0.05	3.10	0.31±0.02	8	28.57	20	71.43	14	50.00	14	50.00	0	0.00	17	60.71	11	39.29
Hati	26	10.38	1.04±0.06	2.83	0.28±0.02	4	15.38	22	84.62	10	38.46	14	53.85	2	7.69	18	69.23	8	30.77
Baga	46	6.74	0.67±0.05	4.25	0.43±0.01	12	26.09	34	73.91	15	32.61	27	58.70	4	8.70	29	63.04	17	36.96
Harm	33	5.71	0.57±0.02	0.58	0.06±0.00	4	12.12	29	87.88	9	27.27	21	63.64	3	9.09	25	75.76	8	24.24
Nanc	33	6.11	0.61±0.01	0.55	0.05±0.00	11	33.33	22	66.67	14	42.42	18	54.55	1	3.03	22	66.67	11	33.33
Naja	32	5.63	0.56±0.02	0.55	0.05±0.00	8	25.00	24	75.00	11	34.38	18	56.25	3	9.38	23	71.88	9	28.13
Bagh	51	5.77	0.58±0.02	1.76	0.18±0.01	11	21.57	40	78.43	16	31.37	32	62.75	3	5.88	31	60.78	20	39.22
Kawa	48	7.41	0.74±0.01	1.35	0.13±0.01	10	20.83	38	79.17	16	33.33	27	56.25	5	10.42	34	70.83	14	29.17
Band	64	0.53	0.05±0.00	0.34	0.03±0.00	13	20.31	51	79.69	21	32.81	40	62.50	3	4.69	42	65.63	22	34.38
Deop	52	6.19	0.62±0.01	0.83	0.08±0.00	12	23.08	40	76.92	18	34.62	31	59.62	3	5.77	33	63.46	19	36.54
Nahr	52	5.65	0.57±0.02	0.42	0.04±0.00	12	23.08	40	76.92	20	38.46	29	55.77	3	5.77	35	67.31	17	32.69
Bura1	45	5.60	0.56±0.02	0.40	0.04±0.00	9	20.00	36	80.00	21	46.67	22	48.89	2	4.44	27	60.00	18	40.00
Kanc	43	5.69	0.57±0.01	0.37	0.04±0.00	10	23.26	33	76.74	19	44.19	23	53.49	1	2.33	29	67.44	14	32.56
Pacg	28	4.66	0.47±0.04	3.68	0.37±0.03	5	17.86	23	82.14	9	32.14	19	67.86	0	0.00	18	64.29	10	35.71
Katb	45	4.78	0.48±0.01	3.62	0.36±0.02	14	31.11	31	68.89	12	26.67	30	66.67	3	6.67	31	68.89	14	31.11
Total	1374	262.51	8.47±0.83	59.17	1.91±0.24	316	23.00	1058	77.00	504	36.68	786	57.21	84	6.11	899	65.43	475	34.57

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, km- kilometres, SE- standard error, ≤- more than equals to and %- in percentages.

Appendix Table 6.46. Kruskal-Wallis significance test among village parameters selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Parameters	χ^2	df	P
Thatching distance from Home to Reserve (in km)	288.80	30	0.00*
Thatching distance travelled inside the Reserve for extraction (in km)	264.46	30	0.00*
Thatching extraction quantity (day/kg)	269.11	30	0.00*
Thatch self-consumption quantity (day/kg)	262.41	30	0.00*

Parameters	χ^2	<i>df</i>	<i>P</i>
Thatch sale quantity (day/kg)	7.33	12	0.84
Thatch extraction quantity (kg/annum)	265.40	30	0.00*
Thatch self-consumption quantity (kg/annum)	260.93	30	0.00*
Thatch sale quantity (kg/annum)	10.43	12	0.58
Annual income from thatch sale (INR/annum)	8.03	12	0.78
Fodder extraction distance from Home to Reserve (in km)	265.88	30	0.00*
Fodder extraction distance travelled inside the Reserve for extraction (in km)	227.10	30	0.00*
Fodder extraction quantity (day/kg)	142.72	30	0.00*
Fodder self-consumption quantity (day/kg)	131.95	30	0.00*
Fodder sale quantity (day/kg)	21.78	19	0.30
Fodder extraction quantity (kg/annum)	144.48	30	0.00*
Fodder self-consumption quantity (kg/annum)	135.95	30	0.00*
Fodder sale quantity (kg/annum)	17.01	19	0.59
Annual income from fodder sale (INR/annum)	18.83	19	0.47
Fuelwood extraction distance from Home to Reserve (in km)	288.11	30	0.00*
Fuelwood extraction distance travelled inside the Reserve for extraction (in km)	267.29	30	0.00*
Fuelwood extraction quantity (day/kg)	222.63	30	0.00*
Fuelwood self-consumption quantity (day/kg)	162.09	30	0.00*
Fuelwood sale quantity (day/kg)	37.45	23	0.03*
Fuelwood extraction quantity (kg/annum)	218.09	30	0.00*
Fuelwood self-consumption quantity (kg/annum)	204.85	30	0.00*
Fuelwood sale quantity (kg/annum)	56.46	23	0.00*
Annual income from Fuelwood sale (INR/annum)	54.96	23	0.00*
Fishing distance from Home to River/beel (in km)	277.74	30	0.00*
Fishing distance travelled inside the Reserve for extraction (in km)	275.33	30	0.00*
Fishing extraction quantity (day/kg)	292.77	30	0.00*
Fish self-consumption quantity (day/kg)	188.44	30	0.00*
Fish sale quantity (day/kg)	143.67	29	0.00*
Fishing extraction quantity (kg/annum)	276.73	30	0.00*
Fish self-consumption quantity (kg/annum)	213.61	30	0.00*
Fish sale quantity (kg/annum)	130.29	29	0.00*
Annual income from fish sale (INR/annum)	108.27	29	0.00*

Km- kilometres, kg-kilogram, INR-Indian stand rupees, χ^2 -chi square value, *df*-degree of freedom and *indicates significant result at $P>0.05$.

Appendix Table 6.47. Details of respondents involved in thatch material extraction (religion and caste) in the villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Respondent details																	
	Religion						Caste											
	Christian		Hindu		Muslim		General		Minority		Other Backward Class		Scheduled Castes		Scheduled Tribes		Tea Tribes	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	0	0.00	61	100	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	61	100	0	0.00
Belo	0	0.00	79	100	0	0.00	7	8.86	0	0.00	13	16.46	2	2.53	57	72.15	0	0.00
Tamp	0	0.00	52	100	0	0.00	0	0.00	0	0.00	45	86.54	7	13.46	0	0.00	0	0.00
Japp	0	0.00	73	100	0	0.00	0	0.00	0	0.00	12	16.44	54	73.97	2	2.74	5	6.85
Meth	2	6.45	29	93.55	0	0.00	1	3.23	0	0.00	1	3.23	7	22.58	2	6.45	20	64.52
Borj	0	0.00	25	100	0	0.00	1	4.00	0	0.00	2	8.00	1	4.00	0	0.00	21	84.00
Hali	0	0.00	34	91.89	3	8.11	0	0.00	3	8.11	23	62.16	0	0.00	0	0.00	11	29.73
Silj	0	0.00	43	95.56	2	4.44	0	0.00	2	4.44	27	60.00	0	0.00	0	0.00	16	35.56
Sild1	0	0.00	43	95.56	2	4.44	3	6.67	2	4.44	2	4.44	0	0.00	0	0.00	38	84.44
Sild2	0	0.00	33	100	0	0.00	2	6.06	0	0.00	0	0.00	0	0.00	23	69.70	8	24.24
Gosh	0	0.00	65	100	0	0.00	12	18.46	0	0.00	0	0.00	0	0.00	3	4.62	50	76.92
Domj1	0	0.00	30	93.75	2	6.25	3	9.38	2	6.25	16	50.00	1	3.13	0	0.00	10	31.25
Domj2	0	0.00	30	96.77	1	3.23	2	6.45	1	3.23	26	83.87	0	0.00	0	0.00	2	6.45
Kazi	0	0.00	42	100	0	0.00	0	0.00	0	0.00	12	28.57	0	0.00	30	71.43	0	0.00
Mohp	0	0.00	49	100	0	0.00	7	14.29	0	0.00	33	67.35	0	0.00	0	0.00	9	18.37
Koho2	5	10.42	43	89.58	0	0.00	6	12.50	0	0.00	29	60.42	0	0.00	0	0.00	13	27.08
Panb	0	0.00	28	100	0	0.00	0	0.00	0	0.00	0	0.00	7	25.00	0	0.00	21	75.00
Hati	0	0.00	26	100	0	0.00	0	0.00	0	0.00	0	0.00	8	30.77	1	3.85	17	65.38
Baga	0	0.00	46	100	0	0.00	2	4.35	0	0.00	7	15.22	1	2.17	0	0.00	36	78.26
Harm	0	0.00	11	33.33	22	66.67	4	12.12	22	66.67	5	15.15	1	3.03	0	0.00	1	3.03
Nanc	0	0.00	0	0.00	33	100	0	0.00	33	100	0	0.00	0	0.00	0	0.00	0	0.00
Naja	0	0.00	6	18.75	26	81.25	3	9.38	26	81.25	3	9.38	0	0.00	0	0.00	0	0.00
Bagh	0	0.00	34	66.67	17	33.33	17	33.33	17	33.33	16	31.37	1	1.96	0	0.00	0	0.00
Kawa	0	0.00	0	0.00	48	100	0	0.00	48	100	0	0.00	0	0.00	0	0.00	0	0.00
Band	0	0.00	0	0.00	64	100	0	0.00	64	100	0	0.00	0	0.00	0	0.00	0	0.00
Deop	0	0.00	5	9.62	47	90.38	0	0.00	47	90.38	3	5.77	2	3.85	0	0.00	0	0.00
Nahr	0	0.00	52	100	0	0.00	0	0.00	0	0.00	1	1.92	4	7.69	13	25.00	34	65.38
Bura1	0	0.00	45	100	0	0.00	0	0.00	0	0.00	0	0.00	4	8.89	0	0.00	41	91.11
Kanc	0	0.00	43	100	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	40	93.02	3	6.98
Pacg	0	0.00	22	78.57	6	21.43	4	14.29	6	21.43	18	64.29	0	0.00	0	0.00	0	0.00
Katb	0	0.00	42	93.33	3	6.67	13	28.89	3	6.67	27	60.00	2	4.44	0	0.00	0	0.00
Total	7	0.51	1091	79.40	276	20.09	87	6.33	276	20.09	321	23.36	102	7.42	232	16.89	356	25.91

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.48. Thatch material extraction duration, time and awareness about species among villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Thatch extraction															
	Duration (in min)						Time (in 24 hours)						Aware of collected species			
	≥30		≥31-60		≤61		6:00-9:00		9:01-12:00		12:01-17:00		No		Yes	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	36	59.02	25	40.98	0	0.00	16	26.23	35	57.38	10	16.39	0	0.00	61	100
Belo	28	35.44	51	64.56	0	0.00	22	27.85	43	54.43	14	17.72	0	0.00	79	100
Tamp	28	53.85	24	46.15	0	0.00	15	28.85	32	61.54	5	9.62	0	0.00	52	100
Japp	29	39.73	44	60.27	0	0.00	24	32.88	37	50.68	12	16.44	0	0.00	73	100
Meth	30	96.77	1	3.23	0	0.00	9	29.03	17	54.84	5	16.13	0	0.00	31	100
Borj	25	100	0	0.00	0	0.00	7	28.00	15	60.00	3	12.00	0	0.00	25	100
Hali	33	89.19	4	10.81	0	0.00	9	24.32	22	59.46	6	16.22	0	0.00	37	100
Silj	33	73.33	12	26.67	0	0.00	15	33.33	25	55.56	5	11.11	0	0.00	45	100
Sild1	32	71.11	13	28.89	0	0.00	13	28.89	26	57.78	6	13.33	0	0.00	45	100
Sild2	26	78.79	7	21.21	0	0.00	9	27.27	19	57.58	5	15.15	0	0.00	33	100
Gosh	32	49.23	33	50.77	0	0.00	15	23.08	44	67.69	6	9.23	0	0.00	65	100
Domj1	29	90.63	3	9.38	0	0.00	5	15.63	18	56.25	9	28.13	0	0.00	32	100
Domj2	24	77.42	7	22.58	0	0.00	11	35.48	17	54.84	3	9.68	0	0.00	31	100
Kazi	39	92.86	3	7.14	0	0.00	11	26.19	25	59.52	6	14.29	0	0.00	42	100
Mohp	28	57.14	21	42.86	0	0.00	10	20.41	30	61.22	9	18.37	0	0.00	49	100
Koho2	30	62.50	18	37.50	0	0.00	12	25.00	27	56.25	9	18.75	0	0.00	48	100
Panb	26	92.86	2	7.14	0	0.00	10	35.71	16	57.14	2	7.14	0	0.00	28	100
Hati	24	92.31	2	7.69	0	0.00	4	15.38	18	69.23	4	15.38	0	0.00	26	100
Baga	34	73.91	12	26.09	0	0.00	18	39.13	24	52.17	4	8.70	0	0.00	46	100
Harm	29	87.88	4	12.12	0	0.00	10	30.30	16	48.48	7	21.21	0	0.00	33	100
Nanc	30	90.91	3	9.09	0	0.00	8	24.24	20	60.61	5	15.15	0	0.00	33	100
Naja	28	87.50	4	12.50	0	0.00	10	31.25	17	53.13	5	15.63	0	0.00	32	100
Bagh	37	72.55	14	27.45	0	0.00	16	31.37	29	56.86	6	11.76	0	0.00	51	100
Kawa	37	77.08	11	22.92	0	0.00	11	22.92	29	60.42	8	16.67	0	0.00	48	100
Band	43	67.19	21	32.81	0	0.00	17	26.56	35	54.69	12	18.75	0	0.00	64	100
Deop	29	55.77	23	44.23	0	0.00	16	30.77	29	55.77	7	13.46	0	0.00	52	100
Nahr	22	42.31	30	57.69	0	0.00	14	26.92	30	57.69	8	15.38	0	0.00	52	100
Bura1	29	64.44	16	35.56	0	0.00	16	35.56	25	55.56	4	8.89	0	0.00	45	100
Kanc	38	88.37	5	11.63	0	0.00	10	23.26	26	60.47	7	16.28	0	0.00	43	100
Pacg	24	85.71	4	14.29	0	0.00	7	25.00	16	57.14	5	17.86	0	0.00	28	100
Katb	38	84.44	7	15.56	0	0.00	10	22.22	28	62.22	7	15.56	0	0.00	45	100
Total	950	69.14	424	30.86	0	0.00	380	27.66	790	57.50	204	14.85	0	0.00	1374	100

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari,

Village	Thatch extraction															
	Duration (in min)						Time (in 24 hours)						Aware of collected species			
	≥30		≥31-60		≤61		6:00-9:00		9:01-12:00		12:01-17:00		No		Yes	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%

Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, ≥- less than equals to, ≤- more than equals to and %- in percentages.

Appendix Table 6.49. Thatch material extraction mode, delivery and end use by villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Thatch extraction															
	Extraction mode				Delivery mode						End use					
	Bolo knife		Hand sickle		Cycle		Hand lifting		Two-wheeler		Self		Sale		Both	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	13	21.31	48	78.69	40	65.57	21	34.43	0	0.00	49	80.33	0	0.00	12	19.67
Belo	36	45.57	43	54.43	52	65.82	20	25.32	7	8.86	53	67.09	0	0.00	26	32.91
Tamp	4	7.69	48	92.31	12	23.08	40	76.92	0	0.00	52	100	0	0.00	0	0.00
Japp	25	34.25	48	65.75	36	49.32	32	43.84	5	6.85	53	72.60	0	0.00	20	27.40
Meth	0	0.00	31	100	0	0.00	31	100	0	0.00	31	100	0	0.00	0	0.00
Borj	0	0.00	25	100	0	0.00	25	100	0	0.00	25	100	0	0.00	0	0.00
Hali	1	2.70	36	97.30	0	0.00	37	100	0	0.00	37	100	0	0.00	0	0.00
Silj	4	8.89	41	91.11	7	15.56	38	84.44	0	0.00	44	97.78	0	0.00	1	2.22
Sild1	8	17.78	37	82.22	12	26.67	33	73.33	0	0.00	42	93.33	0	0.00	3	6.67
Sild2	2	6.06	31	93.94	0	0.00	33	100	0	0.00	33	100	0	0.00	0	0.00
Gosh	31	47.69	34	52.31	48	73.85	13	20.00	4	6.15	43	66.15	0	0.00	22	33.85
Domj1	0	0.00	32	100	0	0.00	32	100	0	0.00	32	100	0	0.00	0	0.00
Domj2	0	0.00	31	100	0	0.00	31	100	0	0.00	31	100	0	0.00	0	0.00
Kazi	0	0.00	42	100	4	9.52	38	90.48	0	0.00	42	100	0	0.00	0	0.00
Mohp	12	24.49	37	75.51	18	36.73	31	63.27	0	0.00	45	91.84	0	0.00	4	8.16
Koho2	4	8.33	44	91.67	6	12.50	42	87.50	0	0.00	48	100	0	0.00	0	0.00
Panb	1	3.57	27	96.43	0	0.00	28	100	0	0.00	28	100	0	0.00	0	0.00
Hati	0	0.00	26	100	0	0.00	26	100	0	0.00	26	100	0	0.00	0	0.00
Baga	3	6.52	43	93.48	7	15.22	39	84.78	0	0.00	46	100	0	0.00	0	0.00
Harm	0	0.00	33	100	2	6.06	31	93.94	0	0.00	33	100	0	0.00	0	0.00
Nanc	0	0.00	33	100	3	9.09	30	90.91	0	0.00	33	100	0	0.00	0	0.00
Naja	0	0.00	32	100	1	3.13	31	96.88	0	0.00	32	100	0	0.00	0	0.00
Bagh	12	23.53	39	76.47	27	52.94	24	47.06	0	0.00	45	88.24	0	0.00	6	11.76
Kawa	5	10.42	43	89.58	9	18.75	39	81.25	0	0.00	47	97.92	0	0.00	1	2.08
Band	29	45.31	35	54.69	40	62.50	21	32.81	3	4.69	44	68.75	0	0.00	20	31.25
Deop	12	23.08	40	76.92	25	48.08	26	50.00	1	1.92	43	82.69	0	0.00	9	17.31
Nahr	13	25.00	39	75.00	26	50.00	26	50.00	0	0.00	45	86.54	0	0.00	7	13.46

Village	Thatch extraction															
	Extraction mode				Delivery mode						End use					
	Bolo knife		Hand sickle		Cycle		Hand lifting		Two-wheeler		Self		Sale		Both	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bura1	4	8.89	41	91.11	9	20.00	36	80.00	0	0.00	43	95.56	0	0.00	2	4.44
Kanc	0	0.00	43	100	1	2.33	42	97.67	0	0.00	43	100	0	0.00	0	0.00
Pacg	0	0.00	28	100	1	3.57	27	96.43	0	0.00	28	100	0	0.00	0	0.00
Katb	0	0.00	45	100	5	11.11	40	88.89	0	0.00	45	100	0	0.00	0	0.00
Total	219	15.94	1155	84.06	391	28.46	963	70.09	20	1.46	1241	90.32	0	0.00	133	9.68

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.50. Total mean annual extraction quantity of thatch, fodder, fuelwood, and fish material by villages selected for the entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Extracted resources	Extraction (N=10)															
	Total annual extraction quantity (Day/kg)		Annual self-consumption quantity (Day/kg)		Annual sale quantity (Day/kg)		Total annual extraction quantity (in kg)		Annual self-consumption quantity (in kg)		Annual sale quantity (in kg)		Total annual income generated (in INR)			
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Thatching	4614.35	461.43±31.10	4290.16	429.02±27.43	1179.65	117.96±20.20	62245.57	6224.56±571.59	55644.32	5564.43±497.79	23882.50	2388.25±400.70	281983.03	28198.30±4951.22		
Fodder	3414.92	341.49±30.35	3176.87	317.69±25.96	761.78	76.18±18.12	31513.65	3151.37±412.50	28741.54	2874.15±345.44	9037.57	903.76±249.19	107904.90	10790.49±2915.34		
Fuelwood	18341.95	1834.19±170.82	14604.67	1460.47±107.60	7153.67	715.37±122.57	148732.22	14873.22±2643.25	97483.76	9748.38±1495.44	87536.33	8753.63±1828.31	2019491.13	201949.11±42803.99		
Fishing	5519.94	551.99±24.05	3241.86	324.19±2.82	3627.02	362.70±24.23	63109.70	6310.97±428.09	34791.47	3479.15±83.99	43906.51	4390.65±393.70	2177127.74	217712.77±22789.12		

N- number of months, kg- kilograms, INR- Indian Rupee and SE- standard error.

Appendix Table 6.51. Daily quantities of thatch material extraction by villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Thatch extraction					
	Total annual extraction quantity (day/kg)		Annual self-consumption quantity (day/kg)		Annual sale quantity (day/kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	244.67	24.47±1.54	216.19	21.62±1.50	121.60	15.20±1.58
Belo	301.91	30.19±2.28	240.64	24.06±2.06	187.67	18.77±2.44
Tamp	220.27	22.03±1.36	220.27	22.03±1.36	0.00	0.00
Japp	277.37	27.74±1.73	235.71	23.57±1.85	146.00	14.60±1.39
Meth	70.96	7.10±0.79	70.96	7.10±0.79	0.00	0.00
Borj	41.97	4.20±0.34	41.97	4.20±0.34	0.00	0.00
Hali	104.11	10.41±0.89	104.11	10.41±0.89	0.00	0.00
Silj	162.32	16.23±0.95	159.40	15.94±0.87	17.50	17.50±0.00

Village	Thatch extraction					
	Total annual extraction quantity (day/kg)		Annual self-consumption quantity (day/kg)		Annual sale quantity (day/kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Sild1	182.43	18.24±1.24	175.86	17.59±0.93	29.80	14.90±5.30
Sild2	94.50	9.45±0.93	94.50	9.45±0.93	0.00	0.00
Gosh	267.45	26.74±1.59	211.00	21.10±1.58	161.48	16.15±1.44
Domj1	83.94	8.39±0.91	83.94	8.39±0.91	0.00	0.00
Domj2	74.91	7.49±0.81	74.91	7.49±0.81	0.00	0.00
Kazi	108.63	10.86±0.89	108.63	10.86±0.89	0.00	0.00
Mohp	191.97	19.20±1.19	182.73	18.27±0.91	46.85	15.62±2.55
Koho2	133.68	13.37±0.66	133.68	13.37±0.66	0.00	0.00
Panb	55.83	5.58±0.53	55.83	5.58±0.53	0.00	0.00
Hati	50.89	5.09±0.46	50.89	5.09±0.46	0.00	0.00
Baga	127.03	12.70±0.71	127.03	12.70±0.71	0.00	0.00
Harm	87.95	8.79±0.91	87.95	8.79±0.91	0.00	0.00
Nanc	98.52	9.85±0.92	98.52	9.85±0.92	0.00	0.00
Naja	79.74	7.97±0.89	79.74	7.97±0.89	0.00	0.00
Bagh	207.23	20.72±1.47	194.07	19.41±1.04	74.90	14.98±3.16
Kawa	145.21	14.52±0.63	144.11	14.41±0.61	6.60	6.60±0.00
Band	256.43	25.64±1.56	204.76	20.48±1.26	154.84	17.20±1.83
Deop	231.50	23.15±1.40	204.57	20.46±0.85	110.30	18.38±2.62
Nahr	238.71	23.87±1.38	218.45	21.84±1.13	99.40	16.57±2.24
Bura1	172.71	17.27±1.05	168.21	16.82±1.04	22.70	11.35±7.05
Kanc	115.38	11.54±0.78	115.38	11.54±0.78	0.00	0.00
Pacg	64.21	6.42±0.69	64.21	6.42±0.69	0.00	0.00
Katb	121.95	12.19±0.69	121.95	12.19±0.69	0.00	0.00
Total	4614.35	148.85±13.70	4290.16	138.39±11.09	1179.65	38.05.00±10.78

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, kg- kilograms and SE- standard error.

Appendix Table 6.52. Total mean annual quantities and income generated from extracted thatch material by villages selected for the entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Thatch extraction									
	Total annual extraction quantity (in kg)		Annual self-consumption quantity (in kg)		Annual sale quantity (in kg)		Sale @INR/kg		Total annual income generated (in INR)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	4033.20	403.32±29.89	3486.14	348.61±29.24	2349.40	293.68±31.41	93.00	11.63±0.26	27544.00	3443.00±398.36
Belo	5456.25	545.63±35.32	4151.13	415.11±30.08	4022.65	402.26±51.14	112.50	11.25±0.39	44914.45	4491.45±545.52

Village	Thatch extraction									
	Total annual extraction quantity (in kg)		Annual self-consumption quantity (in kg)		Annual sale quantity (in kg)		Sale @INR/kg		Total annual income generated (in INR)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Tamp	3102.35	310.24±32.27	3102.35	310.24±32.27	0.00	0.00	0.00	0.00	0.00	0.00
Japp	5139.51	513.95±29.95	4235.45	423.54±32.42	3148.23	314.82±29.19	124.83	12.48±0.61	39289.33	3928.93±489.62
Meth	519.56	51.96±9.08	519.56	51.96±9.08	0.00	0.00	0.00	0.00	0.00	0.00
Borj	373.77	37.38±7.42	373.77	37.38±7.42	0.00	0.00	0.00	0.00	0.00	0.00
Hali	1003.51	100.35±14.83	1003.51	100.35±14.83	0.00	0.00	0.00	0.00	0.00	0.00
Silj	2048.14	204.81±20.47	1992.73	199.27±18.42	332.50	332.50±0.00	10.00	10.00±0.00	3325.00	3325.00±0.00
Sild1	2435.61	243.56±24.40	2314.10	231.41±19.70	546.35	273.18±90.43	24.50	12.25±0.25	6965.70	3482.85±880.35
Sild2	798.70	79.87±10.55	798.70	79.87±10.55	0.00	0.00	0.00	0.00	0.00	0.00
Gosh	4828.83	482.88±26.44	3698.50	369.85±26.53	3195.33	319.53±23.38	105.67	10.57±0.22	34360.57	3436.06±283.64
Domj1	652.59	65.26±10.51	652.59	65.26±10.51	0.00	0.00	0.00	0.00	0.00	0.00
Domj2	560.79	56.08±9.32	560.79	56.08±9.32	0.00	0.00	0.00	0.00	0.00	0.00
Kazi	1103.03	110.30±15.82	1103.03	110.30±15.82	0.00	0.00	0.00	0.00	0.00	0.00
Mohp	2596.24	259.62±27.58	2419.20	241.92±22.31	864.15	288.05±42.20	32.50	10.83±0.83	9225.50	3075.17±519.13
Koho2	1590.06	159.01±15.31	1590.06	159.01±15.31	0.00	0.00	0.00	0.00	0.00	0.00
Panb	459.56	45.96±8.77	459.56	45.96±8.77	0.00	0.00	0.00	0.00	0.00	0.00
Hati	419.75	41.98±8.19	419.75	41.98±8.19	0.00	0.00	0.00	0.00	0.00	0.00
Baga	1463.20	146.32±14.54	1463.20	146.32±14.54	0.00	0.00	0.00	0.00	0.00	0.00
Harm	722.72	72.27±10.48	722.72	72.27±10.48	0.00	0.00	0.00	0.00	0.00	0.00
Nanc	876.35	87.63±11.70	876.35	87.63±11.70	0.00	0.00	0.00	0.00	0.00	0.00
Naja	606.80	60.68±9.78	606.80	60.68±9.78	0.00	0.00	0.00	0.00	0.00	0.00
Bagh	2845.88	284.59±33.55	2599.33	259.93±25.21	1413.30	282.66±62.77	67.00	13.40±1.03	19823.00	3964.60±1069.67
Kawa	1758.91	175.89±15.95	1743.51	174.35±15.49	92.40	92.40±0.00	15.00	15.00±0.00	1386.00	1386.00±0.00
Band	4411.19	441.12±29.94	3355.78	335.58±24.25	3189.68	354.41±38.72	111.67	12.41±0.58	40182.73	4464.75±575.07
Deop	3389.28	338.93±32.19	2854.67	285.47±19.78	2205.20	367.53±56.11	70.00	11.67±0.83	25308.25	4218.04±652.63
Nahr	3765.60	376.56±32.01	3331.93	333.19±26.90	2141.70	356.95±57.65	66.00	11.00±0.82	23934.50	3989.08±751.81
Bura1	2211.04	221.10±21.12	2135.97	213.60±20.43	381.60	190.80±122.00	30.00	15.00±0.00	5724.00	2862.00±1830.00
Kanc	1257.06	125.71±15.05	1257.06	125.71±15.05	0.00	0.00	0.00	0.00	0.00	0.00
Pacg	483.82	48.38±8.96	483.82	48.38±8.96	0.00	0.00	0.00	0.00	0.00	0.00
Katb	1332.24	133.22±15.66	1332.24	133.22±15.66	0.00	0.00	0.00	0.00	0.00	0.00
Total	62245.57	2007.92±279.79	55644.32	1794.98±220.25	23882.50	770.40±223.26	862.67	27.83±7.56	281983.03	9096.23±2610.08

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, kg- kilograms, INR- Indian Rupee and SE- standard error.

Appendix Table 6.53. List of extracted thatch plant species by villages selected for the entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Scientific name	Family	Use	Total	%
<i>Arundo donax</i> L.	Poaceae	Thatching	166	12.08
<i>Chrysopogon zizanioides</i> (L.) Roberty	Poaceae	Thatching	504	36.68
<i>Imperata cylindrica</i> (L.) Raeusch.	Poaceae	Thatching	622	45.27
<i>Phragmites karka</i> (Retz.) Trin. ex Steud.	Poaceae	Thatching	151	10.99
<i>Sachharum</i> spp.	Poaceae	Thatching	1188	86.46
<i>Themeda</i> spp.	Poaceae	Thatching	367	26.71

Appendix Table 6.54. Mann-Whitney significance test comparing quantities (between inside & outside, inside & entry point and outside & entry point) of resource extraction by villages around Kaziranga Tiger Reserve, Assam, India.

Parameters	Between inside and outside Reserve		Between inside Reserve and entry point		Between outside Reserve and entry point	
	U	P	U	P	U	P
Thatch extraction quantity Reserve (day/kg)	470.50	0.89	370.00	0.12	405.00	0.29
Thatch extraction Reserve self-consumption quantity (day/kg)	446.00	0.63	281.00	0.01*	302.00	0.01*
Thatch outside Reserve sale quantity (day/kg)	366.00	0.10	468.00	0.86	430.00	0.47
Thatch extraction quantity Reserve (kg/annum)	164.50	0.00*	339.00	0.05*	121.00	0.00*
Thatch extraction Reserve self-consumption quantity (kg/annum)	135.00	0.00*	370.00	0.12	111.00	0.00*
Thatch extraction quantity Reserve sale (kg/annum)	254.00	0.00*	449.00	0.65	296.00	0.01*
Fodder extraction quantity Reserve (day/kg)	167.50	0.00*	65.00	0.00*	206.00	0.00*
Fodder extraction Reserve self-consumption quantity (day/kg)	65.00	0.00*	5.00	0.00*	83.00	0.00*
Fodder outside Reserve sale quantity (day/kg)	377.00	0.06	231.00	0.00*	374.00	0.11
Fodder extraction quantity Reserve (kg/annum)	182.00	0.00*	217.00	0.00*	183.00	0.00*
Fodder extraction Reserve self-consumption quantity (kg/annum)	143.00	0.00*	191.00	0.00*	196.00	0.00*
Fodder extraction quantity Reserve sale (kg/annum)	398.50	0.14	307.50	0.01*	421.00	0.37
Fuelwood extraction quantity Reserve (day/kg)	189.50	0.00*	86.00	0.00*	272.00	0.00*
Fuelwood extraction Reserve self-consumption quantity (day/kg)	138.00	0.00*	15.00	0.00*	54.00	0.00*
Fuelwood outside Reserve sale quantity (day/kg)	173.50	0.00*	256.50	0.00*	368.50	0.11
Fuelwood extraction quantity Reserve (kg/annum)	94.00	0.00*	194.00	0.00*	9.00	0.00*
Fuelwood extraction Reserve self-consumption quantity (kg/annum)	87.00	0.00*	236.00	0.00*	10.00	0.00*
Fuelwood extraction quantity Reserve sale (kg/annum)	124.50	0.00*	327.50	0.03*	44.50	0.00*
Fish extraction quantity Reserve (day/kg)	372.00	0.13	265.00	0.00*	174.50	0.00*
Fish extraction Reserve self-consumption quantity (day/kg)	445.50	0.62	239.50	0.00*	142.00	0.00*
Fish outside Reserve sale quantity (day/kg)	464.00	0.81	114.50	0.00*	66.50	0.00*
Fish extraction quantity Reserve (kg/annum)	473.00	0.92	444.00	0.61	429.00	0.47
Fish extraction Reserve self-consumption quantity (kg/annum)	453.00	0.70	374.00	0.13	350.00	0.07
Fish extraction quantity Reserve sale (kg/annum)	404.50	0.27	373.50	0.13	412.50	0.34

Kg-kilogram, INR-Indian stand rupees, U-Mann-Whitney and *indicates significant result at $P>0.05$.

Appendix Table 6.55. Mann-Whitney significance test comparing quantities (between socio-economic and entry-point surveys) of resource extraction by villages around Kaziranga Tiger Reserve, Assam, India.

Parameters	Between socio-economic survey and entry-point survey	
	U	P
Thatch extraction quantity Reserve (kg/annum)	123.00	0.00*
Thatch extraction Reserve self-consumption quantity (kg/annum)	119.00	0.00*
Thatch extraction quantity Reserve sale (kg/annum)	287.00	0.01*
Annual income from thatch sale (INR/annum)	278.00	0.00*
Fodder extraction quantity Reserve (kg/annum)	166.00	0.00*
Fodder extraction Reserve self-consumption quantity (kg/annum)	182.00	0.00*
Fodder extraction quantity Reserve sale (kg/annum)	454.00	0.70
Annual income from fodder sale (INR/annum)	450.00	0.65
Fuelwood extraction quantity Reserve (kg/annum)	3.00	0.00*
Fuelwood extraction Reserve self-consumption quantity (kg/annum)	1.00	0.00*
Fuelwood extraction quantity Reserve sale (kg/annum)	29.50	0.00*
Annual income from fuelwood sale (INR/annum)	31.50	0.00*
Fish extraction quantity Reserve (kg/annum)	232.00	0.00*
Fish extraction Reserve self-consumption quantity (kg/annum)	132.00	0.00*
Fish extraction quantity Reserve sale (kg/annum)	353.00	0.07
Annual income from fish sale (INR/annum)	382.00	0.17

Kg-kilogram, INR-Indian stand rupees, U-Mann-Whitney and *indicates significant result at $P>0.05$.

Appendix Table 6.56. Fodder material purchase total mean annual quantity and expenditure of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fodder purchase							
	Purchase (Yes)		Annual qty (in kg)		INR/kg		Total annual expenditure (in INR)	
	Total	%	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	1	11.11	500.00	500.00±0.00	15.00	15.00±0.00	7500.00	7500.00±0.00
Belo	1	3.85	600.00	600.00±0.00	15.00	15.00±0.00	9000.00	9000.00±0.00
Tamp	1	5.00	350.00	350.00±0.00	10.00	10.00±0.00	3500.00	3500.00±0.00
Japp	2	15.38	900.00	450.00±50.00	25.00	12.50±2.50	11000.00	5500.00±500.00
Meth	5	6.58	2900.00	580.00±58.31	64.00	12.80±0.97	37700.00	7540.00±1131.19
Borj	1	2.04	800.00	800.00±0.00	10.00	10.00±0.00	8000.00	8000.00±0.00
Hali	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Silj	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sild1	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sild2	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gosh	2	4.55	1700.00	850.00±50.00	27.00	13.50±1.50	23100.00	11550.00±1950.00

Village	Fodder purchase							
	Purchase (Yes)		Annual qty (in kg)		INR/kg		Total annual expenditure (in INR)	
	Total	%	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Domj1	1	7.14	1000.00	1000.00±0.00	10.00	10.00±0.00	10000.00	10000.00±0.00
Domj2	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kazi	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mohp	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Koho2	1	4.00	700.00	700.00±0.00	15.00	15.00±0.00	10500.00	10500.00±0.00
Panb	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hati	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Baga	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Harm	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nanc	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Naja	1	3.03	500.00	500.00±0.00	12.00	12.00±0.00	6000.00	6000.00±0.00
Bagh	1	4.17	400.00	400.00±0.00	15.00	15.00±0.00	6000.00	6000.00±0.00
Kawa	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Band	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Deop	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nahr	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bura1	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kanc	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pacg	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Katb	3	21.43	1600.00	533.33±33.33	35.00	11.67±1.67	19000.00	6333.33±1333.33
Total	20	3.02	11950.00	597.50±39.81	253.00	12.65±0.51	151300.00	7565.00±579.08

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, qty- quantity, kg- kilograms, INR- Indian Rupee, SE- standard error and %- in percentages.

Appendix Table 6.57. Fodder material extraction instrument and location of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fodder extraction											
	Extraction (Yes)		Instrument				Location (area)					
			Hand sickle		Bolo knife		Inside Reserve		Outside Reserve		Both	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	2	22.22	2	100	0	0.00	0	0.00	2	100	0	0.00
Belo	12	46.15	9	75.00	3	25.00	0	0.00	12	100	0	0.00
Tamp	12	60.00	8	66.67	4	33.33	3	25.00	12	100	3	25.00
Japp	5	38.46	4	80.00	1	20.00	0	0.00	5	100	0	0.00
Meth	23	30.26	16	69.57	7	30.43	0	0.00	23	100	0	0.00

Village	Fodder extraction											
	Extraction (Yes)		Instrument				Location (area)					
			Hand sickle		Bolo knife		Inside Reserve		Outside Reserve		Both	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Borj	12	24.49	8	66.67	4	33.33	0	0.00	12	100	0	0.00
Hali	3	21.43	2	66.67	1	33.33	0	0.00	3	100	0	0.00
Silj	8	28.57	6	75.00	2	25.00	1	12.50	7	87.50	0	0.00
Sild1	3	14.29	2	66.67	1	33.33	2	66.67	2	66.67	1	33.33
Sild2	1	5.88	1	100	0	0.00	0	0.00	1	100	0	0.00
Gosh	8	18.18	6	75.00	2	25.00	0	0.00	8	100	0	0.00
Domj1	3	21.43	3	100	0	0.00	0	0.00	3	100	0	0.00
Domj2	4	66.67	3	75.00	1	25.00	0	0.00	4	100	0	0.00
Kazi	1	14.29	1	100	0	0.00	0	0.00	1	100	0	0.00
Mohp	6	28.57	4	66.67	2	33.33	4	66.67	4	66.67	2	33.33
Koho2	7	28.00	5	71.43	2	28.57	2	28.57	5	71.43	0	0.00
Panb	1	14.29	1	100	0	0.00	0	0.00	1	100	0	0.00
Hati	5	27.78	4	80.00	1	20.00	0	0.00	5	100	0	0.00
Baga	7	13.73	4	57.14	3	42.86	0	0.00	7	100	0	0.00
Harm	6	18.75	4	66.67	2	33.33	0	0.00	6	100	0	0.00
Nanc	1	11.11	1	100	0	0.00	0	0.00	1	100	0	0.00
Naja	4	12.12	3	75.00	1	25.00	0	0.00	4	100	0	0.00
Bagh	11	45.83	7	63.64	4	36.36	0	0.00	11	100	0	0.00
Kawa	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Band	8	80.00	6	75.00	2	25.00	0	0.00	8	100	0	0.00
Deop	10	38.46	6	60.00	4	40.00	0	0.00	10	100	0	0.00
Nahr	3	20.00	2	66.67	1	33.33	2	66.67	2	66.67	1	33.33
Bura1	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Kanc	4	40.00	2	50.00	2	50.00	0	0.00	4	100	0	0.00
Pacg	4	21.05	3	75.00	1	25.00	3	75.00	1	25.00	0	0.00
Katb	4	28.57	2	50.00	2	50.00	0	0.00	4	100	0	0.00
Total	178	26.85	125	70.22	53	29.78	17	9.55	168	94.38	7	3.93

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.58. Fodder material extraction location and season of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fodder extraction																	
	Location outside Reserve										Season							
	Karbi Anglong		National highway		Kaziranga fringe		Home/Field		All areas		Summer		Monsoon		Winter		Throughout the year	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	0	0.00	2	100	1	50.00	2	100	0	0.00	1	50.00	1	50.00	2	100	1	50.00
Belo	0	0.00	5	41.67	4	33.33	12	100	0	0.00	1	8.33	10	83.33	7	58.33	1	8.33
Tamp	0	0.00	6	50.00	4	33.33	12	100	0	0.00	3	25.00	7	58.33	12	100	3	25.00
Japp	0	0.00	2	40.00	1	20.00	4	80.00	0	0.00	1	20.00	3	60.00	5	100	1	20.00
Meth	17	73.91	9	39.13	6	26.09	15	65.22	2	8.70	4	17.39	9	39.13	20	86.96	2	8.70
Borj	6	50.00	4	33.33	4	33.33	8	66.67	0	0.00	2	16.67	2	16.67	12	100	2	16.67
Hali	3	100	0	0.00	0	0.00	1	33.33	0	0.00	1	33.33	0	0.00	3	100	0	0.00
Silj	4	57.14	4	57.14	2	28.57	5	71.43	1	14.29	0	0.00	1	12.50	7	87.50	0	0.00
Sild1	1	50.00	1	50.00	0	0.00	1	50.00	0	0.00	0	0.00	2	66.67	2	66.67	0	0.00
Sild2	1	100	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	100	0	0.00	0	0.00
Gosh	6	75.00	4	50.00	2	25.00	4	50.00	1	12.50	3	37.50	2	25.00	8	100	2	25.00
Domj1	2	66.67	2	66.67	2	66.67	3	100	1	33.33	0	0.00	0	0.00	3	100	0	0.00
Domj2	2	50.00	3	75.00	1	25.00	1	25.00	0	0.00	1	25.00	1	25.00	4	100	1	25.00
Kazi	1	100	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	100	0	0.00
Mohp	3	75.00	2	50.00	1	25.00	3	75.00	0	0.00	2	33.33	3	50.00	5	83.33	1	16.67
Koho2	3	60.00	2	40.00	1	20.00	4	80.00	1	20.00	1	14.29	2	28.57	5	71.43	0	0.00
Panb	1	100	0	0.00	1	100	1	100	0	0.00	0	0.00	0	0.00	1	100	0	0.00
Hati	3	60.00	3	60.00	1	20.00	4	80.00	0	0.00	2	40.00	1	20.00	4	80.00	1	20.00
Baga	4	57.14	2	28.57	2	28.57	5	71.43	0	0.00	2	28.57	5	71.43	5	71.43	2	28.57
Harm	3	50.00	3	50.00	2	33.33	3	50.00	0	0.00	1	16.67	4	66.67	4	66.67	0	0.00
Nanc	1	100	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	1	100	0	0.00	0	0.00
Naja	3	75.00	1	25.00	1	25.00	2	50.00	0	0.00	0	0.00	4	100	0	0.00	0	0.00
Bagh	6	54.55	3	27.27	2	18.18	7	63.64	0	0.00	5	45.45	5	45.45	5	45.45	2	18.18
Kawa	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Band	4	50.00	1	12.50	2	25.00	5	62.50	0	0.00	1	12.50	7	87.50	3	37.50	1	12.50
Deop	5	50.00	6	60.00	2	20.00	6	60.00	0	0.00	1	10.00	0	0.00	10	100	0	0.00
Nahr	1	50.00	0	0.00	1	50.00	1	50.00	0	0.00	1	33.33	3	100	0	0.00	0	0.00
Bura1	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Kanc	2	50.00	2	50.00	1	25.00	2	50.00	0	0.00	2	50.00	1	25.00	4	100	1	25.00
Pacg	0	0.00	0	0.00	0	0.00	1	100	0	0.00	2	50.00	3	75.00	1	25.00	0	0.00
Katb	0	0.00	0	0.00	0	0.00	4	100	0	0.00	3	75.00	1	25.00	2	50.00	0	0.00
Total	82	48.81	67	39.88	44	26.19	116	69.05	6	3.57	40	22.47	79	44.38	135	75.84	21	11.80

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.59. Daily and mean annual quantities of fodder material extraction from inside the Reserve by villages selected for a socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fodder extraction inside Reserve											
	Extraction qty (day/kg)		Self-cons qty (day/kg)		Sale qty (day/kg)		Annual extraction qty (in kg)		Annual self-cons qty (in kg)		Annual sale qty (in kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Belo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tamp	24.00	8.00±3.51	14.00	4.67±0.33	10.00	10.00±0.00	800.00	266.67±109.14	480.00	160.00±23.09	320.00	320.00±0.00
Japp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Meth	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Borj	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hali	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Silj	10.00	10.00±0.00	2.00	2.00±0.00	8.00	8.00±0.00	300.00	300.00±0.00	60.00	60.00±0.00	240.00	240.00±0.00
Sild1	16.00	8.00±4.00	6.00	3.00±1.00	10.00	10.00±0.00	760.00	380.00±20.00	460.00	230.00±170.00	300.00	300.00±0.00
Sild2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gosh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Domj1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Domj2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kazi	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mohp	55.00	13.75±2.39	30.00	7.50±1.50	25.00	6.25±1.31	3750.00	937.50±491.33	1920.00	480.00±241.25	1830.00	457.50±253.19
Koho2	10.00	5.00±0.00	10.00	5.00±0.00	0.00	0.00	1050.00	525.00±75.00	1050.00	525.00±75.00	0.00	0.00
Panb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hati	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Baga	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Harm	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nanc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Naja	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bagh	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kawa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Band	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Deop	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nahr	14.00	7.00±3.00	9.00	4.50±0.50	5.00	5.00±0.00	380.00	190.00±10.00	280.00	140.00±40.00	100.00	100.00±0.00
Bura1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kanc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pacg	35.00	11.67±1.67	12.00	4.00±1.00	23.00	7.67±1.45	3300.00	1100.00±800.00	1110.00	370.00±266.27	2190.00	730.00±535.63
Katb	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	164.00	9.65±1.15	83.00	4.88±0.55	81.00	7.36±0.73	10340.00	608.24±180.81	5360.00	315.29±77.13	4980.00	452.73±163.26

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari,

Village	Fodder extraction inside Reserve											
	Extraction qty (day/kg)		Self-cons qty (day/kg)		Sale qty (day/kg)		Annual extraction qty (in kg)		Annual self-cons qty (in kg)		Annual sale qty (in kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE

Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, cons-consumption, qty- quantity, kg- kilograms, INR- Indian Rupee and SE- standard error.

Appendix Table 6.60. Daily and mean annual quantities of fodder material extraction from outside the Reserve by villages selected for a socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fodder extraction outside Reserve											
	Extraction qty (day/kg)		Self-cons qty (day/kg)		Sale qty (day/kg)		Annual extraction qty (in kg)		Annual self-cons qty (in kg)		Annual sale qty (in kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	10.00	5.00±0.00	10.00	5.00±0.00	0.00	0.00	405.00	202.50±22.50	405.00	202.50±22.50	0.00	0.00
Belo	88.00	7.33±0.90	78.00	6.50±0.58	10.00	10.00±0.00	4916.00	409.67±100.82	4016.00	334.67±54.47	900.00	900.00±0.00
Tamp	96.00	8.00±0.60	96.00	8.00±0.60	0.00	0.00	8080.00	673.33±134.54	8080.00	673.33±134.54	0.00	0.00
Japp	48.00	9.60±1.63	38.00	7.60±1.12	10.00	10.00±0.00	3000.00	600.00±114.02	2400.00	480.00±96.95	600.00	600.00±0.00
Meth	139.00	6.04±0.45	139.00	6.04±0.45	0.00	0.00	5259.00	228.65±27.75	5259.00	228.65±27.75	0.00	0.00
Borj	68.00	5.67±0.63	68.00	5.67±0.63	0.00	0.00	1938.00	161.50±35.37	1938.00	161.50±35.37	0.00	0.00
Hali	15.00	5.00±0.58	15.00	5.00±0.58	0.00	0.00	426.00	142.00±24.58	426.00	142.00±24.58	0.00	0.00
Silj	100.00	14.29±3.17	60.00	8.57±0.92	40.00	13.33±3.33	5600.00	800.00±269.26	3500.00	500.00±130.48	2100.00	700.00±404.15
Sild1	13.00	6.50±1.50	13.00	6.50±1.50	0.00	0.00	700.00	350.00±250.00	700.00	350.00±250.00	0.00	0.00
Sild2	5.00	5.00±0.00	5.00	5.00±0.00	0.00	0.00	180.00	180.00±0.00	180.00	180.00±0.00	0.00	0.00
Gosh	44.00	5.50±0.57	44.00	5.50±0.57	0.00	0.00	1411.00	176.38±29.56	1411.00	176.38±29.56	0.00	0.00
Domj1	33.00	11.00±2.08	23.00	7.67±1.45	10.00	10.00±0.00	2040.00	680.00±340.44	1140.00	380.00±70	900.00	900.00±0.00
Domj2	45.00	11.25±1.25	35.00	8.75±1.25	10.00	10.00±0.00	1675.00	418.75±88.61	1225.00	306.25±35.9	450.00	450.00±0.00
Kazi	15.00	15.00±0.00	5.00	5.00±0.00	10.00	10.00±0.00	180.00	180.00±0.00	60.00	60.00±0.00	120.00	120.00±0.00
Mohp	85.00	21.25±4.27	40.00	10.00±0.00	45.00	15.00±2.89	7650.00	1912.50±715.13	3200.00	800.00±176.78	4450.00	1483.33±552.52
Koho2	44.00	8.80±0.80	44.00	8.80±0.80	0.00	0.00	2910.00	582.00±80.27	2910.00	582.00±80.27	0.00	0.00
Panb	5.00	5.00±0.00	5.00	5.00±0.00	0.00	0.00	70.00	70.00±0.00	70.00	70.00±0.00	0.00	0.00
Hati	32.00	6.40±0.93	32.00	6.40±0.93	0.00	0.00	1030.00	206.00±64.23	1030.00	206.00±64.23	0.00	0.00
Baga	47.00	6.71±1.23	47.00	6.71±1.23	0.00	0.00	2365.00	337.86±104.45	2365.00	337.86±104.45	0.00	0.00
Harm	46.00	7.67±0.84	46.00	7.67±0.84	0.00	0.00	2420.00	403.33±110.44	2420.00	403.33±110.44	0.00	0.00
Nanc	5.00	5.00±0.00	5.00	5.00±0.00	0.00	0.00	80.00	80.00±0.00	80.00	80.00±0.00	0.00	0.00
Naja	26.00	6.50±1.55	26.00	6.50±1.55	0.00	0.00	312.00	78.00±19.77	312.00	78.00±19.77	0.00	0.00
Bagh	80.00	7.27±1.56	70.00	6.36±0.97	10.00	10.00±0.00	1854.00	168.55±33.26	1654.00	150.36±24.40	200.00	200.00±0.00
Kawa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Band	100.00	12.50±2.50	60.00	7.50±0.94	40.00	13.33±1.67	615.00	76.88±13.33	460.00	57.50±15.98	155.00	51.67±13.02
Deop	109.00	10.90±2.07	69.00	6.90±0.74	40.00	13.33±1.67	2520.00	252.00±31.16	1840.00	184.00±25.79	680.00	226.67±37.12
Nahr	9.00	4.50±0.50	9.00	4.50±0.50	0.00	0.00	420.00	210.00±110.00	420.00	210.00±110.00	0.00	0.00
Bura1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Village	Fodder extraction outside Reserve											
	Extraction qty (day/kg)		Self-cons qty (day/kg)		Sale qty (day/kg)		Annual extraction qty (in kg)		Annual self-cons qty (in kg)		Annual sale qty (in kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Kanc	20.00	5.00±0.00	20.00	5.00±0.00	0.00	0.00	900.00	225.00±0.00	900.00	225.00±0.00	0.00	0.00
Pacg	5.00	5.00±0.00	5.00	5.00±0.00	0.00	0.00	100.00	100.00±0.00	100.00	100.00±0.00	0.00	0.00
Katb	38.00	9.50±2.10	28.00	7.00±1.22	10.00	10.00±0.00	1240.00	310.00±85.73	940.00	235.00±77.30	300.00	300.00±0.00
Total	1370.00	8.15±0.38	1135.00	6.76±0.19	235.00	12.37±0.80	60296.00	358.90±34.03	49441.00	294.29±20.38	10855.00	571.32±144.89

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, cons-consumption, qty- quantity, kg- kilograms, INR- Indian Rupee and SE- standard error.

Appendix Table 6.61. Total mean annual quantities of fodder material extraction from both inside and outside the Reserve by villages selected for a socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fodder extraction (both inside and outside Reserve)									
	Total annual extraction qty (in kg)		Total annual self-cons qty (in kg)		Total annual sale qty (in kg)		Sale @INR/kg		Total annual income generated (in INR)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	405.00	202.50±22.50	405.00	202.50±22.50	0.00	0.00	0.00	0.00	0.00	0.00
Belo	4916.00	409.67±100.82	4016.00	334.67±54.47	900.00	900.00±0.00	15.00	15.00±0.00	13500.00	13500.00±0.00
Tamp	8880.00	740.00±172.42	8560.00	713.33±151.57	320.00	320.00±0.00	15.00	15.00±0.00	4800.00	4800.00±0.00
Japp	3000.00	600.00±114.02	2400.00	480.00±96.95	600.00	600.00±0.00	10.00	10.00±0.00	6000.00	6000.00±0.00
Meth	5259.00	228.65±27.75	5259.00	228.65±27.75	0.00	0.00	0.00	0.00	0.00	0.00
Borj	1938.00	161.50±35.37	1938.00	161.50±35.37	0.00	0.00	0.00	0.00	0.00	0.00
Hali	426.00	142.00±24.58	426.00	142.00±24.58	0.00	0.00	0.00	0.00	0.00	0.00
Silj	5900.00	737.50±241.42	3560.00	445.00±125.67	2340.00	585.00±308.04	45.00	11.25±1.25	24600.00	6150.00±2981.47
Sild1	1460.00	486.67±252.01	1160.00	386.67±161.80	300.00	300.00±0.00	15.00	15.00±0.00	4500.00	4500.00±0.00
Sild2	180.00	180.00±0.00	180.00	180.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gosh	1411.00	176.38±29.56	1411.00	176.38±29.56	0.00	0.00	0.00	0.00	0.00	0.00
Domj1	2040.00	680.00±340.44	1140.00	380.00±70	900.00	900.00±0.00	10.00	10.00±0.00	9000.00	9000.00±0.00
Domj2	1675.00	418.75±88.61	1225.00	306.25±35.90	450.00	450.00±0.00	15.00	15.00±0.00	6750.00	6750.00±0.00
Kazi	180.00	180.00±0.00	60.00	60.00±0.00	120.00	120.00±0.00	10.00	10.00±0.00	1200.00	1200.00±0.00
Mohp	11400.00	1900.00±519.13	5120.00	853.33±177.19	6280.00	1046.67±359.21	72.00	12.00±1.00	78900.00	13150.00±5443.39
Koho2	3960.00	565.71±58.71	3960.00	565.71±58.71	0.00	0.00	0.00	0.00	0.00	0.00
Panb	70.00	70.00±0.00	70.00	70.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hati	1030.00	206.00±64.23	1030.00	206.00±64.23	0.00	0.00	0.00	0.00	0.00	0.00
Baga	2365.00	337.86±104.45	2365.00	337.86±104.45	0.00	0.00	0.00	0.00	0.00	0.00
Harm	2420.00	403.33±110.44	2420.00	403.33±110.44	0.00	0.00	0.00	0.00	0.00	0.00
Nanc	80.00	80.00±0.00	80.00	80.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00

Village	Fodder extraction (both inside and outside Reserve)									
	Total annual extraction qty (in kg)		Total annual self-cons qty (in kg)		Total annual sale qty (in kg)		Sale @INR/kg		Total annual income generated (in INR)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Naja	312.00	78.00±19.77	312.00	78.00±19.77	0.00	0.00	0.00	0.00	0.00	0.00
Bagh	1854.00	168.55±33.26	1654.00	150.36±24.40	200.00	200.00±0.00	15.00	15.00±0.00	3000.00	3000.00±0.00
Kawa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Band	615.00	76.88±13.33	460.00	57.50±15.98	155.00	51.67±13.02	32.00	10.67±0.67	1700.00	566.67±176.38
Deop	2520.00	252.00±31.16	1840.00	184.00±25.79	680.00	226.67±37.12	35.00	11.67±1.67	7800.00	2600.00±400.00
Nahr	800.00	266.67±128.75	700.00	233.33±96.15	100.00	100.00±0.00	15.00	15.00±0.00	1500.00	1500.00±0.00
Bura1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kanc	900.00	225.00±0.00	900.00	225.00±0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pacg	3400.00	850.00±618.47	1210.00	302.50±200.02	2190.00	730.00±535.63	37.00	12.33±1.45	26250.00	8750.00±6425.15
Katb	1240.00	310.00±85.73	940.00	235.00±77.30	300.00	300.00±0.00	15.00	15.00±0.00	4500.00	4500.00±0.00
Total	70636.00	396.83±38.54	54801.00	307.87±21.65	15835.00	546.03±112.77	356.00	12.28±0.45	194000.00	6689.66±1491.95

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, cons-consumption, qty- quantity, kg- kilograms, INR- Indian Rupee and SE- standard error.

Appendix Table 6.62. List of extracted fodder plant species by villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Scientific name	Family	Use	Total	%
<i>Andropogon</i> spp.	Poaceae	Fodder	41	23.03
<i>Aristida</i> spp.	Poaceae	Fodder	60	33.71
<i>Arundinella</i> spp.	Poaceae	Fodder	74	41.57
<i>Axonopus compressus</i> (Sw.) P.Beauv.	Poaceae	Fodder	115	64.61
<i>Bambusa</i> spp.	Poaceae	Fodder	129	72.47
<i>Cenchrus ciliaris</i> L.	Poaceae	Fodder	85	47.75
<i>Chrysopogon aciculatus</i> (Retz.) Trin.	Poaceae	Fodder	81	45.51
<i>Chrysopogon gryllus</i> (L.) Trin.	Poaceae	Fodder	80	44.94
<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Fodder	128	71.91
<i>Cyperus</i> spp.	Cyperaceae	Fodder	70	39.33
<i>Dichanthium annulatum</i> (Forssk.) Stapf	Poaceae	Fodder	87	48.88
<i>Digitaria</i> spp.	Poaceae	Fodder	83	46.63
<i>Echinochloa</i> spp.	Poaceae	Fodder	82	46.07
<i>Hemarthria compressa</i> (L.f.) R.Br.	Poaceae	Fodder	139	78.09
<i>Heteropogon contortus</i> (L.) P.Beauv. ex Roem. & Schult.	Poaceae	Fodder	89	50.00
<i>Hymenachne</i> spp.	Poaceae	Fodder	134	75.28
<i>Imperata cylindrica</i> (L.) Raeusch.	Poaceae	Fodder	109	61.24

Scientific name	Family	Use	Total	%
<i>Leersia hexandra</i> Sw.	Poaceae	Fodder	85	47.75
<i>Paddy husk (Oryza officinalis</i> Wall. ex Watt)	Poaceae	Fodder	92	51.69
<i>Panicum</i> spp.	Poaceae	Fodder	68	38.20
<i>Paspalidium</i> spp.	Poaceae	Fodder	68	38.20
<i>Paspalum</i> spp.	Poaceae	Fodder	74	41.57
<i>Saccharum</i> spp.	Poaceae	Fodder	76	42.70
<i>Setaria</i> spp.	Poaceae	Fodder	67	37.64
<i>Sorghum nitidum</i> (Vahl) Pers.	Poaceae	Fodder	57	32.02
<i>Sporobolus</i> spp.	Poaceae	Fodder	41	23.03
<i>Themeda</i> spp.	Poaceae	Fodder	39	21.91
<i>Triticum aestivum</i> L.	Poaceae	Fodder	36	20.22
Tree leaves		Fodder	80	44.94

Appendix Table 6.63. Details of respondents involved in fodder material extraction (travelling distance, gender, age and qualification) in the villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Total visitors	Distance home to extraction location (in km)		Distance travelled inside Reserve for extraction (in km)		Respondent details													
						Gender				Age group						Qualification			
						Female		Male		10-30		31-60		≤61		Illiterate		Literate	
		Total	Mean±SE	Total	Mean±SE	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	38	3.25	0.33±0.02	1.62	0.16±0.01	12	31.58	26	68.42	15	39.47	20	52.63	3	7.89	24	63.16	14	36.84
Belo	44	14.62	1.46±0.06	3.84	0.38±0.03	14	31.82	30	68.18	15	34.09	24	54.55	5	11.36	30	68.18	14	31.82
Tamp	35	3.56	0.36±0.02	3.26	0.33±0.02	7	20.00	28	80.00	12	34.29	21	60.00	2	5.71	22	62.86	13	37.14
Japp	40	14.53	1.45±0.03	4.50	0.45±0.03	12	30.00	28	70.00	17	42.50	21	52.50	2	5.00	29	72.50	11	27.50
Meth	19	13.85	1.54±0.05	1.96	0.22±0.06	4	21.05	15	78.95	4	21.05	13	68.42	2	10.53	9	47.37	10	52.63
Borj	20	14.83	1.65±0.09	1.24	0.14±0.05	3	15.00	17	85.00	7	35.00	11	55.00	2	10.00	10	50.00	10	50.00
Hali	28	14.03	1.40±0.03	1.19	0.12±0.02	5	17.86	23	82.14	11	39.29	14	50.00	3	10.71	22	78.57	6	21.43
Silj	34	9.67	0.97±0.07	1.29	0.13±0.03	6	17.65	28	82.35	16	47.06	15	44.12	3	8.82	24	70.59	10	29.41
Sild1	28	5.84	0.58±0.06	0.64	0.06±0.01	6	21.43	22	78.57	10	35.71	18	64.29	0	0.00	18	64.29	10	35.71
Sild2	22	13.50	1.50±0.04	1.31	0.15±0.02	5	22.73	17	77.27	7	31.82	14	63.64	1	4.55	18	81.82	4	18.18
Gosh	43	3.04	0.30±0.02	0.65	0.06±0.00	12	27.91	31	72.09	16	37.21	25	58.14	2	4.65	29	67.44	14	32.56
Domj1	20	6.88	0.76±0.03	1.03	0.11±0.04	5	25.00	15	75.00	6	30.00	12	60.00	2	10.00	11	55.00	9	45.00
Domj2	22	5.46	0.61±0.03	0.97	0.11±0.05	3	13.64	19	86.36	8	36.36	13	59.09	1	4.55	17	77.27	5	22.73
Kazi	27	14.82	1.48±0.08	1.02	0.10±0.01	7	25.93	20	74.07	10	37.04	17	62.96	0	0.00	23	85.19	4	14.81
Mohp	41	8.05	0.81±0.02	2.38	0.24±0.02	7	17.07	34	82.93	13	31.71	26	63.41	2	4.88	30	73.17	11	26.83
Koho2	24	15.92	1.77±0.02	5.23	0.58±0.03	8	33.33	16	66.67	7	29.17	14	58.33	3	12.50	17	70.83	7	29.17
Panb	19	12.18	1.35±0.05	2.02	0.22±0.02	3	15.79	16	84.21	9	47.37	9	47.37	1	5.26	11	57.89	8	42.11
Hati	19	11.23	1.25±0.08	2.45	0.27±0.03	1	5.26	18	94.74	8	42.11	11	57.89	0	0.00	13	68.42	6	31.58
Baga	26	7.77	0.78±0.09	3.79	0.38±0.03	8	30.77	18	69.23	11	42.31	13	50.00	2	7.69	18	69.23	8	30.77
Harm	25	5.76	0.58±0.03	0.56	0.06±0.00	7	28.00	18	72.00	17	68.00	8	32.00	0	0.00	17	68.00	8	32.00

Village	Total visitors	Distance home to extraction location (in km)		Distance travelled inside Reserve for extraction (in km)		Respondent details													
						Gender				Age group						Qualification			
						Female		Male		10-30		31-60		≤61		Illiterate		Literate	
		Total	Mean±SE	Total	Mean±SE	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Nanc	23	4.72	0.52±0.02	0.68	0.08±0.02	4	17.39	19	82.61	10	43.48	12	52.17	1	4.35	15	65.22	8	34.78
Naja	21	5.00	0.56±0.03	0.50	0.06±0.00	3	14.29	18	85.71	10	47.62	10	47.62	1	4.76	15	71.43	6	28.57
Bagh	31	7.77	0.78±0.02	1.44	0.14±0.02	8	25.81	23	74.19	13	41.94	16	51.61	2	6.45	25	80.65	6	19.35
Kawa	31	7.79	0.78±0.02	1.50	0.15±0.01	2	6.45	29	93.55	12	38.71	18	58.06	1	3.23	21	67.74	10	32.26
Band	42	1.25	0.13±0.07	0.41	0.04±0.02	8	19.05	34	80.95	14	33.33	27	64.29	1	2.38	28	66.67	14	33.33
Deop	29	5.50	0.55±0.06	0.70	0.07±0.01	6	20.69	23	79.31	12	41.38	15	51.72	2	6.90	22	75.86	7	24.14
Nahr	28	5.24	0.52±0.03	0.41	0.04±0.00	6	21.43	22	78.57	14	50.00	14	50.00	0	0.00	21	75.00	7	25.00
Bura1	27	5.04	0.56±0.02	0.35	0.04±0.00	6	22.22	21	77.78	8	29.63	15	55.56	4	14.81	22	81.48	5	18.52
Kanc	28	5.69	0.57±0.03	0.34	0.03±0.00	8	28.57	20	71.43	11	39.29	17	60.71	0	0.00	22	78.57	6	21.43
Pacg	19	6.06	0.67±0.03	1.75	0.19±0.02	5	26.32	14	73.68	5	26.32	13	68.42	1	5.26	16	84.21	3	15.79
Katb	28	6.04	0.67±0.02	1.81	0.20±0.01	6	21.43	22	78.57	14	50.00	13	46.43	1	3.57	21	75.00	7	25.00
Total	881	258.89	8.35±0.77	50.83	1.64±0.23	197	22.36	684	77.64	342	38.82	489	55.51	50	5.68	620	70.37	261	29.63

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, km- kilometres, SE- standard error, ≤- more than equals to and %- in percentages.

Appendix Table 6.64. Details of respondents involved in fodder material extraction (religion and caste) in the villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Respondent details																	
	Religion						Caste											
	Christian		Hindu		Muslim		General		Minority		Other Backward Class		Scheduled Castes		Scheduled Tribes		Tea Tribes	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	0	0.00	38	100	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	38	100	0	0.00
Belo	0	0.00	44	100	0	0.00	2	4.55	0	0.00	7	15.91	2	4.55	33	75.00	0	0.00
Tamp	0	0.00	35	100	0	0.00	0	0.00	0	0.00	33	94.29	2	5.71	0	0.00	0	0.00
Japp	0	0.00	40	100	0	0.00	0	0.00	0	0.00	9	22.50	28	70.00	2	5.00	1	2.50
Meth	1	5.26	18	94.74	0	0.00	0	0.00	0	0.00	1	5.26	3	15.79	2	10.53	13	68.42
Borj	0	0.00	20	100	0	0.00	2	10.00	0	0.00	1	5.00	1	5.00	0	0.00	16	80.00
Hali	0	0.00	27	96.43	1	3.57	0	0.00	1	3.57	16	57.14	0	0.00	0	0.00	11	39.29
Silj	0	0.00	32	94.12	2	5.88	1	2.94	2	5.88	4	11.76	0	0.00	0	0.00	27	79.41
Sild1	0	0.00	27	96.43	1	3.57	2	7.14	1	3.57	0	0.00	0	0.00	0	0.00	25	89.29
Sild2	0	0.00	22	100	0	0.00	1	4.55	0	0.00	0	0.00	0	0.00	15	68.18	6	27.27
Gosh	0	0.00	43	100	0	0.00	9	20.93	0	0.00	0	0.00	0	0.00	1	2.33	33	76.74
Domj1	0	0.00	19	95.00	1	5.00	2	10.00	1	5.00	12	60.00	0	0.00	0	0.00	5	25.00

Village	Respondent details																	
	Religion						Caste											
	Christian		Hindu		Muslim		General		Minority		Other Backward Class		Scheduled Castes		Scheduled Tribes		Tea Tribes	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Domj2	0	0.00	22	100	0	0.00	1	4.55	0	0.00	17	77.27	1	4.55	0	0.00	3	13.64
Kazi	0	0.00	27	100	0	0.00	0	0.00	0	0.00	7	25.93	0	0.00	20	74.07	0	0.00
Mohp	0	0.00	41	100	0	0.00	8	19.51	0	0.00	29	70.73	0	0.00	0	0.00	4	9.76
Koho2	2	8.33	22	91.67	0	0.00	3	12.50	0	0.00	14	58.33	0	0.00	0	0.00	7	29.17
Panb	0	0.00	19	100	0	0.00	0	0.00	0	0.00	0	0.00	7	36.84	0	0.00	12	63.16
Hati	0	0.00	19	100	0	0.00	0	0.00	0	0.00	0	0.00	5	26.32	0	0.00	14	73.68
Baga	0	0.00	26	100	0	0.00	0	0.00	0	0.00	3	11.54	2	7.69	0	0.00	21	80.77
Harm	0	0.00	7	28.00	18	72.00	2	8.00	18	72.00	3	12.00	0	0.00	0	0.00	2	8.00
Nanc	0	0.00	0	0.00	23	100	0	0.00	23	100	0	0.00	0	0.00	0	0.00	0	0.00
Naja	0	0.00	4	19.05	17	80.95	1	4.76	17	80.95	2	9.52	0	0.00	1	4.76	0	0.00
Bagh	0	0.00	21	67.74	10	32.26	6	19.35	10	32.26	9	29.03	6	19.35	0	0.00	0	0.00
Kawa	0	0.00	0	0.00	31	100	0	0.00	31	100	0	0.00	0	0.00	0	0.00	0	0.00
Band	0	0.00	0	0.00	42	100	0	0.00	42	100	0	0.00	0	0.00	0	0.00	0	0.00
Deop	0	0.00	3	10.34	26	89.66	0	0.00	26	89.66	2	6.90	1	3.45	0	0.00	0	0.00
Nahr	0	0.00	28	100	0	0.00	0	0.00	0	0.00	1	3.57	1	3.57	7	25.00	19	67.86
Bura1	0	0.00	27	100	0	0.00	0	0.00	0	0.00	0	0.00	1	3.70	0	0.00	26	96.30
Kanc	0	0.00	28	100	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	24	85.71	4	14.29
Pacg	0	0.00	17	89.47	2	10.53	2	10.53	2	10.53	12	63.16	0	0.00	2	10.53	1	5.26
Katb	0	0.00	27	96.43	1	3.57	6	21.43	1	3.57	18	64.29	3	10.71	0	0.00	0	0.00
Total	3	0.34	703	79.80	175	19.86	48	5.45	175	19.86	200	22.70	63	7.15	145	16.46	250	28.38

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.65. Fodder material extraction duration, time and awareness about species among villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fodder extraction															
	Duration (in min)						Time (in 24 hours)						Aware of collected species			
	≥30		≥31-60		≤61		6:00-9:00		9:01-12:00		12:01-17:00		No		Yes	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	31	81.58	7	18.42	0	0.00	12	31.58	19	50.00	7	18.42	10	26.32	28	73.68
Belo	34	77.27	10	22.73	0	0.00	11	25.00	27	61.36	6	13.64	12	27.27	32	72.73
Tamp	25	71.43	10	28.57	0	0.00	13	37.14	15	42.86	7	20.00	11	31.43	24	68.57
Japp	21	52.50	19	47.50	0	0.00	9	22.50	24	60.00	7	17.50	10	25.00	30	75.00

Village	Fodder extraction															
	Duration (in min)						Time (in 24 hours)						Aware of collected species			
	≥30		≥31-60		≤61		6:00-9:00		9:01-12:00		12:01-17:00		No		Yes	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Meth	14	73.68	5	26.32	0	0.00	6	31.58	10	52.63	3	15.79	4	21.05	15	78.95
Borj	13	65.00	7	35.00	0	0.00	5	25.00	14	70.00	1	5.00	6	30.00	14	70.00
Hali	21	75.00	7	25.00	0	0.00	6	21.43	14	50.00	8	28.57	5	17.86	23	82.14
Silj	17	50.00	17	50.00	0	0.00	10	29.41	19	55.88	5	14.71	11	32.35	23	67.65
Sild1	21	75.00	7	25.00	0	0.00	9	32.14	15	53.57	4	14.29	7	25.00	21	75.00
Sild2	16	72.73	6	27.27	0	0.00	5	22.73	12	54.55	5	22.73	6	27.27	16	72.73
Gosh	28	65.12	15	34.88	0	0.00	11	25.58	24	55.81	8	18.60	15	34.88	28	65.12
Domj1	14	70.00	6	30.00	0	0.00	7	35.00	10	50.00	3	15.00	5	25.00	15	75.00
Domj2	17	77.27	5	22.73	0	0.00	6	27.27	15	68.18	1	4.55	7	31.82	15	68.18
Kazi	22	81.48	5	18.52	0	0.00	6	22.22	15	55.56	6	22.22	6	22.22	21	77.78
Mohp	26	63.41	14	34.15	1	2.44	15	36.59	19	46.34	7	17.07	12	29.27	29	70.73
Koho2	17	70.83	7	29.17	0	0.00	4	16.67	16	66.67	4	16.67	6	25.00	18	75.00
Panb	14	73.68	5	26.32	0	0.00	7	36.84	8	42.11	4	21.05	7	36.84	12	63.16
Hati	14	73.68	5	26.32	0	0.00	5	26.32	10	52.63	4	21.05	3	15.79	16	84.21
Baga	13	50.00	13	50.00	0	0.00	8	30.77	12	46.15	6	23.08	7	26.92	19	73.08
Harm	19	76.00	6	24.00	0	0.00	7	28.00	13	52.00	5	20.00	7	28.00	18	72.00
Nanc	19	82.61	4	17.39	0	0.00	9	39.13	12	52.17	2	8.70	9	39.13	14	60.87
Naja	12	57.14	9	42.86	0	0.00	6	28.57	8	38.10	7	33.33	5	23.81	16	76.19
Bagh	22	70.97	9	29.03	0	0.00	9	29.03	16	51.61	6	19.35	9	29.03	22	70.97
Kawa	15	48.39	16	51.61	0	0.00	9	29.03	17	54.84	5	16.13	11	35.48	20	64.52
Band	24	57.14	18	42.86	0	0.00	14	33.33	19	45.24	9	21.43	13	30.95	29	69.05
Deop	18	62.07	11	37.93	0	0.00	8	27.59	18	62.07	3	10.34	8	27.59	21	72.41
Nahr	17	60.71	11	39.29	0	0.00	5	17.86	17	60.71	6	21.43	8	28.57	20	71.43
Bura1	16	59.26	11	40.74	0	0.00	7	25.93	16	59.26	4	14.81	8	29.63	19	70.37
Kanc	15	53.57	13	46.43	0	0.00	9	32.14	16	57.14	3	10.71	8	28.57	20	71.43
Pacg	13	68.42	6	31.58	0	0.00	4	21.05	10	52.63	5	26.32	7	36.84	12	63.16
Katb	18	64.29	10	35.71	0	0.00	7	25.00	15	53.57	6	21.43	9	32.14	19	67.86
Total	586	66.52	294	33.37	1	0.11	249	28.26	475	53.92	157	17.82	252	28.60	629	71.40

Bang- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, ≥- less than equals to, ≤- more than equals to and %- in percentages.

Appendix Table 6.66. Fodder material extraction mode, delivery and end use by villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fodder extraction													
	Extraction mode				Delivery mode				End use					
	Bolo knife		Hand sickle		Cycle		Hand lifting		Self		Sale		Both	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	5	13.16	33	86.84	16	42.11	22	57.89	29	76.32	0	0.00	9	23.68
Belo	4	9.09	40	90.91	9	20.45	35	79.55	30	68.18	0	0.00	14	31.82
Tamp	4	11.43	31	88.57	7	20.00	28	80.00	32	91.43	0	0.00	3	8.57
Japp	7	17.50	33	82.50	13	32.50	27	67.50	35	87.50	0	0.00	5	12.50
Meth	0	0.00	19	100	1	5.26	18	94.74	19	100	0	0.00	0	0.00
Borj	1	5.00	19	95.00	0	0.00	20	100	20	100	0	0.00	0	0.00
Hali	1	3.57	27	96.43	3	10.71	25	89.29	28	100	0	0.00	0	0.00
Silj	4	11.76	30	88.24	5	14.71	29	85.29	31	91.18	0	0.00	3	8.82
Sild1	1	3.57	27	96.43	1	3.57	27	96.43	26	92.86	0	0.00	2	7.14
Sild2	2	9.09	20	90.91	1	4.55	21	95.45	22	100	0	0.00	0	0.00
Gosh	8	18.60	35	81.40	14	32.56	29	67.44	31	72.09	0	0.00	12	27.91
Domj1	1	5.00	19	95.00	1	5.00	19	95.00	20	100	0	0.00	0	0.00
Domj2	1	4.55	21	95.45	2	9.09	20	90.91	22	100	0	0.00	0	0.00
Kazi	0	0.00	27	100	0	0.00	27	100	26	96.30	0	0.00	1	3.70
Mohp	7	17.07	34	82.93	15	36.59	26	63.41	31	75.61	0	0.00	10	24.39
Koho2	0	0.00	24	100	4	16.67	20	83.33	23	95.83	0	0.00	1	4.17
Panb	1	5.26	18	94.74	1	5.26	18	94.74	19	100	0	0.00	0	0.00
Hati	0	0.00	19	100	0	0.00	19	100	19	100	0	0.00	0	0.00
Baga	2	7.69	24	92.31	5	19.23	21	80.77	24	92.31	0	0.00	2	7.69
Harm	0	0.00	25	100	1	4.00	24	96.00	24	96.00	0	0.00	1	4.00
Nanc	0	0.00	23	100	1	4.35	22	95.65	23	100	0	0.00	0	0.00
Naja	3	14.29	18	85.71	3	14.29	18	85.71	18	85.71	0	0.00	3	14.29
Bagh	0	0.00	31	100	2	6.45	29	93.55	30	96.77	0	0.00	1	3.23
Kawa	2	6.45	29	93.55	4	12.90	27	87.10	24	77.42	0	0.00	7	22.58
Band	5	11.90	37	88.10	6	14.29	36	85.71	36	85.71	0	0.00	6	14.29
Deop	1	3.45	28	96.55	3	10.34	26	89.66	26	89.66	0	0.00	3	10.34
Nahr	1	3.57	27	96.43	3	10.71	25	89.29	28	100	0	0.00	0	0.00
Bura1	0	0.00	27	100	0	0.00	27	100	27	100	0	0.00	0	0.00
Kanc	2	7.14	26	92.86	4	14.29	24	85.71	27	96.43	0	0.00	1	3.57
Pacg	2	10.53	17	89.47	1	5.26	18	94.74	18	94.74	0	0.00	1	5.26
Katb	1	3.57	27	96.43	4	14.29	24	85.71	24	85.71	0	0.00	4	14.29
Total	66	7.49	815	92.51	130	14.76	751	85.24	792	89.90	0	0.00	89	10.10

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.67. Daily quantities of fodder material extraction by villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fodder extraction					
	Total annual extraction quantity (day/kg)		Annual self-consumption quantity (day/kg)		Annual sale quantity (day/kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	154.29	15.43±1.20	132.99	13.30±0.98	48.10	9.62±1.36
Belo	143.05	14.30±1.46	107.78	10.78±1.00	110.70	12.30±1.76
Tamp	144.21	14.42±1.07	137.20	13.72±0.81	21.00	10.50±1.20
Japp	165.17	16.52±1.39	149.04	14.90±1.11	74.70	14.94±1.72
Meth	43.00	4.78±0.49	43.00	4.78±0.49	0.00	0.00
Borj	82.17	9.13±1.07	82.17	9.13±1.07	0.00	0.00
Hali	130.15	13.02±1.19	130.15	13.02±1.19	0.00	0.00
Silj	138.76	13.88±0.91	130.83	13.08±0.97	24.10	8.03±1.82
Sild1	101.00	10.10±0.97	95.53	9.55±0.82	20.90	10.45±0.75
Sild2	87.55	9.73±1.37	87.55	9.73±1.37	0.00	0.00
Gosh	181.55	18.16±1.34	149.98	15.00±0.92	106.15	11.79±1.47
Domj1	71.52	7.95±0.58	71.52	7.95±0.58	0.00	0.00
Domj2	92.74	10.30±0.95	92.74	10.30±0.95	0.00	0.00
Kazi	94.56	9.46±0.76	91.96	9.20±0.63	10.40	10.40±0.00
Mohp	173.57	17.36±1.56	145.21	14.52±1.17	101.05	12.63±1.53
Koho2	101.18	11.24±1.44	98.70	10.97±1.27	9.90	9.90±0.00
Panb	64.63	7.18±0.57	64.63	7.18±0.57	0.00	0.00
Hati	55.63	6.18±0.50	55.63	6.18±0.50	0.00	0.00
Baga	129.46	12.95±1.14	122.17	12.22±0.95	24.60	12.30±5.50
Harm	97.37	9.74±0.93	94.43	9.44±0.77	8.80	8.80±0.00
Nanc	82.87	9.21±0.96	82.87	9.21±0.96	0.00	0.00
Naja	107.62	11.96±2.16	94.35	10.48±1.54	37.30	12.43±4.04
Bagh	112.77	11.28±0.80	108.29	10.83±0.65	17.90	17.90±0.00
Kawa	120.25	12.02±1.33	102.23	10.22±0.91	47.93	9.59±1.10
Band	136.69	13.67±1.25	124.11	12.41±1.10	39.15	9.79±2.26
Deop	124.35	12.43±1.43	116.43	11.64±1.34	26.20	8.73±0.69
Nahr	115.06	11.51±0.77	115.06	11.51±0.77	0.00	0.00
Bura1	90.60	10.07±0.78	90.60	10.07±0.78	0.00	0.00
Kanc	122.28	12.23±0.68	119.95	12.00±0.72	7.00	7.00±0.00
Pacg	58.17	6.46±0.86	55.67	6.19±0.66	5.00	5.00±0.00
Katb	92.74	10.30±0.86	84.11	9.35±0.84	20.90	6.97±0.99
Total	3414.92	110.16±6.26	3176.87	102.48±5.05	761.78	24.57±5.87

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari,

Village	Fodder extraction					
	Total annual extraction quantity (day/kg)		Annual self-consumption quantity (day/kg)		Annual sale quantity (day/kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE

Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, kg- kilograms and SE- standard error.

Appendix Table 6.68. Total mean annual quantities and income generated from extracted fodder material by villages selected for the entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fodder extraction									
	Total annual extraction quantity (in kg)		Annual self-consumption quantity (in kg)		Sale annual quantity (in kg)		Sale @INR/kg		Total annual income generated (in INR)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	1454.22	145.42±15.00	1224.55	122.46±11.80	513.40	102.68±15.50	60.00	12.00±0.97	6293.67	1258.73±237.54
Belo	1699.82	169.98±19.96	1239.10	123.91±15.35	1537.08	170.79±26.77	110.50	12.28±0.77	18926.53	2102.95±370.25
Tamp	1413.42	141.34±17.72	1313.87	131.39±12.04	283.75	141.88±48.88	20.00	10.00±0.00	2837.50	1418.75±488.75
Japp	1563.67	156.37±18.64	1388.00	138.80±14.51	828.10	165.62±26.94	61.00	12.20±0.80	10209.00	2041.80±405.81
Meth	385.20	42.80±6.13	385.20	42.80±6.13	0.00	0.00	0.00	0.00	0.00	0.00
Borj	418.18	46.46±5.53	418.18	46.46±5.53	0.00	0.00	0.00	0.00	0.00	0.00
Hali	957.63	95.76±12.25	957.63	95.76±12.25	0.00	0.00	0.00	0.00	0.00	0.00
Silj	1329.66	132.97±12.28	1225.88	122.59±10.27	328.70	109.57±34.50	37.00	12.33±1.45	4234.50	1411.50±583.06
Sild1	1083.86	108.39±14.76	1003.49	100.35±11.44	330.70	165.35±58.65	20.00	10.00±0.00	3307.00	1653.50±586.50
Sild2	665.02	73.89±14.10	665.02	73.89±14.10	0.00	0.00	0.00	0.00	0.00	0.00
Gosh	1829.70	182.97±21.58	1468.44	146.84±16.03	1216.85	135.21±21.13	117.50	13.06±0.69	15660.25	1740.03±272.15
Domj1	671.33	74.59±11.92	671.33	74.59±11.92	0.00	0.00	0.00	0	0.00	0.00
Domj2	735.34	81.70±7.31	735.34	81.70±7.31	0.00	0.00	0.00	0	0.00	0.00
Kazi	947.09	94.71±11.85	918.49	91.85±10.27	114.40	114.40±0.00	10.00	10.00±0.00	1144.00	1144.00±0.00
Mohp	1668.99	166.90±21.44	1376.54	137.65±15.54	1048.55	131.07±20.39	91.50	11.44±0.68	11866.35	1483.29±225.77
Koho2	1115.29	123.92±21.05	1073.22	119.25±18.02	168.30	168.30±0.00	10.00	10.00±0.00	1683.00	1683.00±0.00
Panb	568.10	63.12±8.27	568.10	63.12±8.27	0.00	0.00	0.00	0.00	0.00	0.00
Hati	316.70	35.19±4.41	316.70	35.19±4.41	0.00	0.00	0.00	0.00	0.00	0.00
Baga	1195.10	119.51±21.57	1119.57	111.96±18.21	294.60	147.30±22.70	30.00	15.00±0.00	4419.00	2209.50±340.50
Harm	550.07	55.01±12.93	514.87	51.49±9.71	105.60	105.60±0.00	15.00	15.00±0.00	1584.00	1584.00±0.00
Nanc	742.96	82.55±13.43	742.96	82.55±13.43	0.00	0.00	0.00	0.00	0.00	0.00
Naja	622.07	69.12±15.53	527.10	58.57±9.84	272.40	90.80±33.43	30.00	10.00±0.00	2724.00	908.00±334.33
Bagh	1000.96	100.10±11.20	956.21	95.62±8.78	179.00	179.00±0.00	10.00	10.00±0.00	1790.00	1790.00±0.00
Kawa	1230.90	123.09±20.60	997.12	99.71±13.30	612.43	122.49±24.53	70.33	14.07±0.61	8351.50	1670.30±296.31
Band	1485.09	148.51±27.37	1309.49	130.95±20.77	502.60	125.65±39.17	40.00	10.00±0.00	5026.00	1256.50±391.65
Deop	1391.63	139.16±26.04	1278.27	127.83±22.80	399.20	133.07±29.07	32.00	10.67±0.67	4263.60	1421.20±308.54
Nahr	1249.97	125.00±10.07	1249.97	125.00±10.07	0.00	0.00	0.00	0.00	0.00	0.00
Bura1	970.94	107.88±15.16	970.94	107.88±15.16	0.00	0.00	0.00	0.00	0.00	0.00

Village	Fodder extraction									
	Total annual extraction quantity (in kg)		Annual self-consumption quantity (in kg)		Sale annual quantity (in kg)		Sale @INR/kg		Total annual income generated (in INR)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Kanc	836.85	83.69±10.42	822.85	82.29±10.50	42.00	42.00±0.00	10.00	10.00±0.00	420.00	420.00±0.00
Pacg	478.82	53.20±7.18	466.32	51.81±6.49	25.00	25.00±0.00	12.00	12.00±0.00	300.00	300.00±0.00
Katb	935.09	103.90±9.85	836.79	92.98±8.11	234.90	78.30±9.29	36.00	12.00±1.53	2865.00	955.00±205.82
Total	31513.65	1016.57±75.94	28741.54	927.15±60.46	9037.57	291.53±70.68	822.83	26.54±6.00	107904.90	3480.80±872.45

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, kg- kilograms, INR- Indian Rupee and SE- standard error.

Appendix Table 6.69. List of extracted fodder plant species by villages selected for the entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Scientific name	Family	Use	Total	%
<i>Acroceras zizanioides</i> (Kunth) Dandy	Poaceae	Fodder	59	6.70
<i>Ageratum conyzoides</i> (L.) L.	Compositae	Fodder	47	5.33
<i>Alpinia nigra</i> (Gaertn.) Burt	Zingiberaceae	Fodder	54	6.13
<i>Amaranthus viridis</i> L.	Amaranthaceae	Fodder	52	5.90
<i>Amaranthus</i> spp.	Amaranthaceae	Fodder	45	5.11
<i>Andropogon</i> spp.	Poaceae	Fodder	102	11.58
<i>Apluda mutica</i> L.	Poaceae	Fodder	52	5.90
<i>Aristida</i> spp.	Poaceae	Fodder	96	10.90
<i>Artemisia</i> spp.	Compositae	Fodder	42	4.77
<i>Arundinella</i> spp.	Poaceae	Fodder	172	19.52
<i>Axonopus compressus</i> (Sw.) P.Beauv.	Poaceae	Fodder	237	26.90
<i>Brachiaria</i> spp.	Poaceae	Fodder	138	15.66
<i>Capillipedium assimile</i> (Steud.) A.Camus	Poaceae	Fodder	87	9.88
<i>Cenchrus ciliaris</i> L.	Poaceae	Fodder	205	23.27
<i>Chrysopogon aciculatus</i> (Retz.) Trin.	Poaceae	Fodder	197	22.36
<i>Chrysopogon gryllus</i> (L.) Trin.	Poaceae	Fodder	148	16.80
<i>Chrysopogon zizanioides</i> (L.) Roberty	Poaceae	Fodder	167	18.96
<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Fodder	252	28.60
<i>Cyperus</i> spp.	Cyperaceae	Fodder	123	13.96
<i>Dichanthium annulatum</i> (Forssk.) Stapf	Poaceae	Fodder	179	20.32
<i>Digitaria</i> spp.	Poaceae	Fodder	221	25.09
<i>Diplazium esculentum</i> (Retz.) Sw.	Athyriaceae	Fodder	56	6.36
<i>Echinochloa colona</i> (L.) Link	Poaceae	Fodder	98	11.12
<i>Echinochloa crus-galli</i> (L.) P.Beauv.	Poaceae	Fodder	93	10.56

Scientific name	Family	Use	Total	%
<i>Eclipta prostrata</i> (L.) L.	Compositae	Fodder	64	7.26
<i>Eleusine indica</i> (L.) Gaertn.	Poaceae	Fodder	75	8.51
<i>Eragrostis</i> spp.	Poaceae	Fodder	84	9.53
<i>Ethulia conyzoides</i> L.f.	Compositae	Fodder	61	6.92
<i>Euphorbia</i> spp.	Euphorbiaceae	Fodder	53	6.02
<i>Fimbristylis</i> spp.	Cyperaceae	Fodder	156	17.71
<i>Glinus lotoides</i> L.	Molluginaceae	Fodder	52	5.90
<i>Heliotropium indicum</i> L.	Boraginaceae	Fodder	59	6.70
<i>Hemarthria compressa</i> (L.f.) R.Br.	Poaceae	Fodder	326	37.00
<i>Heteropogon contortus</i> (L.) P.Beauv. ex Roem. & Schult.	Poaceae	Fodder	110	12.49
<i>Hymenachne amplexicaulis</i> (Rudge) Nees	Poaceae	Fodder	187	21.23
<i>Hyptis suaveolens</i> (L.) Poit.	Lamiaceae	Fodder	48	5.45
<i>Imperata cylindrica</i> (L.) Raeusch.	Poaceae	Fodder	129	14.64
<i>Laphangium luteoalbum</i> (L.) Tzvelev	Compositae	Fodder	52	5.90
<i>Lindernia</i> spp.	Linderniaceae	Fodder	57	6.47
<i>Oplismenus</i> spp.	Poaceae	Fodder	118	13.39
<i>Panicum</i> spp.	Poaceae	Fodder	174	19.75
<i>Paspalidium</i> spp.	Poaceae	Fodder	140	15.89
<i>Paspalum conjugatum</i> P.J.Bergius	Poaceae	Fodder	237	26.90
<i>Poa annua</i> L.	Poaceae	Fodder	70	7.95
<i>Polygonum</i> spp.	Polygonaceae	Fodder	54	6.13
<i>Pouzolzia</i> spp.	Urticaceae	Fodder	46	5.22
<i>Rorippa indica</i> (L.) Hiern	Brassicaceae	Fodder	80	9.08
<i>Saccharum</i> spp.	Poaceae	Fodder	145	16.46
<i>Scleria terrestris</i> (L.) Fassett	Cyperaceae	Fodder	34	3.86
<i>Setaria palmifolia</i> (J.Koenig) Stapf	Poaceae	Fodder	75	8.51
<i>Setaria pumila</i> (Poir.) Roem. & Schult.	Poaceae	Fodder	226	25.65
<i>Solanum americanum</i> Mill.	Solanaceae	Fodder	50	5.68
<i>Sorghum nitidum</i> (Vahl) Pers.	Poaceae	Fodder	63	7.15
<i>Sporobolus</i> spp.	Poaceae	Fodder	78	8.85
<i>Tetragium dubium</i> (Lawson) Planch.	Vitaceae	Fodder	48	5.45
<i>Themeda</i> spp.	Poaceae	Fodder	50	5.68

Appendix Table 6.70. Fuelwood material purchase total mean annual quantity and expenditure of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fuelwood purchase							
	Purchase (Yes)		Annual qty (in kg)		INR/kg		Total annual expenditure (in INR)	
	Total	%	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	5	55.56	545.00	109.00±12.69	100.00	20.00±1.58	11025.00	2205.00±353.94

Village	Fuelwood purchase							
	Purchase (Yes)		Annual qty (in kg)		INR/kg		Total annual expenditure (in INR)	
	Total	%	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Belo	6	23.08	635.00	105.83±18.82	130.00	21.67±1.05	13700.00	2283.33±398.05
Tamp	19	95.00	1855.00	97.63±9.67	398.00	20.95±0.63	38035.00	2001.84±187.54
Japp	7	53.85	1080.00	154.29±10.49	150.00	21.43±0.92	22925.00	3275.00±186.37
Meth	17	22.37	2590.00	152.35±6.40	368.00	21.65±0.63	56410.00	3318.24±190.68
Borj	9	18.37	1270.00	141.11±14.48	195.00	21.67±0.83	27150.00	3016.67±311.80
Hali	4	28.57	570.00	142.50±8.54	90.00	22.50±1.44	12800.00	3200.00±270.80
Silj	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sild1	1	4.76	90.00	90.00±0.00	25.00	25.00±0.00	2250.00	2250.00±0.00
Sild2	2	11.76	180.00	90.00±10.00	50.00	25.00±0.00	4500.00	2250.00±250.00
Gosh	13	29.55	1985.00	152.69±10.84	295.00	22.69±0.72	44650.00	3434.62±254.03
Domj1	4	28.57	576.00	144.00±9.09	95.00	23.75±1.25	13700.00	3425.00±306.53
Domj2	3	50.00	270.00	90.00±5.77	70.00	23.33±1.67	6250.00	2083.33±83.33
Kazi	1	14.29	130.00	130.00±0.00	25.00	25.00±0.00	3250.00	3250.00±0.00
Mohp	15	71.43	2045.00	136.33±5.82	330.00	22.00±0.65	45075.00	3005.00±164.10
Koho2	16	64.00	2250.00	140.63±6.16	335.00	20.94±0.50	47250.00	2953.13±156.16
Panb	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hati	3	16.67	400.00	133.33±8.82	65.00	21.67±1.67	8650.00	2883.33±252.21
Baga	2	3.92	210.00	105.00±45.00	45.00	22.50±2.50	4950.00	2475.00±1275.00
Harm	7	21.88	1030.00	147.14±13.58	150.00	21.43±0.92	22000.00	3142.86±291.84
Nanc	4	44.44	510.00	127.50±8.54	90.00	22.50±1.44	11400.00	2850.00±181.43
Naja	8	24.24	790.00	98.75±13.02	175.00	21.88±0.91	17300.00	2162.50±312.36
Bagh	12	50.00	1350.00	112.50±14.41	245.00	20.42±0.42	27750.00	2312.50±309.09
Kawa	2	66.67	300.00	150.00±10.00	40.00	20.00±0.00	6000.00	3000.00±200.00
Band	3	30.00	330.00	110.00±5.77	65.00	21.67±1.67	7150.00	2383.33±216.67
Deop	10	38.46	1324.00	132.40±7.72	225.00	22.50±0.83	29500.00	2950.00±152.02
Nahr	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bura1	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kanc	2	20.00	155.00	77.50±2.50	40.00	20.00±0.00	3100.00	1550.00±50.00
Pacg	1	5.26	60.00	60.00±0.00	20.00	20.00±0.00	1200.00	1200.00±0.00
Katb	2	14.29	160.00	80.00±30.00	45.00	22.50±2.50	3750.00	1875.00±875.00
Total	178	26.85	22690.00	127.47±2.88	3861.00	21.69±0.19	491720.00	2762.47±66.50

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, qty- quantity, kg- kilograms, INR- Indian Rupee, SE- standard error and %- in percentages.

Appendix Table 6.71. Fuelwood material extraction instrument and location of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fuelwood extraction													
	Extraction (Yes)		Instrument						Location (area)					
			Axe		Hand saw		Bolo knife		Inside Reserve		Outside Reserve		Both	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	9	100	6	66.67	1	11.11	2	22.22	5	55.56	7	77.78	3	33.33
Belo	23	88.46	16	69.57	2	8.70	5	21.74	17	73.91	16	69.57	10	43.48
Tamp	17	85.00	11	64.71	1	5.88	5	29.41	11	64.71	12	70.59	6	35.29
Japp	7	53.85	5	71.43	0	0.00	2	28.57	7	100	2	28.57	2	28.57
Meth	61	80.26	42	68.85	4	6.56	15	24.59	0	0.00	61	100	0	0.00
Borj	24	48.98	16	66.67	2	8.33	6	25.00	8	33.33	18	75.00	2	8.33
Hali	11	78.57	6	54.55	1	9.09	4	36.36	8	72.73	7	63.64	4	36.36
Silj	26	92.86	16	61.54	2	7.69	8	30.77	17	65.38	21	80.77	12	46.15
Sild1	20	95.24	14	70.00	1	5.00	5	25.00	17	85.00	15	75.00	12	60.00
Sild2	17	100	10	58.82	1	5.88	6	35.29	15	88.24	16	94.12	14	82.35
Gosh	44	100	32	72.73	3	6.82	9	20.45	39	88.64	33	75.00	28	63.64
Domj1	14	100	9	64.29	0	0.00	5	35.71	13	92.86	14	100	13	92.86
Domj2	6	100	5	83.33	0	0.00	1	16.67	4	66.67	6	100	4	66.67
Kazi	7	100	5	71.43	0	0.00	2	28.57	5	71.43	3	42.86	1	14.29
Mohp	12	57.14	10	83.33	1	8.33	1	8.33	4	33.33	12	100	4	33.33
Koho2	15	60.00	9	60.00	1	6.67	5	33.33	3	20.00	14	93.33	2	13.33
Panb	7	100	5	71.43	0	0.00	2	28.57	2	28.57	7	100	2	28.57
Hati	16	88.89	12	75.00	1	6.25	3	18.75	4	25.00	16	100	4	25.00
Baga	49	96.08	32	65.31	3	6.12	14	28.57	6	12.24	49	100	6	12.24
Harm	31	96.88	20	64.52	2	6.45	9	29.03	9	29.03	30	96.77	8	25.81
Nanc	6	66.67	4	66.67	0	0.00	2	33.33	2	33.33	6	100	2	33.33
Naja	23	69.70	17	73.91	2	8.70	4	17.39	8	34.78	23	100	8	34.78
Bagh	17	70.83	11	64.71	2	11.76	4	23.53	6	35.29	17	100	6	35.29
Kawa	3	100	3	100	0	0.00	0	0.00	3	100	3	100	3	100
Band	8	80.00	6	75.00	1	12.50	1	12.50	7	87.50	4	50.00	3	37.50
Deop	23	88.46	15	65.22	1	4.35	7	30.43	10	43.48	22	95.65	9	39.13
Nahr	15	100	10	66.67	1	6.67	4	26.67	3	20.00	15	100	3	20.00
Bura1	2	100	1	50.00	0	0.00	1	50.00	1	50.00	2	100	1	50.00
Kanc	9	90.00	6	66.67	0	0.00	3	33.33	9	100	3	33.33	3	33.33
Pacg	17	89.47	11	64.71	1	5.88	5	29.41	16	94.12	8	47.06	7	41.18
Katb	11	78.57	7	63.64	0	0.00	4	36.36	10	90.91	9	81.82	8	72.73
Total	550	82.96	372	67.64	34	6.18	144	26.18	269	48.91	471	85.64	190	34.55

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.72. Fuelwood material extraction location and season of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fuelwood extraction																	
	Location outside Reserve										Season							
	Karbi Anglong		National highway		Kaziranga fringe		Home/Field		All areas		Summer		Monsoon		Winter		Throughout the year	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	0	0.00	4	57.14	4	57.14	7	100	0	0.00	3	33.33	3	33.33	9	100	1	11.11
Belo	0	0.00	11	68.75	7	43.75	14	87.50	0	0.00	5	21.74	4	17.39	22	95.65	1	4.35
Tamp	0	0.00	8	66.67	4	33.33	10	83.33	0	0.00	4	23.53	3	17.65	17	100	0	0.00
Japp	0	0.00	1	50.00	0	0.00	2	100	0	0.00	5	71.43	1	14.29	7	100	1	14.29
Meth	53	86.89	33	54.10	25	40.98	17	27.87	3	4.92	32	52.46	8	13.11	61	100	4	6.56
Borj	16	88.89	9	50.00	11	61.11	6	33.33	3	16.67	17	70.83	3	12.50	24	100	3	12.50
Hali	7	100	6	85.71	4	57.14	3	42.86	2	28.57	4	36.36	2	18.18	11	100	0	0.00
Silj	16	76.19	12	57.14	9	42.86	8	38.10	1	4.76	23	88.46	3	11.54	24	92.31	3	11.54
Sild1	12	80.00	8	53.33	6	40.00	6	40.00	2	13.33	18	90.00	3	15.00	20	100	3	15.00
Sild2	14	87.50	9	56.25	5	31.25	4	25.00	0	0.00	12	70.59	3	17.65	17	100	2	11.76
Gosh	28	84.85	21	63.64	14	42.42	10	30.30	2	6.06	21	47.73	8	18.18	43	97.73	3	6.82
Domj1	13	92.86	10	71.43	7	50.00	4	28.57	1	7.14	11	78.57	3	21.43	13	92.86	1	7.14
Domj2	2	33.33	4	66.67	1	16.67	1	16.67	0	0.00	1	16.67	1	16.67	6	100	0	0.00
Kazi	2	66.67	2	66.67	1	33.33	1	33.33	0	0.00	4	57.14	2	28.57	6	85.71	1	14.29
Mohp	7	58.33	7	58.33	4	33.33	2	16.67	0	0.00	4	33.33	3	25.00	10	83.33	0	0.00
Koho2	10	71.43	7	50.00	5	35.71	3	21.43	0	0.00	4	26.67	2	13.33	15	100	0	0.00
Panb	3	42.86	3	42.86	1	14.29	2	28.57	0	0.00	3	42.86	1	14.29	7	100	0	0.00
Hati	14	87.50	9	56.25	9	56.25	3	18.75	0	0.00	5	31.25	2	12.50	16	100	1	6.25
Baga	40	81.63	31	63.27	19	38.78	16	32.65	2	4.08	32	65.31	7	14.29	42	85.71	3	6.12
Harm	23	76.67	17	56.67	10	33.33	6	20.00	0	0.00	17	54.84	3	9.68	27	87.10	1	3.23
Nanc	5	83.33	3	50.00	2	33.33	2	33.33	0	0.00	0	0.00	1	16.67	6	100	0	0.00
Naja	20	86.96	9	39.13	9	39.13	6	26.09	1	4.35	3	13.04	2	8.70	18	78.26	0	0.00
Bagh	12	70.59	7	41.18	7	41.18	4	23.53	0	0.00	1	5.88	2	11.76	17	100	0	0.00
Kawa	3	100	0	0.00	2	66.67	0	0.00	0	0.00	2	66.67	0	0.00	3	100	0	0.00
Band	3	75.00	1	25.00	2	50.00	1	25.00	0	0.00	2	25.00	1	12.50	6	75.00	1	12.50
Deop	18	81.82	6	27.27	10	45.45	6	27.27	0	0.00	2	8.70	2	8.70	21	91.30	0	0.00
Nahr	12	80.00	3	20.00	7	46.67	5	33.33	0	0.00	10	66.67	2	13.33	13	86.67	0	0.00
Bura1	1	50.00	0	0.00	1	50.00	0	0.00	0	0.00	0	0.00	0	0.00	2	100	0	0.00
Kanc	3	100	1	33.33	2	66.67	1	33.33	0	0.00	2	22.22	1	11.11	9	100	1	11.11
Pacg	0	0.00	0	0.00	8	100	0	0.00	0	0.00	2	11.76	3	17.65	17	100	0	0.00
Katb	0	0.00	0	0.00	9	100	0	0.00	0	0.00	2	18.18	1	9.09	11	100	1	9.09
Total	337	71.55	242	51.38	205	43.52	150	31.85	17	3.61	251	45.64	80	14.55	520	94.55	31	5.64

Village	Fuelwood extraction																	
	Location outside Reserve										Season							
	Karbi Anglong		National highway		Kaziranga fringe		Home/Field		All areas		Summer		Monsoon		Winter		Throughout the year	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.73. Daily and mean annual quantities of fuelwood material extraction from inside the Reserve by villages selected for a socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fuelwood extraction inside Reserve											
	Extraction qty (day/kg)		Self-cons qty (day/kg)		Sale qty (day/kg)		Annual extraction qty (in kg)		Annual self-cons qty (in kg)		Annual sale qty (in kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	80.00	16.00±3.67	65.00	13.00±4.06	15.00	7.50±2.50	6715.00	1343.00±625.38	6245.00	1249.00±658.24	470.00	235.00±85.00
Belo	326.00	19.18±1.82	184.00	10.82±1.29	142.00	10.92±1.52	27497.00	1617.47±417.42	14806.00	870.94±198.91	12691.00	976.23±325.72
Tamp	220.00	20.00±5.96	115.00	10.45±2.73	105.00	17.50±4.83	19155.00	1741.36±662.12	8247.00	749.73±234.81	10908.00	1818.00±684.92
Japp	105.00	15.00±1.89	94.00	13.43±2.69	11.00	5.50±0.50	9330.00	1332.86±320.51	9018.00	1288.29±344.11	312.00	156.00±96.00
Meth	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Borj	185.00	23.13±3.13	125.00	15.63±2.02	60.00	15.00±4.14	15650.00	1956.25±457.91	11108.00	1388.50±321.15	4542.00	1135.50±581.63
Hali	231.00	28.88±7.58	116.00	14.50±3.86	115.00	19.17±3.53	20618.00	2577.25±911.15	10001.00	1250.13±434.11	10617.00	1769.50±553.70
Silj	404.00	23.76±3.78	185.00	10.88±1.18	219.00	13.69±2.85	31161.00	1833.00±572.22	14459.00	850.53±291.96	16702.00	1043.88±317.83
Sild1	376.00	22.12±4.07	195.00	11.47±1.85	181.00	12.93±2.41	27905.00	1641.47±595.42	13067.00	768.65±263.14	14838.00	1059.86±409.30
Sild2	245.00	16.33±2.16	122.00	8.13±1.08	123.00	8.20±1.33	11720.00	781.33±215.85	5428.00	361.87±91.61	6292.00	419.47±128.66
Gosh	781.00	20.03±2.89	434.00	11.13±1.47	347.00	13.88±2.17	55775.00	1430.13±284.97	31538.00	808.67±175.34	24237.00	969.48±208.10
Domj1	180.00	13.85±1.84	79.00	6.08±0.89	101.00	7.77±1.04	8151.00	627.00±112.99	3631.00	279.31±52.19	4520.00	347.69±62.55
Domj2	84.00	21.00±4.56	47.00	11.75±2.95	37.00	9.25±2.98	1761.00	440.25±79.26	1036.00	259.00±79.77	725.00	181.25±27.70
Kazi	95.00	19.00±6.00	82.00	16.40±3.93	13.00	13.00±0.00	8125.00	1625.00±459.35	7345.00	1469.00±418.19	780.00	780.00±0.00
Mohp	58.00	14.50±2.60	26.00	6.50±1.71	32.00	8.00±1.35	1778.00	444.50±109.40	796.00	199.00±56.01	982.00	245.50±63.77
Koho2	32.00	10.67±4.70	32.00	10.67±4.70	0.00	0.00	3138.00	1046.00±677.02	3138.00	1046.00±677.02	0.00	0.00
Panb	39.00	19.50±3.50	21.00	10.50±1.50	18.00	9.00±2.00	1692.00	846.00±18	918.00	459.00±27.00	774.00	387.00±9.00
Hati	61.00	15.25±0.85	24.00	6.00±0.71	37.00	9.25±1.11	3228.00	807.00±173.10	1236.00	309.00±65.02	1992.00	498.00±127.18
Baga	87.00	14.50±3.20	50.00	8.33±1.54	37.00	9.25±2.84	2492.00	415.33±141.39	1340.00	223.33±56.65	1152.00	288.00±113.05
Harm	169.00	18.78±4.27	83.00	9.22±2.01	86.00	10.75±2.45	10116.00	1124.00±424.94	4999.00	555.44±193.95	5117.00	639.63±257.60
Nanc	47.00	23.50±4.50	22.00	11.00±3.00	25.00	12.50±1.50	3368.00	1684.00±164	1564.00	782.00±142.00	1804.00	902.00±22.00
Naja	166.00	20.75±3.00	97.00	12.13±1.66	69.00	9.86±1.86	12469.00	1558.63±428.25	7133.00	891.63±224.61	5336.00	762.29±231.97
Bagh	85.00	14.17±3.60	46.00	7.67±1.56	39.00	9.75±2.32	4350.00	725.00±299.34	2343.00	390.50±142.16	2007.00	501.75±227.97
Kawa	23.00	7.67±1.45	18.00	6.00±1.00	5.00	5.00±0.00	788.00	262.67±12.67	663.00	221.00±49.24	125.00	125.00±0.00
Band	374.00	53.43±13.73	169.00	24.14±7.18	205.00	29.29±6.91	21560.00	3080.00±985.77	9192.00	1313.14±413.70	12368.00	1766.86±585.75

Village	Fuelwood extraction inside Reserve											
	Extraction qty (day/kg)		Self-cons qty (day/kg)		Sale qty (day/kg)		Annual extraction qty (in kg)		Annual self-cons qty (in kg)		Annual sale qty (in kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Deop	217.00	21.70±4.11	99.00	9.90±1.46	118.00	14.75±2.53	10183.00	1018.30±280.43	4530.00	453.00±109.51	5653.00	706.63±190.83
Nahr	31.00	10.33±2.60	17.00	5.67±0.88	14.00	7.00±1.00	890.00	296.67±104.93	510.00	170.00±51.32	380.00	190.00±110.00
Bura1	2.00	2.00±0.00	2.00	2.00±0.00	0.00	0.00	48.00	48.00±0.00	48.00	48.00±0.00	0.00	0.00
Kanc	677.00	75.22±9.52	311.00	34.56±4.39	366.00	40.67±6.24	31744.00	3527.11±593.63	14494.00	1610.44±303.17	17250.00	1916.67±319.80
Pacg	929.00	58.06±12.36	409.00	25.56±4.16	520.00	34.67±8.64	28340.00	1771.25±373.17	13184.00	824.00±136.07	15156.00	1010.40±261.75
Katb	394.00	39.40±10.35	151.00	15.10±3.93	243.00	24.30±6.88	10642.00	1064.20±203.46	4037.00	403.70±72.88	6605.00	660.50±138.50
Total	6703.00	24.92±1.48	3420.00	12.71±0.63	3283.00	15.78±1.09	390389.00	1451.26±102.35	206054.00	766.00±53.40	184335.00	886.23±71.60

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, cons-consumption, qty- quantity, kg- kilograms, INR- Indian Rupee and SE- standard error.

Appendix Table 6.74. Daily and mean annual quantities of fuelwood material extraction from outside the Reserve by villages selected for a socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fuelwood extraction outside Reserve											
	Extraction qty (day/kg)		Self-cons qty (day/kg)		Sale qty (day/kg)		Annual extraction qty (in kg)		Annual self-cons qty (in kg)		Annual sale qty (in kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	120.00	17.14±3.06	89.00	12.71±2.93	31.00	10.33±4.84	12320.00	1760.00±394.51	8960.00	1280.00±409.44	3360.00	1120.00±355.53
Belo	256.00	16.00±1.56	190.00	11.88±1.77	66.00	7.33±1.18	25270.00	1579.38±227.05	18695.00	1168.44±237.37	6575.00	730.56±101.34
Tamp	238.00	19.83±2.85	178.00	14.83±1.52	60.00	20.00±2.89	28220.00	2351.67±412.56	21920.00	1826.67±317.58	6300.00	2100.00±300.00
Japp	50.00	25.00±5.00	20.00	10.00±0.00	30.00	15.00±5.00	3900.00	1950.00±450.00	1700.00	850.00±350.00	2200.00	1100.00±100.00
Meth	4033.00	66.11±9.19	1547.00	25.36±1.77	2486.00	49.72±8.99	160286.00	2627.64±137.05	76156.00	1248.46±82.65	84130.00	1682.60±97.52
Borj	698.00	38.78±4.90	343.00	19.06±2.17	355.00	27.31±3.05	45986.00	2554.78±306.50	22310.00	1239.44±121.42	23676.00	1821.23±270.62
Hali	169.00	24.14±5.60	105.00	15.00±1.40	64.00	16.00±6.10	13742.00	1963.14±294.57	9454.00	1350.57±192.11	4288.00	1072.00±354.66
Silj	1306.00	62.19±17.75	469.00	22.33±4.03	837.00	44.05±15.12	80235.00	3820.71±337.34	37988.00	1808.95±241.41	42247.00	2223.53±265.86
Sild1	939.00	62.60±25.03	309.00	20.60±5.42	630.00	52.50±23.88	40145.00	2676.33±185.30	20168.00	1344.53±207.36	19977.00	1664.75±161.57
Sild2	475.00	29.69±2.71	253.00	15.81±1.96	222.00	13.88±1.11	53650.00	3353.13±211.04	27910.00	1744.38±145.39	25740.00	1608.75±126.75
Gosh	809.00	24.52±2.45	494.00	14.97±1.02	315.00	17.50±1.93	82111.00	2488.21±177.96	57899.00	1754.52±188.26	24212.00	1345.11±136.78
Domj1	420.00	30.00±2.75	205.00	14.64±1.23	215.00	15.36±2.24	48890.00	3492.14±192.09	24455.00	1746.79±126.82	24435.00	1745.36±201.65
Domj2	226.00	37.67±5.60	104.00	17.33±3.95	122.00	20.33±2.28	24609.00	4101.50±664.46	11442.00	1907.00±484.83	13167.00	2194.50±234.49
Kazi	95.00	31.67±9.28	69.00	23.00±1.53	26.00	26.00±0.00	12800.00	4266.67±1185.09	9680.00	3226.67±826.67	3120.00	3120.00±0.00
Mohp	432.00	36.00±6.66	244.00	20.33±2.01	188.00	23.50±5.87	43758.00	3646.50±424.85	27698.00	2308.17±391.91	16060.00	2007.50±241.87
Koho2	253.00	18.07±2.16	215.00	15.36±0.87	38.00	19.00±7.00	24887.00	1777.64±243.20	22367.00	1597.64±240.53	2520.00	1260.00±300.00
Panb	311.00	44.43±3.93	162.00	23.14±3.05	149.00	21.29±2.22	28120.00	4017.14±672.86	14540.00	2077.14±393.29	13580.00	1940.00±351.91
Hati	777.00	48.56±5.12	389.00	24.31±2.75	388.00	25.87±2.54	63330.00	3958.13±421.33	30864.00	1929.00±192.14	32466.00	2164.40±239.71
Baga	1698.00	34.65±3.45	1062.00	21.67±1.46	636.00	26.50±3.08	180685.00	3687.45±326.46	119126.00	2431.14±189.10	61559.00	2564.96±270.35
Harm	1013.00	33.77±3.42	608.00	20.27±1.72	405.00	23.82±1.87	97989.00	3266.30±236.98	60510.00	2017.00±141.73	37479.00	2204.65±258.27

Village	Fuelwood extraction outside Reserve											
	Extraction qty (day/kg)		Self-cons qty (day/kg)		Sale qty (day/kg)		Annual extraction qty (in kg)		Annual self-cons qty (in kg)		Annual sale qty (in kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Nanc	373.00	62.17±9.34	173.00	28.83±7.11	200.00	33.33±3.83	18060.00	3010.00±158.30	7788.00	1298.00±156.32	10272.00	1712.00±267.64
Naja	1404.00	61.04±6.65	610.00	26.52±3.13	794.00	37.81±4.29	82332.00	3579.65±288.85	38442.00	1671.39±210.81	43890.00	2090.00±166.65
Bagh	695.00	40.88±5.71	417.00	24.53±2.87	278.00	27.80±4.04	36626.00	2154.47±122.94	24150.00	1420.59±155.86	12476.00	1247.60±97.29
Kawa	52.00	17.33±1.45	42.00	14.00±2.08	10.00	10.00±0.00	7278.00	2426.00±819.07	6378.00	2126.00±974.00	900.00	900.00±0.00
Band	226.00	56.50±12.69	92.00	23.00±6.42	134.00	33.50±7.19	15668.00	3917.00±99.24	6344.00	1586.00±170.63	9324.00	2331.00±188.87
Deop	1043.00	47.41±5.60	517.00	23.50±2.48	526.00	29.22±3.47	54334.00	2469.73±193.21	28156.00	1279.82±84.87	26178.00	1454.33±140.35
Nahr	499.00	33.27±7.68	303.00	20.20±3.27	196.00	32.67±7.19	50155.00	3343.67±493.34	33345.00	2223.00±271.43	16810.00	2801.67±525.56
Bura1	28.00	14.00±6.00	28.00	14.00±6.00	0.00	0.00	2640.00	1320.00±680.00	2640.00	1320.00±680.00	0.00	0.00
Kanc	313.00	104.33±32.33	132.00	44.00±13.01	181.00	60.33±21.54	10080.00	3360.00±277.13	4264.00	1421.33±206.06	5816.00	1938.67±263.33
Pacg	361.00	45.13±6.47	140.00	17.50±1.59	221.00	31.57±3.79	21110.00	2638.75±397.16	9110.00	1138.75±207.75	12000.00	1714.29±302.87
Katb	326.00	36.22±5.81	135.00	15.00±2.30	191.00	23.88±3.71	8860.00	984.44±173.23	3664.00	407.11±80.54	5196.00	649.50±82.09
Total	19638.00	41.69±1.96	9644.00	20.48±0.55	9994.00	30.56±2.03	1378076.00	2925.85±69.07	788123.00	1673.30±45.59	589953.00	1804.14±50.30

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, cons-consumption, qty- quantity, kg- kilograms, INR- Indian Rupee and SE- standard error.

Appendix Table 6.75. Total mean annual quantities of fuelwood material extraction from both inside and outside the Reserve by villages selected for a socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fuelwood extraction (both inside and outside Reserve)									
	Total annual extraction qty (in kg)		Total annual self-cons qty (in kg)		Total annual sale qty (in kg)		Sale @INR/kg		Total annual income generated (in INR)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	19035.00	2115.00±359.83	15205.00	1689.44±406.34	3830.00	1276.67±267.35	65.00	21.67±3.33	77750.00	25916.67±1474.32
Belo	52767.00	2294.22±272.89	33501.00	1456.57±165.75	19266.00	1482.00±246.30	260.00	20.00±0.80	377445.00	29034.23±4481.32
Tamp	47375.00	2786.76±407.10	30167.00	1774.53±240.35	17208.00	2458.29±389.98	143.00	20.43±1.36	358840.00	51262.86±10105.61
Japp	13230.00	1890.00±225.27	10718.00	1531.14±235.71	2512.00	1256.00±196.00	40.00	20.00±5.00	52200.00	26100.00±10200.00
Meth	160286.00	2627.64±137.05	76156.00	1248.46±82.65	84130.00	1682.60±97.52	1059.00	21.18±0.50	1773882.00	35477.64±2202.67
Borj	61636.00	2568.17±244.09	33418.00	1392.42±118.78	28218.00	1881.20±229.63	340.00	22.67±0.83	635070.00	42338.00±5714.61
Hali	34360.00	3123.64±503.32	19455.00	1768.64±214.57	14905.00	1863.13±358.79	175.00	21.88±1.62	319175.00	39896.88±8607.19
Silj	111396.00	4284.46±333.10	52447.00	2017.19±231.77	58949.00	2456.21±225.58	505.00	21.04±0.85	1262395.00	52599.79±6067.97
Sild1	68050.00	3402.50±367.27	33235.00	1661.75±206.70	34815.00	2047.94±258.65	360.00	21.18±0.68	742135.00	43655.00±6461.48
Sild2	65370.00	3845.29±234.68	33338.00	1961.06±155.61	32032.00	1884.24±134.09	370.00	21.76±1.05	705005.00	41470.88±3746.12
Gosh	137886.00	3133.77±172.71	89437.00	2032.66±158.07	48449.00	1794.41±131.42	625.00	23.15±0.54	1130795.00	41881.30±3347.90
Domj1	57041.00	4074.36±241.85	28086.00	2006.14±132.67	28955.00	2068.21±224.54	335.00	23.93±0.57	696325.00	49737.50±5644.54
Domj2	26370.00	4395.00±630.71	12478.00	2079.67±460.21	13892.00	2315.33±212.50	140.00	23.33±1.05	330080.00	55013.33±6967.47
Kazi	20925.00	2989.29±665.70	17025.00	2432.14±460.71	3900.00	1950.00±1170.00	45.00	22.50±2.50	93600.00	46800.00±31200.00

Village	Fuelwood extraction (both inside and outside Reserve)									
	Total annual extraction qty (in kg)		Total annual self-cons qty (in kg)		Total annual sale qty (in kg)		Sale @INR/kg		Total annual income generated (in INR)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Mohp	45536.00	3794.67±454.20	28494.00	2374.50±389.53	17042.00	2130.25±271.55	190.00	23.75±0.82	408050.00	51006.25±7300.86
Koho2	28025.00	1868.33±225.06	25505.00	1700.33±227.71	2520.00	1260.00±300.00	40.00	20.00±0.00	50400.00	25200.00±6000.00
Panb	29812.00	4258.86±635.72	15458.00	2208.29±349.94	14354.00	2050.57±360.70	158.00	22.57±1.17	338564.00	48366.29±10140.91
Hati	66558.00	4159.88±414.6	32100.00	2006.25±190.75	34458.00	2297.20±229.77	355.00	23.67±0.59	803150.00	53543.33±4770.55
Baga	183177.00	3738.31±324.18	120466.00	2458.49±186.85	62711.00	2612.96±263.24	518.00	21.58±0.51	1354835.00	56451.46±6250.65
Harm	108105.00	3487.26±257.19	65509.00	2113.19±144.05	42596.00	2366.44±251.72	380.00	21.11±0.65	914620.00	50812.22±6552.08
Nanc	21428.00	3571.33±414.14	9352.00	1558.67±222.65	12076.00	2012.67±340.25	130.00	21.67±1.05	259120.00	43186.67±6965.90
Naja	94801.00	4121.78±290.43	45575.00	1981.52±229.45	49226.00	2344.10±148.69	435.00	20.71±0.52	1013240.00	48249.52±3272.56
Bagh	40976.00	2410.35±183.42	26493.00	1558.41±168.74	14483.00	1448.30±147.17	210.00	21.00±0.67	307420.00	30742.00±3830.81
Kawa	8066.00	2688.67±811.42	7041.00	2347.00±996.67	1025.00	1025.00±0.00	20.00	20.00±0.00	20500.00	20500.00±0.00
Band	37228.00	4653.50±386.35	15536.00	1942.00±155.55	21692.00	2711.50±300.25	170.00	21.25±0.82	464600.00	58075.00±7214.36
Deop	64517.00	2805.09±209.48	32686.00	1421.13±93.21	31831.00	1675.32±131.74	420.00	22.11±0.58	693785.00	36515.00±2549.99
Nahr	51045.00	3403.00±502.11	33855.00	2257.00±265.13	17190.00	2865.00±553.94	145.00	24.17±0.83	416700.00	69450.00±14214.75
Bura1	2688.00	1344.00±656.00	2688.00	1344.00±656.00	0.00	0.00	0.00	0.00	0.00	0.00
Kanc	41824.00	4647.11±425.59	18758.00	2084.22±276.79	23066.00	2562.89±192.49	200.00	22.22±0.88	512860.00	56984.44±5017.72
Pacg	49450.00	2908.82±371.39	22294.00	1311.41±182.37	27156.00	1697.25±247.39	345.00	21.56±0.99	628555.00	39284.69±6671.06
Katb	19502.00	1772.91±307.52	7701.00	700.09±116.30	11801.00	1180.10±184.59	220.00	22.00±0.82	253805.00	25380.50±3850.52
Total	1768465.00	3215.39±67.49	994177.00	1807.59±41.62	774288.00	2011.14±47.28	8398.00	21.81±0.16	16994901.00	44142.60±1151.13

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaihari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, cons-consumption, qty- quantity, kg- kilograms, INR- Indian Rupee and SE- standard error.

Appendix Table 6.76. List of extracted fuelwood species by villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Scientific name	Family	Use	Total	%
<i>Acacia catechu</i> (L.f.) Willd.	Leguminosae	Firewood	158	28.73
<i>Acacia nilotica</i> (L.) Delile	Leguminosae	Firewood	70	12.73
<i>Aegle marmelos</i> (L.) Corrêa	Rutaceae	Firewood	49	8.91
<i>Ailanthus excelsa</i> Roxb.	Simaroubaceae	Firewood	57	10.36
<i>Albizia lebbek</i> (L.) Benth.	Leguminosae	Firewood	187	34.00
<i>Albizia odoratissima</i> (L.f.) Benth.	Leguminosae	Firewood	142	25.82
<i>Albizia procera</i> (Roxb.) Benth.	Leguminosae	Firewood	351	63.82
<i>Alstonia scholaris</i> (L.) R. Br.	Apocynaceae	Firewood	108	19.64
<i>Artocarpus</i> spp.	Moraceae	Firewood	51	9.27
<i>Azadirachta indica</i> A.Juss.	Meliaceae	Firewood	47	8.55

Scientific name	Family	Use	Total	%
<i>Baccaurea ramiflora</i> Lour.	Phyllanthaceae	Firewood	116	21.09
<i>Barringtonia acutangula</i> (L.) Gaertn.	Lecythidaceae	Firewood	135	24.55
<i>Bauhinia purpurea</i> L.	Leguminosae	Firewood	167	30.36
<i>Bauhinia variegata</i> L.	Leguminosae	Firewood	156	28.36
<i>Bischofia javanica</i> Blume	Phyllanthaceae	Firewood	149	27.09
<i>Bombax ceiba</i> L.	Malvaceae	Firewood	98	17.82
<i>Bridelia retusa</i> (L.) A.Juss.	Phyllanthaceae	Firewood	83	15.09
<i>Butea monosperma</i> (Lam.) Taub.	Leguminosae	Firewood	69	12.55
<i>Calamus tenuis</i> Roxb.	Arecaceae	Firewood	32	5.82
<i>Callistemon citrinus</i> (Curtis) Skeels	Myrtaceae	Firewood	43	7.82
<i>Camellia sinensis</i> (L.) Kuntze	Theaceae	Firewood	62	11.27
<i>Cassia fistula</i> L.	Leguminosae	Firewood	67	12.18
<i>Cordia dichotoma</i> G.Forst.	Boraginaceae	Firewood	65	11.82
<i>Crateva nurvala</i> Buch.-Ham.	Capparaceae	Firewood	118	21.45
<i>Dalbergia sissoo</i> DC.	Leguminosae	Firewood	170	30.91
<i>Delonix regia</i> (Hook.) Raf.	Leguminosae	Firewood	106	19.27
<i>Derris robusta</i> (DC.) Benth.	Leguminosae	Firewood	61	11.09
<i>Dillenia indica</i> L.	Dilleniaceae	Firewood	81	14.73
<i>Dillenia pentagyna</i> Roxb.	Dilleniaceae	Firewood	76	13.82
<i>Dipterocarpus</i> spp.	Dipterocarpaceae	Firewood	104	18.91
<i>Duabanga grandiflora</i> (DC.) Walp.	Lythraceae	Firewood	75	13.64
<i>Dysoxylum gotadhora</i> (Buch.-Ham.) Mabb.	Meliaceae	Firewood	74	13.45
<i>Ehretia acuminata</i> R.Br.	Boraginaceae	Firewood	62	11.27
<i>Erythrina variegata</i> L.	Leguminosae	Firewood	56	10.18
<i>Ficus</i> spp.	Moraceae	Firewood	48	8.73
<i>Flueggea virosa</i> (Roxb. ex Willd.) Royle	Phyllanthaceae	Firewood	36	6.55
<i>Glochidion multiloculare</i> (Rottler ex Willd.) Voigt	Phyllanthaceae	Firewood	34	6.18
<i>Gmelina arborea</i> Roxb.	Lamiaceae	Firewood	173	31.45
<i>Ipomoea carnea</i> Jacq.	Convolvulaceae	Firewood	17	3.09
<i>Lagerstroemia parviflora</i> Roxb.	Lythraceae	Firewood	180	32.73
<i>Lagerstroemia speciosa</i> (L.) Pers.	Lythraceae	Firewood	253	46.00
<i>Litsea salicifolia</i> (J. Roxb. ex Nees) Hook. f.	Lauraceae	Religious	42	7.64
<i>Mangifera indica</i> L.	Anacardiaceae	Firewood	50	9.09
<i>Melia azedarach</i> L.	Meliaceae	Firewood	64	11.64
<i>Morus alba</i> L.	Moraceae	Firewood	46	8.36
<i>Neolamarckia cadamba</i> (Roxb.) Bosser	Rubiaceae	Firewood	78	14.18
<i>Oroxylum indicum</i> (L.) Kurz	Bignoniaceae	Firewood	80	14.55
<i>Phyllanthus acidus</i> (L.) Skeels	Phyllanthaceae	Firewood	59	10.73
<i>Phyllanthus emblica</i> L.	Phyllanthaceae	Firewood	73	13.27
<i>Pterospermum acerifolium</i> (L.) Willd.	Malvaceae	Firewood	68	12.36
<i>Senna siamea</i> (Lam.) H.S.Irwin & Barneby	Leguminosae	Firewood	71	12.91

Scientific name	Family	Use	Total	%
<i>Shorea robusta</i> Gaertn.	Dipterocarpaceae	Firewood	85	15.45
<i>Sterculia villosa</i> Roxb.	Malvaceae	Firewood	90	16.36
<i>Stereospermum chelonoides</i> (L.f.) DC.	Bignoniaceae	Firewood	58	10.55
<i>Streblus asper</i> Lour.	Moraceae	Firewood	60	10.91
<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	Firewood	44	8.00
<i>Tamarindus indica</i> L.	Leguminosae	Firewood	55	10.00
<i>Tectona grandis</i> L.f.	Lamiaceae	Firewood	93	16.91
<i>Terminalia</i> spp.	Combretaceae	Firewood	53	9.64
<i>Tetrameles nudiflora</i> R. Br.	Tetramelaceae	Firewood	225	40.91
<i>Toona ciliata</i> M.Roem.	Meliaceae	Firewood	63	11.45
<i>Ziziphus jujuba</i> Mill.	Rhamnaceae	Firewood	52	9.45

Appendix Table 6.77. Details of respondents involved in fuelwood material extraction (travelling distance, gender, age and qualification) in the villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Total visitors	Distance home to extraction location (in km)		Distance travelled inside Reserve for extraction (in km)		Respondent details													
						Gender				Age group						Qualification			
		Total	Mean±SE	Total	Mean±SE	Female		Male		10-30		31-60		≤61		Illiterate		Literate	
						Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	44	3.24	0.32±0.02	1.35	0.13±0.01	9	20.45	35	79.55	22	50.00	21	47.73	1	2.27	24	54.55	20	45.45
Belo	73	14.47	1.45±0.04	3.70	0.37±0.03	22	30.14	51	69.86	27	36.99	41	56.16	5	6.85	45	61.64	28	38.36
Tamp	63	2.69	0.27±0.03	3.98	0.40±0.03	13	20.63	50	79.37	25	39.68	37	58.73	1	1.59	36	57.14	27	42.86
Japp	44	13.59	1.36±0.08	4.40	0.44±0.03	10	22.73	34	77.27	17	38.64	25	56.82	2	4.55	29	65.91	15	34.09
Meth	29	13.59	1.36±0.01	2.09	0.21±0.04	5	17.24	24	82.76	14	48.28	13	44.83	2	6.90	22	75.86	7	24.14
Borj	33	16.88	1.69±0.03	1.89	0.19±0.04	8	24.24	25	75.76	14	42.42	18	54.55	1	3.03	18	54.55	15	45.45
Hali	55	14.05	1.40±0.02	1.41	0.14±0.02	10	18.18	45	81.82	14	25.45	38	69.09	3	5.45	37	67.27	18	32.73
Silj	71	14.14	1.41±0.05	2.35	0.23±0.02	17	23.94	54	76.06	33	46.48	31	43.66	7	9.86	53	74.65	18	25.35
Sild1	44	6.46	0.65±0.02	0.82	0.08±0.01	11	25.00	33	75.00	21	47.73	20	45.45	3	6.82	26	59.09	18	40.91
Sild2	40	15.30	1.53±0.04	2.67	0.27±0.01	10	25.00	30	75.00	17	42.50	21	52.50	2	5.00	27	67.50	13	32.50
Gosh	76	3.81	0.38±0.02	0.74	0.07±0.00	18	23.68	58	76.32	24	31.58	47	61.84	5	6.58	55	72.37	21	27.63
Domj1	38	7.62	0.76±0.02	1.13	0.11±0.01	9	23.68	29	76.32	23	60.53	13	34.21	2	5.26	26	68.42	12	31.58
Domj2	34	6.50	0.65±0.02	1.42	0.14±0.03	11	32.35	23	67.65	11	32.35	20	58.82	3	8.82	20	58.82	14	41.18
Kazi	48	11.25	1.13±0.08	1.11	0.11±0.01	10	20.83	38	79.17	26	54.17	20	41.67	2	4.17	33	68.75	15	31.25
Mohp	58	8.19	0.82±0.06	1.90	0.19±0.01	13	22.41	45	77.59	27	46.55	29	50.00	2	3.45	42	72.41	16	27.59
Koho2	52	16.77	1.68±0.10	3.82	0.38±0.02	9	17.31	43	82.69	21	40.38	27	51.92	4	7.69	35	67.31	17	32.69
Panb	25	13.19	1.32±0.07	3.20	0.32±0.02	5	20.00	20	80.00	10	40.00	13	52.00	2	8.00	18	72.00	7	28.00
Hati	32	9.62	0.96±0.08	4.16	0.42±0.02	13	40.63	19	59.38	14	43.75	15	46.88	3	9.38	20	62.50	12	37.50
Baga	38	5.51	0.55±0.03	3.77	0.38±0.02	8	21.05	30	78.95	18	47.37	18	47.37	2	5.26	27	71.05	11	28.95
Harm	41	4.08	0.41±0.03	0.64	0.06±0.00	9	21.95	32	78.05	12	29.27	27	65.85	2	4.88	23	56.10	18	43.90
Nanc	40	5.61	0.56±0.02	0.56	0.06±0.00	12	30.00	28	70.00	18	45.00	21	52.50	1	2.50	28	70.00	12	30.00

Village	Total visitors	Distance home to extraction location (in km)		Distance travelled inside Reserve for extraction (in km)		Respondent details													
						Gender				Age group						Qualification			
						Female		Male		10-30		31-60		≤61		Illiterate		Literate	
		Total	Mean±SE	Total	Mean±SE	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Naja	49	5.86	0.59±0.01	0.77	0.08±0.02	9	18.37	40	81.63	20	40.82	26	53.06	3	6.12	34	69.39	15	30.61
Bagh	58	6.51	0.65±0.01	2.52	0.25±0.02	11	18.97	47	81.03	33	56.90	24	41.38	1	1.72	40	68.97	18	31.03
Kawa	49	7.88	0.79±0.01	1.55	0.16±0.01	11	22.45	38	77.55	17	34.69	29	59.18	3	6.12	33	67.35	16	32.65
Band	89	0.47	0.05±0.00	0.33	0.03±0.00	24	26.97	65	73.03	38	42.70	46	51.69	5	5.62	63	70.79	26	29.21
Deop	65	4.27	0.43±0.03	0.79	0.08±0.00	16	24.62	49	75.38	28	43.08	28	43.08	9	13.85	44	67.69	21	32.31
Nahr	49	2.12	0.21±0.03	0.38	0.04±0.00	14	28.57	35	71.43	21	42.86	27	55.10	1	2.04	35	71.43	14	28.57
Bura1	66	3.35	0.33±0.05	0.32	0.03±0.00	17	25.76	49	74.24	27	40.91	38	57.58	1	1.52	47	71.21	19	28.79
Kanc	84	5.04	0.50±0.02	0.31	0.03±0.00	18	21.43	66	78.57	37	44.05	44	52.38	3	3.57	59	70.24	25	29.76
Pacg	51	5.71	0.57±0.03	3.84	0.38±0.02	9	17.65	42	82.35	12	23.53	35	68.63	4	7.84	34	66.67	17	33.33
Katb	59	5.68	0.57±0.02	3.88	0.39±0.02	12	20.34	47	79.66	23	38.98	35	59.32	1	1.69	37	62.71	22	37.29
Total	1597	253.43	8.18±0.86	61.77	1.99±0.25	373	23.36	1224	76.64	664	41.58	847	53.04	86	5.39	1070	67.00	527	33.00

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, km- kilometres, SE- standard error, ≤- more than equals to and %- in percentages.

Appendix Table 6.78. Details of respondents involved in fuelwood material extraction (religion and caste) in the villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Respondent details																	
	Religion						Caste											
	Christian		Hindu		Muslim		General		Minority		Other Backward Class		Scheduled Castes		Scheduled Tribes		Tea Tribes	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	0	0.00	44	100	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	44	100	0	0.00
Belo	0	0.00	73	100	0	0.00	8	10.96	0	0.00	6	8.22	6	8.22	53	72.60	0	0.00
Tamp	0	0.00	63	100	0	0.00	0	0.00	0	0.00	58	92.06	5	7.94	0	0.00	0	0.00
Japp	0	0.00	44	100	0	0.00	0	0.00	0	0.00	8	18.18	34	77.27	1	2.27	1	2.27
Meth	5	17.24	24	82.76	0	0.00	1	3.45	0	0.00	2	6.90	7	24.14	1	3.45	18	62.07
Borj	0	0.00	33	100	0	0.00	2	6.06	0	0.00	5	15.15	1	3.03	0	0.00	25	75.76
Hali	0	0.00	53	96.36	2	3.64	0	0.00	2	3.64	29	52.73	0	0.00	0	0.00	24	43.64
Silj	0	0.00	68	95.77	3	4.23	5	7.04	3	4.23	6	8.45	0	0.00	0	0.00	57	80.28
Sild1	0	0.00	42	95.45	2	4.55	3	6.82	2	4.55	4	9.09	0	0.00	0	0.00	35	79.55
Sild2	0	0.00	40	100	0	0.00	2	5.00	0	0.00	0	0.00	0	0.00	29	72.50	9	22.50
Gosh	0	0.00	76	100	0	0.00	15	19.74	0	0.00	0	0.00	0	0.00	3	3.95	58	76.32
Domj1	0	0.00	35	92.11	3	7.89	5	13.16	3	7.89	22	57.89	0	0.00	0	0.00	8	21.05
Domj2	0	0.00	32	94.12	2	5.88	3	8.82	2	5.88	23	67.65	0	0.00	0	0.00	6	17.65

Village	Respondent details																	
	Religion						Caste											
	Christian		Hindu		Muslim		General		Minority		Other Backward Class		Scheduled Castes		Scheduled Tribes		Tea Tribes	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Kazi	0	0.00	48	100	0	0.00	0	0.00	0	0.00	13	27.08	0	0.00	35	72.92	0	0.00
Mohp	0	0.00	58	100	0	0.00	10	17.24	0	0.00	42	72.41	0	0.00	0	0.00	6	10.34
Koho2	4	7.69	48	92.31	0	0.00	7	13.46	0	0.00	31	59.62	0	0.00	0	0.00	14	26.92
Panb	0	0.00	25	100	0	0.00	0	0.00	0	0.00	0	0.00	5	20.00	0	0.00	20	80.00
Hati	0	0.00	32	100	0	0.00	0	0.00	0	0.00	0	0.00	11	34.38	1	3.13	20	62.50
Baga	0	0.00	38	100	0	0.00	6	15.79	0	0.00	4	10.53	1	2.63	0	0.00	27	71.05
Harm	0	0.00	21	51.22	20	48.78	8	19.51	20	48.78	3	7.32	2	4.88	0	0.00	8	19.51
Nanc	0	0.00	1	2.50	39	97.50	1	2.50	39	97.50	0	0.00	0	0.00	0	0.00	0	0.00
Naja	0	0.00	12	24.49	37	75.51	5	10.20	37	75.51	6	12.24	0	0.00	1	2.04	0	0.00
Bagh	0	0.00	44	75.86	14	24.14	19	32.76	14	24.14	19	32.76	6	10.34	0	0.00	0	0.00
Kawa	0	0.00	0	0.00	49	100	0	0.00	49	100	0	0.00	0	0.00	0	0.00	0	0.00
Band	0	0.00	0	0.00	89	100	0	0.00	89	100	0	0.00	0	0.00	0	0.00	0	0.00
Deop	0	0.00	14	21.54	51	78.46	0	0.00	51	78.46	6	9.23	2	3.08	1	1.54	5	7.69
Nahr	0	0.00	49	100	0	0.00	0	0.00	0	0.00	2	4.08	5	10.20	7	14.29	35	71.43
Bura1	0	0.00	66	100	0	0.00	0	0.00	0	0.00	0	0.00	10	15.15	6	9.09	50	75.76
Kanc	0	0.00	81	96.43	3	3.57	1	1.19	3	3.57	5	5.95	0	0.00	70	83.33	5	5.95
Pacg	0	0.00	41	80.39	10	19.61	7	13.73	10	19.61	34	66.67	0	0.00	0	0.00	0	0.00
Katb	0	0.00	56	94.92	3	5.08	11	18.64	3	5.08	40	67.80	5	8.47	0	0.00	0	0.00
Total	9	0.56	1261	78.96	327	20.48	119	7.45	327	20.48	368	23.04	100	6.26	252	15.78	431	26.99

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.79. Fuelwood material extraction duration, time and awareness about species among villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fuelwood extraction															
	Duration (in min)						Time (in 24 hours)						Aware of collected species			
	≥30		≥31-60		≤61		6:00-9:00		9:01-12:00		12:01-17:00		No		Yes	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	7	15.91	25	56.82	12	27.27	23	52.27	13	29.55	8	18.18	7	15.91	37	84.09
Belo	2	2.74	22	30.14	49	67.12	37	50.68	24	32.88	12	16.44	17	23.29	56	76.71
Tamp	4	6.35	19	30.16	40	63.49	31	49.21	21	33.33	11	17.46	13	20.63	50	79.37
Japp	6	13.64	26	59.09	12	27.27	28	63.64	9	20.45	7	15.91	12	27.27	32	72.73
Meth	15	51.72	14	48.28	0	0.00	14	48.28	9	31.03	6	20.69	6	20.69	23	79.31

Village	Fuelwood extraction															
	Duration (in min)						Time (in 24 hours)						Aware of collected species			
	≥30		≥31-60		≤61		6:00-9:00		9:01-12:00		12:01-17:00		No		Yes	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Borj	9	27.27	23	69.70	1	3.03	21	63.64	9	27.27	3	9.09	7	21.21	26	78.79
Hali	9	16.36	15	27.27	31	56.36	32	58.18	16	29.09	7	12.73	14	25.45	41	74.55
Silj	3	4.23	15	21.13	53	74.65	41	57.75	18	25.35	12	16.90	14	19.72	57	80.28
Sild1	5	11.36	25	56.82	14	31.82	25	56.82	15	34.09	4	9.09	9	20.45	35	79.55
Sild2	9	22.50	22	55.00	9	22.50	20	50.00	13	32.50	7	17.50	9	22.50	31	77.50
Gosh	4	5.26	14	18.42	58	76.32	41	53.95	20	26.32	15	19.74	16	21.05	60	78.95
Domj1	11	28.95	19	50.00	8	21.05	21	55.26	13	34.21	4	10.53	5	13.16	33	86.84
Domj2	11	32.35	19	55.88	4	11.76	18	52.94	10	29.41	6	17.65	6	17.65	28	82.35
Kazi	7	14.58	24	50.00	17	35.42	27	56.25	14	29.17	7	14.58	10	20.83	38	79.17
Mohp	3	5.17	16	27.59	39	67.24	29	50.00	19	32.76	10	17.24	10	17.24	48	82.76
Koho2	4	7.69	20	38.46	28	53.85	27	51.92	11	21.15	14	26.92	9	17.31	43	82.69
Panb	13	52.00	11	44.00	1	4.00	12	48.00	9	36.00	4	16.00	6	24.00	19	76.00
Hati	18	56.25	13	40.63	1	3.13	17	53.13	10	31.25	5	15.63	9	28.13	23	71.88
Baga	11	28.95	23	60.53	4	10.53	25	65.79	8	21.05	5	13.16	10	26.32	28	73.68
Harm	13	31.71	20	48.78	8	19.51	22	53.66	12	29.27	7	17.07	13	31.71	28	68.29
Nanc	14	35.00	21	52.50	5	12.50	22	55.00	10	25.00	8	20.00	8	20.00	32	80.00
Naja	7	14.29	28	57.14	14	28.57	30	61.22	14	28.57	5	10.20	13	26.53	36	73.47
Bagh	7	12.07	22	37.93	29	50.00	33	56.90	15	25.86	10	17.24	11	18.97	47	81.03
Kawa	10	20.41	21	42.86	18	36.73	24	48.98	18	36.73	7	14.29	12	24.49	37	75.51
Band	0	0.00	18	20.22	71	79.78	52	58.43	25	28.09	12	13.48	15	16.85	74	83.15
Deop	0	0.00	22	33.85	43	66.15	34	52.31	19	29.23	12	18.46	13	20.00	52	80.00
Nahr	6	12.24	18	36.73	25	51.02	27	55.10	14	28.57	8	16.33	12	24.49	37	75.51
Bura1	6	9.09	22	33.33	38	57.58	41	62.12	19	28.79	6	9.09	12	18.18	54	81.82
Kanc	1	1.19	14	16.67	69	82.14	46	54.76	24	28.57	14	16.67	20	23.81	64	76.19
Pacg	7	13.73	23	45.10	21	41.18	25	49.02	16	31.37	10	19.61	10	19.61	41	80.39
Katb	6	10.17	15	25.42	38	64.41	36	61.02	17	28.81	6	10.17	19	32.20	40	67.80
Total	228	14.28	609	38.13	760	47.59	881	55.17	464	29.05	252	15.78	347	21.73	1250	78.27

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, ≥- less than equals to, ≤- more than equals to and %- in percentages.

Appendix Table 6.80. Fuelwood material extraction mode, delivery and end use by villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fuelwood extraction																					
	Extraction mode								Delivery mode								End use					
	Axe		Bolo knife		Hand picked		Hand saw		Cart		Cycle		Hand lifting		Two-wheeler		Self		Sale		Both	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	26	59.09	9	20.45	7	15.91	2	4.55	2	4.55	23	52.27	11	25.00	8	18.18	42	95.45	1	2.27	1	2.27
Belo	50	68.49	19	26.03	1	1.37	3	4.11	25	34.25	33	45.21	2	2.74	13	17.81	23	31.51	6	8.22	44	60.27
Tamp	47	74.60	15	23.81	0	0.00	1	1.59	11	17.46	36	57.14	3	4.76	13	20.63	37	58.73	1	1.59	25	39.68
Japp	26	59.09	13	29.55	4	9.09	1	2.27	0	0.00	29	65.91	11	25.00	4	9.09	43	97.73	0	0.00	1	2.27
Meth	10	34.48	5	17.24	13	44.83	1	3.45	0	0.00	9	31.03	20	68.97	0	0.00	29	100	0	0.00	0	0.00
Borj	15	45.45	4	12.12	14	42.42	0	0.00	0	0.00	14	42.42	19	57.58	0	0.00	33	100	0	0.00	0	0.00
Hali	32	58.18	21	38.18	0	0.00	2	3.64	6	10.91	33	60.00	1	1.82	15	27.27	36	65.45	2	3.64	17	30.91
Silj	48	67.61	23	32.39	0	0.00	0	0.00	14	19.72	34	47.89	4	5.63	19	26.76	33	46.48	4	5.63	34	47.89
Sild1	25	56.82	15	34.09	2	4.55	2	4.55	1	2.27	29	65.91	10	22.73	4	9.09	44	100	0	0.00	0	0.00
Sild2	23	57.50	14	35.00	3	7.50	0	0.00	1	2.50	25	62.50	9	22.50	5	12.50	39	97.50	0	0.00	1	2.50
Gosh	49	64.47	24	31.58	1	1.32	2	2.63	27	35.53	35	46.05	1	1.32	13	17.11	16	21.05	7	9.21	53	69.74
Domj1	20	52.63	13	34.21	5	13.16	0	0.00	1	2.63	17	44.74	17	44.74	3	7.89	38	100	0	0.00	0	0.00
Domj2	15	44.12	6	17.65	13	38.24	0	0.00	0	0.00	15	44.12	18	52.94	1	2.94	34	100	0	0.00	0	0.00
Kazi	29	60.42	16	33.33	3	6.25	0	0.00	2	4.17	35	72.92	8	16.67	3	6.25	44	91.67	1	2.08	3	6.25
Mohp	40	68.97	17	29.31	1	1.72	0	0.00	6	10.34	35	60.34	5	8.62	12	20.69	32	55.17	3	5.17	23	39.66
Koho2	33	63.46	18	34.62	0	0.00	1	1.92	4	7.69	35	67.31	8	15.38	5	9.62	45	86.54	1	1.92	6	11.54
Panb	6	24.00	3	12.00	16	64.00	0	0.00	0	0.00	7	28.00	17	68.00	1	4.00	25	100	0	0.00	0	0.00
Hati	9	28.13	8	25.00	15	46.88	0	0.00	0	0.00	9	28.13	21	65.63	2	6.25	31	96.88	0	0.00	1	3.13
Baga	18	47.37	6	15.79	14	36.84	0	0.00	1	2.63	14	36.84	22	57.89	1	2.63	35	92.11	0	0.00	3	7.89
Harm	22	53.66	17	41.46	2	4.88	0	0.00	0	0.00	23	56.10	12	29.27	6	14.63	41	100	0	0.00	0	0.00
Nanc	22	55.00	9	22.50	8	20.00	1	2.50	0	0.00	20	50.00	19	47.50	1	2.50	39	97.50	0	0.00	1	2.50
Naja	29	59.18	17	34.69	3	6.12	0	0.00	5	10.20	32	65.31	9	18.37	3	6.12	46	93.88	0	0.00	3	6.12
Bagh	37	63.79	21	36.21	0	0.00	0	0.00	7	12.07	36	62.07	4	6.90	11	18.97	34	58.62	1	1.72	23	39.66
Kawa	32	65.31	16	32.65	1	2.04	0	0.00	2	4.08	33	67.35	8	16.33	6	12.24	43	87.76	1	2.04	5	10.20
Band	57	64.04	28	31.46	0	0.00	4	4.49	27	30.34	45	50.56	0	0.00	17	19.10	16	17.98	5	5.62	68	76.40
Deop	40	61.54	25	38.46	0	0.00	0	0.00	14	21.54	38	58.46	5	7.69	8	12.31	27	41.54	5	7.69	33	50.77
Nahr	31	63.27	18	36.73	0	0.00	0	0.00	1	2.04	36	73.47	5	10.20	7	14.29	42	85.71	1	2.04	6	12.24
Bura1	41	62.12	23	34.85	1	1.52	1	1.52	16	24.24	38	57.58	3	4.55	9	13.64	26	39.39	4	6.06	36	54.55
Kanc	53	63.10	26	30.95	0	0.00	5	5.95	21	25.00	41	48.81	2	2.38	20	23.81	12	14.29	4	4.76	68	80.95
Pacg	28	54.90	20	39.22	2	3.92	1	1.96	1	1.96	33	64.71	9	17.65	8	15.69	45	88.24	2	3.92	4	7.84
Katb	40	67.80	15	25.42	2	3.39	2	3.39	11	18.64	37	62.71	4	6.78	7	11.86	39	66.10	1	1.69	19	32.20
Total	953	59.67	484	30.31	131	8.20	29	1.82	206	12.90	879	55.04	287	17.97	225	14.09	1069	66.94	50	3.13	478	29.93

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.81. Daily quantities of fuelwood material extraction by villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fuelwood extraction					
	Total annual extraction quantity (day/kg)		Annual self-consumption quantity (day/kg)		Annual sale quantity (day/kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	498.44	49.84±5.64	495.50	49.55±5.64	14.70	14.70±0.00
Belo	949.25	94.92±7.91	573.30	57.33±4.12	603.31	67.03±7.32
Tamp	829.98	83.00±6.74	650.79	65.08±6.10	364.48	52.07±7.61
Japp	432.90	43.29±5.19	427.85	42.79±5.19	20.20	20.20±0.00
Meth	208.64	20.86±3.02	208.64	20.86±3.02	0.00	0.00
Borj	246.99	24.70±3.15	246.99	24.70±3.15	0.00	0.00
Hali	701.98	70.20±6.48	572.82	57.28±3.55	336.09	48.01±5.80
Silj	921.64	92.16±7.18	633.14	63.31±5.47	639.93	63.99±5.97
Sild1	470.84	47.08±5.49	470.84	47.08±5.49	0.00	0.00
Sild2	376.93	37.69±4.78	373.01	37.30±4.78	15.70	15.70±0.00
Gosh	986.20	98.62±7.85	556.75	55.67±2.14	641.44	64.14±7.01
Domj1	337.93	33.79±4.53	337.93	33.79±4.53	0.00	0.00
Domj2	264.15	26.42±3.40	264.15	26.42±3.40	0.00	0.00
Kazi	530.31	53.03±6.34	501.52	50.15±5.54	194.75	64.92±12.52
Mohp	763.67	76.37±6.56	592.43	59.24±4.22	308.18	51.36±6.11
Koho2	639.26	63.93±6.29	588.56	58.86±5.77	285.10	57.02±16.98
Panb	193.21	19.32±2.52	193.21	19.32±2.52	0.00	0.00
Hati	215.10	21.51±3.31	213.62	21.36±3.24	7.40	7.40±0.00
Baga	291.80	29.18±3.78	277.77	27.78±3.45	65.55	32.78±14.63
Harm	402.72	40.27±5.09	402.72	40.27±5.09	0.00	0.00
Nanc	315.62	31.56±4.10	308.82	30.88±3.81	40.80	40.80±0.00
Naja	540.86	54.09±5.87	529.38	52.94±5.90	54.30	18.10±5.36
Bagh	727.06	72.71±6.54	562.14	56.21±4.38	331.72	47.39±6.43
Kawa	580.33	58.03±6.06	544.34	54.43±5.39	207.70	41.54±9.33
Band	1068.16	106.82±7.82	557.98	55.80±4.26	663.63	66.36±4.54
Deop	856.83	85.68±6.88	565.14	56.51±4.91	431.56	61.65±4.43
Nahr	672.24	67.22±6.42	613.45	61.35±4.67	286.37	57.27±5.35
Bura1	885.46	88.55±6.97	588.43	58.84±5.89	498.54	55.39±5.02
Kanc	1030.50	103.05±7.59	520.79	52.08±3.40	605.84	67.32±6.62
Pacg	607.98	60.80±6.15	581.90	58.19±5.71	239.55	47.91±10.78
Katb	794.96	79.50±6.57	650.79	65.08±4.29	296.85	49.47±11.41
Total	18341.95	591.68±48.38	14604.67	471.12±26.12	7153.67	230.76±41.82

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, kg- kilograms and SE- standard error.

Appendix Table 6.82. Total mean annual quantities and income generated from extracted fuelwood material by villages selected for the entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fuelwood extraction									
	Total annual extraction quantity (in kg)		Annual self-consumption quantity (in kg)		Annual sale quantity (in kg)		Sale @INR/kg		Total annual income generated (in INR)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	1993.78	199.38±37.53	1958.50	195.85±37.39	176.40	176.40±0.00	20.00	20.00±0.00	3528.00	3528.00±0.00
Belo	12447.15	1244.71±214.56	6875.91	687.59±93.92	8526.22	947.36±165.50	198.12	22.01±0.40	189350.20	21038.91±3830.95
Tamp	7183.60	718.36±128.84	5222.37	522.24±84.29	3784.85	540.69±100.71	151.34	21.62±0.68	83903.64	11986.23±2494.00
Japp	1526.04	152.60±33.32	1485.64	148.56±33.24	161.60	161.60±0.00	20.00	20.00±0.00	3232.00	3232.00±0.00
Meth	465.21	46.52±11.93	465.21	46.52±11.93	0.00	0.00	0.00	0.00	0.00	0.00
Borj	597.54	59.75±14.04	597.54	59.75±14.04	0.00	0.00	0.00	0.00	0.00	0.00
Hali	4926.09	492.61±107	3591.24	359.12±68.69	3234.92	462.13±90.41	162.00	23.14±0.86	74151.40	10593.06±2162.74
Silj	10423.60	1042.36±172.16	6624.31	662.43±95.47	7955.16	795.52±123.11	225.58	22.56±0.58	181761.76	18176.18±2953.52
Sild1	1789.52	178.95±34.53	1789.52	178.95±34.53	0.00	0.00	0.00	0.00	0.00	0.00
Sild2	1164.07	116.41±24.94	1140.52	114.05±24.91	94.20	94.20±0.00	20.00	20.00±0.00	1884.00	1884.00±0.00
Gosh	13856.43	1385.64±228.62	6956.18	695.62±83.36	9506.92	950.69±173.23	230.57	23.06±0.33	217945.87	21794.59±4013.65
Domj1	1075.96	107.60±24.11	1075.96	107.60±24.11	0.00	0.00	0.00	0.00	0.00	0.00
Domj2	669.15	66.91±14.64	669.15	66.91±14.64	0.00	0.00	0.00	0.00	0.00	0.00
Kazi	2163.42	216.34±39.15	1937.50	193.75±31.37	1341.45	447.15±93.97	75.00	25.00±0.00	33536.25	11178.75±2349.28
Mohp	6085.75	608.58±131.34	4133.76	413.38±76.37	3229.02	538.17±92.85	141.33	23.56±0.47	76257.90	12709.65±2306.42
Koho2	3822.61	382.26±70.83	3322.11	332.21±61.34	2728.45	545.69±179.72	115.00	23.00±1.22	65551.00	13110.20±4702.42
Panb	423.63	42.36±11.05	423.63	42.36±11.05	0.00	0.00	0.00	0.00	0.00	0.00
Hati	530.47	53.05±13.84	520.11	52.01±13.40	51.80	51.80±0.00	25.00	25.00±0.00	1295.00	1295.00±0.00
Baga	732.95	73.29±15.76	684.44	68.44±14.26	243.15	121.58±68.03	45.00	22.50±2.50	5811.00	2905.50±1834.50
Harm	1339.19	133.92±27.01	1339.19	133.92±27.01	0.00	0.00	0.00	0.00	0.00	0.00
Nanc	814.75	81.47±15.88	780.75	78.07±14.76	204.00	204.00±0.00	20.00	20.00±0.00	4080.00	4080.00±0.00
Naja	2493.29	249.33±42.36	2405.76	240.58±41.65	444.60	148.20±48.79	65.00	21.67±1.67	9774.00	3258.00±1097.46
Bagh	5374.31	537.43±122.27	3533.51	353.35±55.44	3461.36	494.48±85.42	157.33	22.48±0.83	77533.16	11076.17±1781.42
Kawa	3019.94	301.99±55.98	2743.84	274.38±50.87	1555.70	311.14±81.47	115.00	23.00±1.22	35655.00	7131.00±2001.09
Band	15919.98	1592.00±237.69	7844.02	784.40±120.83	10333.75	1033.37±139.88	227.38	22.74±0.43	237267.50	23726.75±3515.31
Deop	8696.10	869.61±171.64	4972.81	497.28±96.24	5422.35	774.62±88.56	157.62	22.52±0.37	122889.63	17555.66±1809.66
Nahr	4641.66	464.17±103.97	3916.34	391.63±79.13	3223.67	644.73±83.43	120.00	24.00±1.00	78666.67	15733.33±2397.52
Bura1	9465.69	946.57±171.77	5596.31	559.63±88.44	6373.59	708.18±123.77	212.39	23.60±0.39	150116.37	16679.60±2807.38
Kanc	14916.90	1491.69±242.62	6731.98	673.20±87.67	9587.18	1065.24±178.84	205.98	22.89±0.28	222749.73	24749.97±4228.53
Pacg	3511.69	351.17±66.91	3176.60	317.66±58.68	2416.10	483.22±139.06	117.50	23.50±1.00	58218.50	11643.70±3415.00
Katb	6661.75	666.17±132.09	4969.06	496.91±82.55	3479.90	579.98±132.17	146.29	24.38±0.33	84332.57	14055.43±3156.55
Total	148732.22	4797.81±838.81	97483.76	3144.64±414.66	87536.33	2823.75±600.60	2973.43	95.92±14.89	2019491.13	65144.88±13768.58

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari,

Village	Fuelwood extraction									
	Total annual extraction quantity (in kg)		Annual self-consumption quantity (in kg)		Annual sale quantity (in kg)		Sale @INR/kg		Total annual income generated (in INR)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE

Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, kg- kilograms, INR- Indian Rupee and SE- standard error.

Appendix Table 6.83. List of extracted fuelwood species by villages selected for the entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Scientific name	Family	Use	Total	%
<i>Aglaia spectabilis</i> (Miq.) S.S.Jain & S.Bennet	Meliaceae	Firewood	108	6.76
<i>Ailanthus excelsa</i> Roxb.	Simaroubaceae	Firewood	100	6.26
<i>Albizia lebbek</i> (L.) Benth.	Leguminosae	Firewood	203	12.71
<i>Albizia odoratissima</i> (L.f.) Benth.	Leguminosae	Firewood	157	9.83
<i>Albizia procera</i> (Roxb.) Benth.	Leguminosae	Firewood	225	14.09
<i>Alstonia scholaris</i> (L.) R. Br.	Apocynaceae	Firewood	138	8.64
<i>Artocarpus</i> spp.	Moraceae	Firewood	114	7.14
<i>Baccaurea ramiflora</i> Lour.	Phyllanthaceae	Firewood	123	7.70
<i>Barringtonia acutangula</i> (L.) Gaertn.	Lecythidaceae	Firewood	135	8.45
<i>Bauhinia purpurea</i> L.	Leguminosae	Firewood	189	11.83
<i>Bauhinia variegata</i> L.	Leguminosae	Firewood	165	10.33
<i>Bischofia javanica</i> Blume	Phyllanthaceae	Firewood	158	9.89
<i>Bombax ceiba</i> L.	Malvaceae	Firewood	145	9.08
<i>Bridelia retusa</i> (L.) A.Juss.	Phyllanthaceae	Firewood	119	7.45
<i>Butea monosperma</i> (Lam.) Taub.	Leguminosae	Firewood	94	5.89
<i>Careya arborea</i> Roxb.	Lecythidaceae	Firewood	153	9.58
<i>Cassia fistula</i> L.	Leguminosae	Firewood	126	7.89
<i>Cordia dichotoma</i> G.Forst.	Boraginaceae	Firewood	124	7.76
<i>Crateva nurvala</i> Buch.-Ham.	Capparaceae	Firewood	178	11.15
<i>Dalbergia sissoo</i> DC.	Leguminosae	Firewood	175	10.96
<i>Delonix regia</i> (Hook.) Raf.	Leguminosae	Firewood	127	7.95
<i>Derris robusta</i> (DC.) Benth.	Leguminosae	Firewood	86	5.39
<i>Dillenia indica</i> L.	Dilleniaceae	Firewood	142	8.89
<i>Dillenia pentagyna</i> Roxb.	Dilleniaceae	Firewood	113	7.08
<i>Dipterocarpus</i> spp.	Dipterocarpaceae	Firewood	22	1.38
<i>Duabanga grandiflora</i> (DC.) Walp.	Lythraceae	Firewood	75	4.70
<i>Dysoxylum gotadhora</i> (Buch.-Ham.) Mabb.	Meliaceae	Firewood	52	3.26
<i>Ehretia acuminata</i> R.Br.	Boraginaceae	Firewood	76	4.76
<i>Erythrina variegata</i> L.	Leguminosae	Firewood	55	3.44
<i>Ficus</i> spp.	Moraceae	Firewood	80	5.01

Scientific name	Family	Use	Total	%
<i>Flemingia strobilifera</i> (L.) W.T.Aiton	Leguminosae	Firewood/Religious	68	4.26
<i>Flueggea virosa</i> (Roxb. ex Willd.) Royle	Phyllanthaceae	Firewood	85	5.32
<i>Garcinia xanthochymus</i> Hook.f. ex T.Anderson	Clusiaceae	Firewood	48	3.01
<i>Glochidion multiloculare</i> (Rottler ex Willd.) Voigt	Phyllanthaceae	Firewood	79	4.95
<i>Gmelina arborea</i> Roxb.	Lamiaceae	Firewood	250	15.65
<i>Lagerstroemia parviflora</i> Roxb.	Lythraceae	Firewood	215	13.46
<i>Lagerstroemia speciosa</i> (L.) Pers.	Lythraceae	Firewood	276	17.28
<i>Leea indica</i> (Burm. f.) Merr.	Vitaceae	Firewood	61	3.82
<i>Litsea salicifolia</i> (J. Roxb. ex Nees) Hook. f.	Lauraceae	Religious	87	5.45
<i>Mallotus nudiflorus</i> (L.) Kulju & Welzen	Euphorbiaceae	Firewood	219	13.71
<i>Melia azedarach</i> L.	Meliaceae	Firewood	74	4.63
<i>Neolamarckia cadamba</i> (Roxb.) Bosser	Rubiaceae	Firewood	50	3.13
<i>Oroxylum indicum</i> (L.) Kurz	Bignoniaceae	Firewood	78	4.88
<i>Papilionanthe teres</i> (Roxb.) Schltr.	Orchidaceae	Income source	24	1.50
<i>Phyllanthus acidus</i> (L.) Skeels	Phyllanthaceae	Firewood	69	4.32
<i>Phyllanthus emblica</i> L.	Phyllanthaceae	Firewood	73	4.57
<i>Pterospermum acerifolium</i> (L.) Willd.	Malvaceae	Firewood	53	3.32
<i>Rhynchostylis retusa</i> (L.) Blume	Orchidaceae	Income source	28	1.75
<i>Senna siamea</i> (Lam.) H.S.Irwin & Barneby	Leguminosae	Firewood	81	5.07
<i>Shorea robusta</i> Gaertn.	Dipterocarpaceae	Firewood	70	4.38
<i>Sterculia villosa</i> Roxb.	Malvaceae	Firewood	106	6.64
<i>Stereospermum chelonoides</i> (L.f.) DC.	Bignoniaceae	Firewood	19	1.19
<i>Stereospermum tetragonum</i> DC.	Bignoniaceae	Firewood	25	1.57
<i>Streblus asper</i> Lour.	Moraceae	Firewood	84	5.26
<i>Tamarindus indica</i> L.	Leguminosae	Firewood	36	2.25
<i>Tectona grandis</i> L.f.	Lamiaceae	Firewood	60	3.76
<i>Terminalia</i> spp.	Combretaceae	Firewood	83	5.20
<i>Tetrameles nudiflora</i> R. Br.	Tetramelaceae	Firewood	125	7.83
<i>Toona ciliata</i> M.Roem.	Meliaceae	Firewood	112	7.01
<i>Ziziphus jujuba</i> Mill.	Rhamnaceae	Firewood	148	9.27

Appendix Table 6.84. Fish material purchase total mean annual quantity and expenditure of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fish purchase						
	Purchase (Yes)		Annual qty (in kg)		INR/kg		Total annual expenditure (in INR)
	Total	%	Total	Mean±SE	Total	Mean±SE	Total Mean±SE
Bamg	5	55.56	4500.00	900.00±223.61	245.00	49.00±4.58	208000.00 41600.00±9368.03
Belo	14	53.85	8750.00	625.00±84.80	732.00	52.29±3.42	448000.00 32000.00±4046.94
Tamp	17	85.00	14300.00	841.18±122.94	820.00	48.24±1.35	688250.00 40485.29±6540.19

Village	Fish purchase							
	Purchase (Yes)		Annual qty (in kg)		INR/kg		Total annual expenditure (in INR)	
	Total	%	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Japp	7	53.85	4900.00	700.00±108.56	340.00	48.57±3.03	232500.00	33214.29±4905.79
Meth	38	50.00	27610.00	726.58±64.51	1734.00	45.63±0.90	1251200.00	32926.32±2885.87
Borj	40	81.63	30850.00	771.25±47.06	2062.00	51.55±1.76	1620300.00	40507.50±3307.94
Hali	5	35.71	4550.00	910.00±106.54	230.00	46.00±1.00	209750.00	41950.00±5099.88
Silj	14	50.00	9150.00	653.57±63.00	750.00	53.57±3.21	483750.00	34553.57±3648.08
Sild1	15	71.43	9850.00	656.67±110.83	755.00	50.33±1.50	490500.00	32700.00±5451.26
Sild2	6	35.29	4750.00	791.67±256.39	265.00	44.17±2.39	222250.00	37041.67±12986.28
Gosh	37	84.09	25400.00	686.49±45.55	1787.00	48.30±1.19	1216250.00	32871.62±2145.31
Domj1	12	85.71	8500.00	708.33±103.32	702.00	58.50±4.12	515750.00	42979.17±7039.29
Domj2	3	50.00	1100.00	366.67±44.10	145.00	48.33±1.67	53500.00	17833.33±2603.42
Kazi	2	28.57	2650.00	1325.00±975.00	95.00	47.50±2.50	130750.00	65375.00±49625.00
Mohp	17	80.95	10700.00	629.41±100.83	802.00	47.18±1.52	486250.00	28602.94±4220.54
Koho2	20	80.00	11200.00	560.00±80.83	930.00	46.50±1.67	505000.00	25250.00±3359.15
Panb	6	85.71	2550.00	425.00±107.04	270.00	45.00±1.29	111500.00	18583.33±4413.36
Hati	15	83.33	10700.00	713.33±92.51	745.00	49.67±2.10	550750.00	36716.67±5923.31
Baga	44	86.27	28750.00	653.41±34.50	2197.00	49.93±1.55	1458850.00	33155.68±2328.87
Harm	22	68.75	14400.00	654.55±82.44	1067.00	48.50±1.79	698250.00	31738.64±4214.05
Nanc	9	100	4750.00	527.78±75.05	402.00	44.67±1.22	210450.00	23383.33±3273.59
Naja	21	63.64	14000.00	666.67±85.45	990.00	47.14±1.53	660500.00	31452.38±4049.57
Bagh	17	70.83	9700.00	570.59±104.41	767.00	45.12±0.82	438200.00	25776.47±4698.67
Kawa	1	33.33	650.00	650.00±0.00	45.00	45.00±0.00	29250.00	29250.00±0.00
Band	1	10.00	350.00	350.00±0.00	50.00	50.00±0.00	17500.00	17500.00±0.00
Deop	20	76.92	8900.00	445.00±67.76	1077.00	53.85±2.75	457850.00	22892.50±3167.97
Nahr	14	93.33	9250.00	660.71±121.59	707.00	50.50±2.43	448550.00	32039.29±5647.71
Bura1	2	100	1550.00	775.00±125.00	105.00	52.50±7.50	79500.00	39750.00±750.00
Kanc	10	100	6950.00	695.00±119.83	495.00	49.50±2.03	344750.00	34475.00±6616.52
Pacg	16	84.21	10000.00	625.00±72.46	717.00	44.81±1.13	452000.00	28250.00±3603.46
Katb	10	71.43	7650.00	765.00±125.84	480.00	48.00±2.49	358500.00	35850.00±5381.58
Total	460	69.38	308910.00	671.54±16.95	22508.00	48.93±0.41	15078400.00	32779.13±876.69

Bang- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, qty- quantity, kg- kilograms, INR- Indian Rupee, SE- standard error and %- in percentages.

Appendix Table 6.85. Fish material extraction instrument, location and season of villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fish extraction																			
	Extraction (Yes)		Instrument				Location (area)						Season							
			Nylon fishing net		Bamboo trap		Inside Reserve		Outside Reserve		Both		Summer		Monsoon		Winter		Throughout the year	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	4	44.44	4	100	0	0.00	4	100	4	100	4	100	2	50.00	4	100	1	25.00	0	0.00
Belo	14	53.85	14	100	0	0.00	0	0.00	14	100	0	0.00	5	35.71	14	100	6	42.86	2	14.29
Tamp	5	25.00	5	100	0	0.00	0	0.00	5	100	0	0.00	1	20.00	5	100	1	20.00	0	0.00
Japp	7	53.85	7	100	0	0.00	0	0.00	7	100	0	0.00	1	14.29	7	100	2	28.57	1	14.29
Meth	41	53.95	41	100	0	0.00	0	0.00	41	100	0	0.00	11	26.83	36	87.80	17	41.46	5	12.20
Borj	12	24.49	12	100	0	0.00	0	0.00	12	100	0	0.00	3	25.00	10	83.33	4	33.33	2	16.67
Hali	9	64.29	9	100	0	0.00	7	77.78	9	100	7	77.78	2	22.22	8	88.89	4	44.44	1	11.11
Silj	14	50.00	14	100	0	0.00	14	100	14	100	14	100	4	28.57	13	92.86	8	57.14	3	21.43
Sild1	9	42.86	9	100	0	0.00	0	0.00	9	100	0	0.00	4	44.44	9	100	3	33.33	3	33.33
Sild2	13	76.47	13	100	0	0.00	8	61.54	13	100	8	61.54	2	15.38	12	92.31	4	30.77	1	7.69
Gosh	12	27.27	12	100	0	0.00	10	83.33	12	100	10	83.33	4	33.33	12	100	5	41.67	3	25.00
Domj1	4	28.57	3	75.00	1	25.00	3	75.00	4	100	3	75.00	1	25.00	4	100	3	75.00	0	0.00
Domj2	3	50.00	3	100	0	0.00	3	100	3	100	3	100	1	33.33	3	100	1	33.33	0	0.00
Kazi	5	71.43	5	100	0	0.00	5	100	5	100	5	100	1	20.00	5	100	2	40.00	1	20.00
Mohp	10	47.62	9	90.00	1	10.00	0	0.00	10	100	0	0.00	4	40.00	10	100	2	20.00	2	20.00
Koho2	14	56.00	14	100	0	0.00	1	7.14	14	100	1	7.14	3	21.43	14	100	6	42.86	2	14.29
Panb	3	42.86	3	100	0	0.00	1	33.33	3	100	1	33.33	3	100	3	100	1	33.33	1	33.33
Hati	7	38.89	7	100	0	0.00	2	28.57	7	100	2	28.57	2	28.57	7	100	2	28.57	1	14.29
Baga	10	19.61	10	100	0	0.00	5	50.00	10	100	5	50.00	4	40.00	10	100	4	40.00	2	20.00
Harm	12	37.50	12	100	0	0.00	10	83.33	12	100	10	83.33	2	16.67	10	83.33	8	66.67	1	8.33
Nanc	5	55.56	5	100	0	0.00	0	0.00	5	100	0	0.00	2	40.00	5	100	1	20.00	1	20.00
Naja	15	45.45	14	93.33	1	6.67	11	73.33	15	100	11	73.33	3	20.00	12	80.00	8	53.33	1	6.67
Bagh	16	66.67	13	81.25	3	18.75	4	25.00	16	100	4	25.00	4	25.00	16	100	6	37.50	3	18.75
Kawa	2	66.67	2	100	0	0.00	2	100	2	100	2	100	1	50.00	2	100	1	50.00	1	50.00
Band	9	90.00	9	100	0	0.00	9	100	9	100	9	100	4	44.44	8	88.89	6	66.67	3	33.33
Deop	19	73.08	16	84.21	3	15.79	4	21.05	19	100	4	21.05	7	36.84	17	89.47	10	52.63	5	26.32
Nahr	3	20.00	1	33.33	2	66.67	1	33.33	3	100	1	33.33	1	33.33	2	66.67	3	100	1	33.33
Bura1	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Kanc	3	30.00	1	33.33	2	66.67	0	0.00	3	100	0	0.00	2	66.67	3	100	1	33.33	1	33.33
Pacg	8	42.11	7	87.50	1	12.50	4	50.00	8	100	4	50.00	2	25.00	6	75.00	5	62.50	1	12.50
Katb	6	42.86	6	100	0	0.00	2	33.33	6	100	2	33.33	1	16.67	5	83.33	2	33.33	1	16.67
Total	294	44.34	280	95.24	14	4.76	110	37.41	294	100	110	37.41	87	29.59	272	92.52	127	43.20	49	16.67

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.86. Daily and mean annual quantities of fish material extraction from inside the Reserve by villages selected for a socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fish extraction inside Reserve											
	Extraction qty (day/kg)		Self-cons qty (day/kg)		Sale qty (day/kg)		Annual extraction qty (in kg)		Annual self-cons qty (in kg)		Annual sale qty (in kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	57.00	14.25±1.49	41.00	10.25±2.39	16.00	8.00±1.00	1765.00	441.25±116.63	1088.00	272.00±33.43	677.00	338.50±93.50
Belo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tamp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Japp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Meth	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Borj	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hali	106.00	15.14±1.55	93.00	13.29±1.69	13.00	13.00±0.00	2660.00	380.00±51.64	2426.00	346.57±63.30	234.00	234.00±0.00
Silj	210.00	15.00±1.55	124.00	10.33±1.63	86.00	10.75±2.12	6616.00	472.57±81.80	3503.00	291.92±45.63	3113.00	389.13±105.83
Sild1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sild2	102.00	12.75±1.05	61.00	7.63±1.77	41.00	6.83±0.75	3405.00	425.63±100.71	2302.00	287.75±110.71	1103.00	183.83±49.28
Gosh	150.00	15.00±1.63	74.00	7.40±1.31	76.00	9.50±1.96	2842.00	284.20±30.34	1353.00	135.30±18.11	1489.00	186.13±28.51
Domj1	44.00	14.67±2.60	28.00	9.33±4.84	16.00	8.00±3.00	783.00	261.00±27.22	432.00	144.00±43.27	351.00	175.50±55.50
Domj2	47.00	15.67±2.96	33.00	11.00±3.21	14.00	14.00±0.00	886.00	295.33±75.24	592.00	197.33±55.21	294.00	294.00±0.00
Kazi	84.00	16.80±3.31	84.00	16.80±3.31	0.00	0.00	1562.00	312.40±86.32	1562.00	312.40±86.32	0.00	0.00
Mohp	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Koho2	10.00	10.00±0.00	3.00	3.00±0.00	7.00	7.00±0.00	180.00	180.00±0.00	54.00	54.00±0.00	126.00	126.00±0.00
Panb	10.00	10.00±0.00	10.00	10.00±0.00	0.00	0.00	300.00	300.00±0.00	300.00	300.00±0.00	0.00	0.00
Hati	27.00	13.50±3.50	15.00	7.50±2.50	12.00	12.00±0.00	762.00	381.00±231.00	330.00	165.00±15.00	432.00	432.00±0.00
Baga	67.00	13.40±2.09	55.00	11.00±2.14	12.00	12.00±0.00	2156.00	431.20±130.59	1820.00	364.00±138.29	336.00	336.00±0.00
Harm	137.00	13.70±1.14	87.00	8.70±1.14	50.00	10.00±1.00	3054.00	305.40±60.44	1924.00	192.40±35.12	1130.00	226.00±70.04
Nanc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Naja	160.00	14.55±1.21	116.00	10.55±1.83	44.00	8.80±1.56	3463.00	314.82±30.83	2528.00	229.82±43.62	935.00	187.00±26.58
Bagh	42.00	10.50±1.66	42.00	10.50±1.66	0.00	0.00	1085.00	271.25±61.05	1085.00	271.25±61.05	0.00	0.00
Kawa	18.00	9.00±1.00	18.00	9.00±1.00	0.00	0.00	296.00	148.00±52.00	296.00	148.00±52.00	0.00	0.00
Band	141.00	15.67±2.36	64.00	7.11±1.37	77.00	11.00±2.51	2924.00	324.89±53.97	1162.00	129.11±12.95	1762.00	251.71±47.98
Deop	55.00	13.75±2.17	39.00	9.75±2.95	16.00	8.00±4.00	1546.00	386.50±116.17	1178.00	294.50±129.58	368.00	184.00±152.00
Nahr	18.00	18.00±0.00	18.00	18.00±0.00	0.00	0.00	450.00	450.00±0.00	450.00	450.00±0.00	0.00	0.00
Bura1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kanc	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pacg	54.00	13.50±2.18	25.00	6.25±1.31	29.00	9.67±2.03	1475.00	368.75±102.03	606.00	151.50±21.42	869.00	289.67±75.98
Katb	20.00	10.00±0.00	13.00	6.50±0.50	7.00	3.50±0.50	520.00	260.00±20.00	340.00	170.00±26.00	180.00	90.00±6.00
Total	1559.00	14.17±0.45	1043.00	9.66±0.50	516.00	9.38±0.61	38730.00	352.09±19.12	25331.00	234.55±16.12	13399.00	243.62±22.04

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari,

Village	Fish extraction inside Reserve											
	Extraction qty (day/kg)		Self-cons qty (day/kg)		Sale qty (day/kg)		Annual extraction qty (in kg)		Annual self-cons qty (in kg)		Annual sale qty (in kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE

Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, cons-consumption, qty- quantity, kg- kilograms, INR- Indian Rupee and SE- standard error.

Appendix Table 6.87. Daily and mean annual quantities of fish material extraction from outside the Reserve by villages selected for a socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fish extraction outside Reserve											
	Extraction qty (day/kg)		Self-cons qty (day/kg)		Sale qty (day/kg)		Annual extraction qty (in kg)		Annual self-cons qty (in kg)		Annual sale qty (in kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	15.00	3.75±1.11	8.00	2.00±0.41	7.00	3.50±1.50	1742.00	435.50±252.31	678.00	169.50±55.69	1064.00	532.00±308.00
Belo	83.00	5.93±0.54	77.00	5.50±0.60	6.00	3.00±1.00	4154.00	296.71±40.65	3690.00	263.57±28.73	464.00	232.00±128.00
Tamp	39.00	7.80±1.98	29.00	5.80±1.66	10.00	3.33±0.88	1648.00	329.60±115.05	1172.00	234.40±81.05	476.00	158.67±51.72
Japp	47.00	6.71±0.75	40.00	5.71±1.06	7.00	3.50±0.50	2301.00	328.71±51.20	1995.00	285.00±64.41	306.00	153.00±27.00
Meth	395.00	9.63±0.65	376.00	9.17±0.69	19.00	3.80±0.80	20997.00	512.12±49.06	19888.00	485.07±49.88	1109.00	221.80±50.01
Borj	121.00	10.08±1.12	103.00	8.58±1.40	18.00	6.00±1.15	4800.00	400.00±53.48	4200.00	350.00±63.93	600.00	200.00±44.00
Hali	94.00	10.44±1.14	87.00	9.67±1.27	7.00	7.00±0.00	6824.00	758.22±248.96	6089.00	676.56±241.67	735.00	735.00±0.00
Silj	146.00	10.43±0.94	111.00	7.93±1.14	35.00	5.83±1.14	9084.00	648.86±92.04	6912.00	493.71±104.16	2172.00	362.00±54.68
Sild1	76.00	8.44±1.63	44.00	4.89±0.77	32.00	6.40±1.69	2998.00	333.11±63.93	1806.00	200.67±42.71	1192.00	238.40±68.12
Sild2	91.00	7.00±0.76	61.00	4.69±0.90	30.00	4.29±0.87	3848.00	296.00±28.66	2407.00	185.15±27.61	1441.00	205.86±27.28
Gosh	129.00	10.75±1.13	72.00	6.00±1.14	57.00	7.13±1.33	1452.00	121.00±22.61	828.00	69.00±16.32	624.00	78.00±25.13
Domj1	21.00	5.25±1.65	14.00	3.50±1.85	7.00	3.50±1.50	486.00	121.50±36.05	266.00	66.50±23.55	220.00	110.00±40.00
Domj2	45.00	15.00±2.89	31.00	10.33±2.60	14.00	14.00±0.00	840.00	280.00±105.83	672.00	224.00±128.75	168.00	168.00±0.00
Kazi	68.00	13.60±1.03	68.00	13.60±1.03	0.00	0.00	559.00	111.80±21.92	559.00	111.80±21.92	0.00	0.00
Mohp	121.00	12.10±1.73	99.00	9.90±1.92	22.00	7.33±2.19	1251.00	125.10±22.34	1071.00	107.10±25.80	180.00	60.00±15.87
Koho2	151.00	10.79±0.90	114.00	8.14±1.11	37.00	7.40±1.44	2758.00	197.00±56.39	1668.00	119.14±21.09	1090.00	218.00±95.12
Panb	29.00	9.67±1.20	29.00	9.67±1.20	0.00	0.00	321.00	107.00±19.00	321.00	107.00±19.00	0.00	0.00
Hati	75.00	10.71±1.27	51.00	7.29±1.63	24.00	8.00±1.15	834.00	119.14±27.53	598.00	85.43±29.42	236.00	78.67±24.26
Baga	99.00	9.90±1.45	93.00	9.30±1.56	6.00	6.00±0.00	1704.00	170.40±64.83	1668.00	166.80±65.60	36.00	36.00±0.00
Harm	100.00	8.33±0.99	100.00	8.33±0.99	0.00	0.00	1956.00	163.00±30.71	1956.00	163.00±30.71	0.00	0.00
Nanc	51.00	10.20±1.98	32.00	6.40±1.69	19.00	9.50±1.50	1001.00	200.20±137.87	419.00	83.80±32.33	582.00	291.00±259.00
Naja	123.00	8.20±0.98	109.00	7.27±1.11	14.00	4.67±1.45	2165.00	144.33±45.11	1763.00	117.53±39.07	402.00	134.00±83.16
Bagh	141.00	8.81±1.13	124.00	7.75±0.95	17.00	5.67±3.18	2391.00	149.44±43.19	1771.00	110.69±20.19	620.00	206.67±123.12
Kawa	5.00	2.50±0.50	5.00	2.50±0.50	0.00	0.00	285.00	142.50±97.50	285.00	142.50±97.50	0.00	0.00
Band	67.00	7.44±1.19	41.00	4.56±0.50	26.00	6.50±1.44	1502.00	166.89±38.01	1067.00	118.56±37.69	435.00	108.75±31.76
Deop	165.00	8.68±1.23	122.00	6.42±0.83	43.00	6.14±1.67	4347.00	228.79±88.53	2586.00	136.11±42.50	1761.00	251.57±128.70
Nahr	10.00	3.33±0.88	10.00	3.33±0.88	0.00	0.00	90.00	30.00±15.10	90.00	30.00±15.10	0.00	0.00
Bura1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Village	Fish extraction outside Reserve											
	Extraction qty (day/kg)		Self-cons qty (day/kg)		Sale qty (day/kg)		Annual extraction qty (in kg)		Annual self-cons qty (in kg)		Annual sale qty (in kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Kanc	14.00	4.67±0.88	14.00	4.67±0.88	0.00	0.00	94.00	31.33±6.77	94.00	31.33±6.77	0.00	0.00
Pacg	81.00	10.13±2.22	39.00	4.88±0.90	42.00	6.00±1.96	680.00	85.00±28.50	403.00	50.38±23.48	277.00	39.57±7.96
Katb	36.00	6.00±0.89	21.00	3.50±0.96	15.00	3.00±0.32	5863.00	977.17±538.36	3123.00	520.50±330.72	2740.00	548.00±233.80
Total	2638.00	8.97±0.25	2124.00	7.22±0.25	514.00	5.71±0.36	88975.00	302.64±21.14	70045.00	238.25±17.20	18930.00	210.33±24.02

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, cons-consumption, qty- quantity, kg- kilograms, INR- Indian Rupee and SE- standard error.

Appendix Table 6.88. Total mean annual quantities of fish material extraction from both inside and outside the Reserve by villages selected for a socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fish extraction (both inside and outside Reserve)									
	Total annual extraction qty (in kg)		Total annual self-cons qty (in kg)		Total annual sale qty (in kg)		Sale @INR/kg		Total annual income generated (in INR)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	3507.00	876.75±319.45	1766.00	441.50±64.90	1741.00	870.50±214.50	145.00	72.50±2.50	127295.00	63647.50±17727.50
Belo	4154.00	296.71±40.65	3690.00	263.57±28.73	464.00	232.00±128.00	95.00	47.50±2.50	21400.00	10700.00±5500.00
Tamp	1648.00	329.60±115.05	1172.00	234.40±81.05	476.00	158.67±51.72	135.00	45.00±0.00	21420.00	7140.00±2327.47
Japp	2301.00	328.71±51.20	1995.00	285.00±64.41	306.00	153.00±27.00	95.00	47.50±2.50	14670.00	7335.00±1665.00
Meth	20997.00	512.12±49.06	19888.00	485.07±49.88	1109.00	221.80±50.01	235.00	47.00±2.00	53280.00	10656.00±2371.24
Borj	4800.00	400.00±53.48	4200.00	350.00±63.93	600.00	200.00±44.00	155.00	51.67±7.26	29460.00	9820.00±1085.73
Hali	9484.00	1053.78±257.55	8515.00	946.11±250.37	969.00	969.00±0.00	70.00	70.00±0.00	67830.00	67830.00±0.00
Silj	15700.00	1121.43±116.32	10415.00	743.93±104.59	5285.00	660.63±113.49	480.00	60.00±5.82	345855.00	43231.88±10236.34
Sild1	2998.00	333.11±63.93	1806.00	200.67±42.71	1192.00	238.40±68.12	247.00	49.40±1.17	58456.00	11691.20±3328.86
Sild2	7253.00	557.92±98.60	4709.00	362.23±98.50	2544.00	363.43±39.41	335.00	47.86±1.49	123000.00	17571.43±2181.14
Gosh	4294.00	357.83±51.47	2181.00	181.75±30.39	2113.00	264.13±43.82	410.00	51.25±2.80	104895.00	13111.88±1715.87
Domj1	1269.00	317.25±95.47	698.00	174.50±69.42	571.00	285.50±15.50	95.00	47.50±2.50	27045.00	13522.50±22.50
Domj2	1726.00	575.33±152.08	1264.00	421.33±183.86	462.00	462.00±0.00	45.00	45.00±0.00	20790.00	20790.00±0.00
Kazi	2121.00	424.20±87.91	2121.00	424.20±87.91	0.00	0.00	0.00	0.00	0.00	0.00
Mohp	1251.00	125.10±22.34	1071.00	107.10±25.80	180.00	60.00±15.87	135.00	45.00±2.89	8370.00	2790.00±901.50
Koho2	2938.00	209.86±57.34	1722.00	123.00±20.61	1216.00	243.20±91.08	225.00	45.00±2.24	54600.00	10920.00±3817.39
Panb	621.00	207.00±118.58	621.00	207.00±118.58	0.00	0.00	0.00	0.00	0.00	0.00
Hati	1596.00	228.00±104.28	928.00	132.57±51.85	668.00	222.67±165.16	137.00	45.67±2.33	32712.00	10904.00±8369.73
Baga	3860.00	386.00±146.90	3488.00	348.80±146.60	372.00	372.00±0.00	45.00	45.00±0.00	16740.00	16740.00±0.00
Harm	5010.00	417.50±80.23	3880.00	323.33±45.75	1130.00	226.00±70.04	225.00	45.00±2.74	47705.00	9541.00±2411.42
Nanc	1001.00	200.20±137.87	419.00	83.80±32.33	582.00	291.00±259.00	80.00	40.00±0.00	23280.00	11640.00±10360.00

Village	Fish extraction (both inside and outside Reserve)									
	Total annual extraction qty (in kg)		Total annual self-cons qty (in kg)		Total annual sale qty (in kg)		Sale @INR/kg		Total annual income generated (in INR)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Naja	5628.00	375.20±57.89	4291.00	286.07±48.25	1337.00	222.83±31.58	295.00	49.17±3.27	63215.00	10535.83±1166.46
Bagh	3476.00	217.25±54.53	2856.00	178.50±43.19	620.00	206.67±123.12	135.00	45.00±5.00	30880.00	10293.33±6188.43
Kawa	581.00	290.50±149.50	581.00	290.50±149.50	0.00	0.00	0.00	0.00	0.00	0.00
Band	4426.00	491.78±72.22	2229.00	247.67±40.08	2197.00	313.86±63.97	345.00	49.29±2.30	110195.00	15742.14±3655.48
Deop	5893.00	310.16±97.87	3764.00	198.11±54.83	2129.00	236.56±102.00	430.00	47.78±3.24	119420.00	13268.89±6549.32
Nahr	540.00	180.00±165.01	540.00	180.00±165.01	0.00	0.00	0.00	0.00	0.00	0.00
Bura1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Kanc	94.00	31.33±6.77	94.00	31.33±6.77	0.00	0.00	0.00	0.00	0.00	0.00
Pacg	2155.00	269.38±91.71	1009.00	126.13±46.97	1146.00	163.71±63.56	327.00	46.71±1.57	54030.00	7718.57±2995.88
Katb	6383.00	1063.83±578.09	3463.00	577.17±359.24	2920.00	584.00±245.49	255.00	51.00±4.85	171480.00	34296.00±18391.25
Total	127705.00	434.37±25.27	95376.00	324.41±19.80	32329.00	307.90±26.09	5176.00	49.30±0.88	1748023.00	16647.84±1838.56

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, cons-consumption, qty- quantity, kg- kilograms, INR- Indian Rupee and SE- standard error.

Appendix Table 6.89. List of extracted fish species by villages selected for socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Scientific name	Family	Use	Total	%
<i>Amblypharyngodon mola</i> (Hamilton, 1822)	Cyprinidae	Income source	129	43.88
<i>Anabas testudineus</i> (Bloch, 1792)	Anabantidae	Income source	184	62.59
<i>Aspidoparia</i> spp.	Cyprinidae	Income source	96	32.65
<i>Bangana ariza</i> (Hamilton, 1807)	Cyprinidae	Income source	110	37.41
<i>Brachyura</i> spp.	Cancridae	Income source	25	8.50
<i>Cabdio morar</i> (Hamilton, 1822)	Cyprinidae	Income source	137	46.60
<i>Catla catla</i> (Hamilton, 1822)	Cyprinidae	Income source	124	42.18
<i>Chanda nama</i> (Hamilton, 1822)	Ambassidae	Income source	109	37.07
<i>Chandramara chandramara</i> (Hamilton, 1822)	Bagridae	Income source	112	38.10
<i>Channa gachua</i> (Hamilton, 1822)	Channidae	Income source	93	31.63
<i>Channa marulius</i> (Hamilton, 1822)	Channidae	Income source	142	48.30
<i>Channa punctata</i> (Bloch, 1793)	Channidae	Income source	178	60.54
<i>Channa striata</i> (Bloch, 1793)	Channidae	Income source	127	43.20
<i>Chitala chitala</i> (Hamilton, 1822)	Notopteridae	Income source	140	47.62
<i>Cirrhinus cirrhosus</i> (Bloch, 1795)	Cyprinidae	Income source	120	40.82
<i>Cirrhinus mrigala</i> (Hamilton, 1822)	Cyprinidae	Income source	126	42.86
<i>Clarias batrachus</i> (Linnaeus, 1758)	Clariidae	Income source	164	55.78

Scientific name	Family	Use	Total	%
<i>Ctenopharyngodon idella</i> (Valenciennes, 1844)	Cyprinidae	Income source	48	16.33
<i>Cyprinus carpio</i> (Linnaeus, 1758)	Cyprinidae	Income source	46	15.65
<i>Eutropiichthys vacha</i> (Hamilton, 1822)	Schilbeidae	Income source	115	39.12
<i>Gudusia chapra</i> (Hamilton, 1822)	Clupeidae	Income source	169	57.48
<i>Hemibagrus menoda</i> (Hamilton, 1822)	Bagridae	Income source	113	38.44
<i>Heteropneustes fossilis</i> (Bloch, 1794)	Heteropneustidae	Income source	123	41.84
<i>Hypophthalmichthys molitrix</i> (Valenciennes, 1844)	Cyprinidae	Income source	35	11.90
<i>Labeo bata</i> (Hamilton, 1822)	Cyprinidae	Income source	121	41.16
<i>Labeo calbasu</i> (Hamilton, 1822)	Cyprinidae	Income source	45	15.31
<i>Labeo gonius</i> (Hamilton, 1822)	Cyprinidae	Income source	132	44.90
<i>Labeo nandina</i> (Hamilton, 1822)	Cyprinidae	Income source	36	12.24
<i>Labeo rohita</i> (Hamilton, 1822)	Cyprinidae	Income source	154	52.38
<i>Leiodon cutcutia</i> (Hamilton, 1822)	Tetraodontidae	Income source	106	36.05
<i>Lepidocephalichthys</i> spp.	Cobitidae	Income source	68	23.13
<i>Macrobrachium</i> spp.	Palaemonidae	Income source	31	10.54
<i>Macrognathus aral</i> (Bloch & Schneider, 1801)	Mastacembelidae	Income source	139	47.28
<i>Macrognathus pancalus</i> (Hamilton, 1822)	Mastacembelidae	Income source	157	53.40
<i>Mastacembelus armatus</i> (Lacepède, 1800)	Mastacembelidae	Income source	146	49.66
<i>Monopterusuchia</i> (Hamilton, 1822)	Synbranchidae	Income source	130	44.22
<i>Mystus bleekeri</i> (Day, 1877)	Bagridae	Income source	107	36.39
<i>Mystus cavasius</i> (Hamilton, 1822)	Bagridae	Income source	32	10.88
<i>Mystus tengara</i> (Hamilton, 1822)	Bagridae	Income source	147	50.00
<i>Mystus vittatus</i> (Bloch, 1794)	Bagridae	Income source	98	33.33
<i>Nandus nandus</i> (Hamilton, 1822)	Nandidae	Income source	41	13.95
<i>Notopterus notopterus</i> (Pallas, 1769)	Notopteridae	Income source	162	55.10
<i>Ompok pabo</i> (Hamilton, 1822)	Siluridae	Income source	135	45.92
<i>Opsarius barna</i> (Hamilton, 1822)	Cyprinidae	Income source	57	19.39
<i>Parambassis ranga</i> (Hamilton, 1822)	Ambassidae	Income source	102	34.69
<i>Puntius sophore</i> (Hamilton, 1822)	Cyprinidae	Income source	97	32.99
<i>Puntius</i> spp.	Cyprinidae	Income source	138	46.94
<i>Rasbora daniconius</i> (Hamilton, 1822)	Cyprinidae	Income source	134	45.58
<i>Salmostoma bacaila</i> (Hamilton, 1822)	Cyprinidae	Income source	62	21.09
<i>Sperata seenghala</i> (Sykes, 1839)	Bagridae	Income source	119	40.48
<i>Systomus sarana</i> (Hamilton, 1822)	Cyprinidae	Income source	118	40.14
<i>Tenualosa ilisha</i> (Hamilton, 1822)	Clupeidae	Income source	47	15.99
<i>Trichogaster fasciata</i> (Bloch & Schneider, 1801)	Osphronemidae	Income source	105	35.71
<i>Trichogaster lalius</i> (Hamilton, 1822)	Osphronemidae	Income source	39	13.27
<i>Wallago attu</i> (Bloch & Schneider, 1801)	Siluridae	Income source	125	42.52
<i>Xenentodon cancila</i> (Hamilton, 1822)	Belonidae	Income source	116	39.46

Appendix Table 6.90. Details of respondents involved in fish material extraction (travelling distance, gender, age and qualification) in the villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Total visitors	Distance home to extraction location (in km)		Distance travelled inside Reserve for extraction (in km)		Respondent details													
						Gender				Age group						Qualification			
		Total	Mean±SE	Total	Mean±SE	Female		Male		10-30		31-60		≤61		Illiterate		Literate	
						Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	81	4.04	0.40±0.01	0.32	0.03±0.00	14	17.28	67	82.72	33	40.74	41	50.62	7	8.64	59	72.84	22	27.16
Belo	115	6.51	0.65±0.01	2.52	0.25±0.01	24	20.87	91	79.13	52	45.22	56	48.70	7	6.09	74	64.35	41	35.65
Tamp	86	1.65	0.16±0.02	0.39	0.04±0.00	16	18.60	70	81.40	43	50.00	41	47.67	2	2.33	60	69.77	26	30.23
Japp	111	12.12	1.21±0.08	3.27	0.33±0.02	18	16.22	93	83.78	55	49.55	51	45.95	5	4.50	78	70.27	33	29.73
Meth	40	6.97	0.70±0.07	3.21	0.32±0.02	8	20.00	32	80.00	21	52.50	18	45.00	1	2.50	26	65.00	14	35.00
Borj	49	15.79	1.58±0.03	3.36	0.34±0.02	9	18.37	40	81.63	18	36.73	28	57.14	3	6.12	35	71.43	14	28.57
Hali	101	10.73	1.07±0.08	1.40	0.14±0.01	18	17.82	83	82.18	42	41.58	54	53.47	5	4.95	70	69.31	31	30.69
Silj	128	14.32	1.43±0.01	1.78	0.18±0.01	22	17.19	106	82.81	52	40.63	68	53.13	8	6.25	94	73.44	34	26.56
Sild1	59	5.99	0.60±0.01	0.49	0.05±0.00	8	13.56	51	86.44	23	38.98	34	57.63	2	3.39	41	69.49	18	30.51
Sild2	111	13.87	1.39±0.02	0.97	0.10±0.03	21	18.92	90	81.08	48	43.24	58	52.25	5	4.50	72	64.86	39	35.14
Gosh	125	1.50	0.15±0.01	0.25	0.02±0.00	19	15.20	106	84.80	51	40.80	65	52.00	9	7.20	88	70.40	37	29.60
Domj1	55	9.19	0.92±0.07	0.26	0.03±0.00	10	18.18	45	81.82	24	43.64	29	52.73	2	3.64	41	74.55	14	25.45
Domj2	62	9.30	0.93±0.04	0.26	0.03±0.00	10	16.13	52	83.87	23	37.10	37	59.68	2	3.23	45	72.58	17	27.42
Kazi	85	11.86	1.19±0.06	0.39	0.04±0.00	16	18.82	69	81.18	34	40.00	46	54.12	5	5.88	60	70.59	25	29.41
Mohp	111	8.72	0.87±0.10	0.33	0.03±0.00	24	21.62	87	78.38	49	44.14	60	54.05	2	1.80	81	72.97	30	27.03
Koho2	76	17.43	1.74±0.05	0.45	0.04±0.00	11	14.47	65	85.53	31	40.79	38	50.00	7	9.21	50	65.79	26	34.21
Panb	43	13.58	1.36±0.03	0.73	0.07±0.00	7	16.28	36	83.72	13	30.23	29	67.44	1	2.33	34	79.07	9	20.93
Hati	50	11.22	1.12±0.06	0.46	0.05±0.00	7	14.00	43	86.00	20	40.00	30	60.00	0	0.00	37	74.00	13	26.00
Baga	116	12.52	1.25±0.04	0.55	0.05±0.00	18	15.52	98	84.48	41	35.34	69	59.48	6	5.17	82	70.69	34	29.31
Harm	87	5.65	0.57±0.02	0.23	0.02±0.00	14	16.09	73	83.91	32	36.78	50	57.47	5	5.75	58	66.67	29	33.33
Nanc	78	5.94	0.59±0.02	0.24	0.02±0.00	13	16.67	65	83.33	29	37.18	45	57.69	4	5.13	55	70.51	23	29.49
Naja	83	6.49	0.65±0.02	0.35	0.04±0.00	15	18.07	68	81.93	34	40.96	46	55.42	3	3.61	60	72.29	23	27.71
Bagh	71	7.19	0.72±0.02	0.45	0.04±0.00	12	16.90	59	83.10	29	40.85	39	54.93	3	4.23	51	71.83	20	28.17
Kawa	78	8.13	0.81±0.02	0.27	0.03±0.00	16	20.51	62	79.49	36	46.15	37	47.44	5	6.41	54	69.23	24	30.77
Band	121	1.27	0.13±0.07	0.17	0.02±0.00	23	19.01	98	80.99	47	38.84	64	52.89	10	8.26	82	67.77	39	32.23
Deop	111	5.93	0.59±0.06	0.22	0.02±0.00	15	13.51	96	86.49	41	36.94	65	58.56	5	4.50	76	68.47	35	31.53
Nahr	82	5.93	0.59±0.02	0.22	0.02±0.00	13	15.85	69	84.15	37	45.12	45	54.88	0	0.00	54	65.85	28	34.15
Bura1	59	5.64	0.56±0.02	0.22	0.02±0.00	8	13.56	51	86.44	20	33.90	35	59.32	4	6.78	39	66.10	20	33.90
Kanc	38	5.56	0.56±0.02	0.49	0.05±0.02	5	13.16	33	86.84	18	47.37	18	47.37	2	5.26	25	65.79	13	34.21
Pacg	120	7.41	0.74±0.01	2.06	0.21±0.01	20	16.67	100	83.33	54	45.00	58	48.33	8	6.67	86	71.67	34	28.33
Katb	136	7.51	0.75±0.01	2.19	0.22±0.02	24	17.65	112	82.35	68	50.00	64	47.06	4	2.94	92	67.65	44	32.35
Total	2668	259.97	8.39±0.74	28.51	0.92±0.18	458	17.17	2210	82.83	1118	41.90	1418	53.15	132	4.95	1859	69.68	809	30.32

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari,

Village	Total visitors	Distance home to extraction location (in km)		Distance travelled inside Reserve for extraction (in km)		Respondent details													
						Gender				Age group						Qualification			
		Female		Male		10-30		31-60		≤61		Illiterate		Literate					
		Total	Mean±SE	Total	Mean±SE	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%

Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, km- kilometres, SE- standard error, ≤- more than equals to and %- in percentages.

Appendix Table 6.91. Details of respondents involved in fish material extraction (religion and caste) in the villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Respondent details																	
	Religion						Caste											
	Christian		Hindu		Muslim		General		Minority		Other Backward Class		Scheduled Castes		Scheduled Tribes		Tea Tribes	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	0	0.00	81	100	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	81	100	0	0.00
Belo	0	0.00	115	100	0	0.00	10	8.70	0	0.00	13	11.30	6	5.22	86	74.78	0	0.00
Tamp	0	0.00	86	100	0	0.00	0	0.00	0	0.00	75	87.21	10	11.63	1	1.16	0	0.00
Japp	0	0.00	111	100	0	0.00	0	0.00	0	0.00	15	13.51	86	77.48	2	1.80	8	7.21
Meth	4	10.00	36	90.00	0	0.00	2	5.00	0	0.00	1	2.50	5	12.50	6	15.00	26	65.00
Borj	0	0.00	49	100	0	0.00	3	6.12	0	0.00	4	8.16	3	6.12	0	0.00	39	79.59
Hali	0	0.00	95	94.06	6	5.94	0	0.00	6	5.94	62	61.39	0	0.00	0	0.00	33	32.67
Silj	0	0.00	124	96.88	4	3.13	0	0.00	4	3.13	74	57.81	0	0.00	0	0.00	50	39.06
Sild1	0	0.00	57	96.61	2	3.39	4	6.78	2	3.39	5	8.47	0	0.00	0	0.00	48	81.36
Sild2	0	0.00	111	100	0	0.00	5	4.50	0	0.00	0	0.00	0	0.00	74	66.67	32	28.83
Gosh	0	0.00	125	100	0	0.00	23	18.40	0	0.00	0	0.00	0	0.00	3	2.40	99	79.20
Domj1	0	0.00	52	94.55	3	5.45	2	3.64	3	5.45	38	69.09	1	1.82	0	0.00	11	20.00
Domj2	0	0.00	61	98.39	1	1.61	5	8.06	1	1.61	44	70.97	3	4.84	0	0.00	9	14.52
Kazi	0	0.00	85	100	0	0.00	0	0.00	0	0.00	14	16.47	0	0.00	71	83.53	0	0.00
Mohp	0	0.00	111	100	0	0.00	16	14.41	0	0.00	77	69.37	0	0.00	0	0.00	18	16.22
Koho2	7	9.21	69	90.79	0	0.00	12	15.79	0	0.00	44	57.89	0	0.00	0	0.00	20	26.32
Panb	0	0.00	43	100	0	0.00	0	0.00	0	0.00	0	0.00	12	27.91	0	0.00	31	72.09
Hati	0	0.00	50	100	0	0.00	0	0.00	0	0.00	0	0.00	12	24.00	4	8.00	34	68.00
Baga	0	0.00	108	93.10	8	6.90	5	4.31	8	6.90	20	17.24	3	2.59	0	0.00	80	68.97
Harm	0	0.00	24	27.59	63	72.41	12	13.79	63	72.41	7	8.05	2	2.30	0	0.00	3	3.45
Nanc	0	0.00	1	1.28	77	98.72	1	1.28	77	98.72	0	0.00	0	0.00	0	0.00	0	0.00
Naja	0	0.00	23	27.71	60	72.29	6	7.23	60	72.29	15	18.07	0	0.00	2	2.41	0	0.00
Bagh	0	0.00	38	53.52	33	46.48	15	21.13	33	46.48	12	16.90	11	15.49	0	0.00	0	0.00
Kawa	0	0.00	0	0.00	78	100	0	0.00	78	100	0	0.00	0	0.00	0	0.00	0	0.00
Band	0	0.00	0	0.00	121	100	0	0.00	121	100	0	0.00	0	0.00	0	0.00	0	0.00
Deop	0	0.00	27	24.32	84	75.68	0	0.00	84	75.68	15	13.51	3	2.70	3	2.70	6	5.41

Village	Respondent details																	
	Religion						Caste											
	Christian		Hindu		Muslim		General		Minority		Other Backward Class		Scheduled Castes		Scheduled Tribes		Tea Tribes	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Nahr	0	0.00	73	89.02	9	10.98	0	0.00	9	10.98	5	6.10	3	3.66	16	19.51	49	59.76
Bura1	0	0.00	59	100	0	0.00	0	0.00	0	0.00	0	0.00	8	13.56	1	1.69	50	84.75
Kanc	0	0.00	38	100	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	36	94.74	2	5.26
Pacg	0	0.00	102	85.00	18	15.00	21	17.50	18	15.00	81	67.50	0	0.00	0	0.00	0	0.00
Katb	0	0.00	128	94.12	8	5.88	24	17.65	8	5.88	95	69.85	9	6.62	0	0.00	0	0.00
Total	11	0.41	2082	78.04	575	21.55	166	6.22	575	21.55	716	26.84	177	6.63	386	14.47	648	24.29

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.92. Fish material extraction duration, time and awareness about species among villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fish extraction															
	Duration (in min)						Time (in 24 hours)						Aware of collected species			
	≥30		≥31-60		≤61		6:00-9:00		9:01-12:00		12:01-17:00		No		Yes	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	15	18.52	49	60.49	17	20.99	27	33.33	45	55.56	9	11.11	23	28.40	58	71.60
Belo	4	3.48	32	27.83	79	68.70	36	31.30	60	52.17	19	16.52	31	26.96	84	73.04
Tamp	12	13.95	39	45.35	35	40.70	27	31.40	47	54.65	12	13.95	23	26.74	63	73.26
Japp	11	9.91	27	24.32	73	65.77	32	28.83	62	55.86	17	15.32	33	29.73	78	70.27
Meth	24	60.00	16	40.00	0	0.00	15	37.50	16	40.00	9	22.50	6	15.00	34	85.00
Borj	24	48.98	25	51.02	0	0.00	14	28.57	29	59.18	6	12.24	12	24.49	37	75.51
Hali	14	13.86	36	35.64	51	50.50	25	24.75	55	54.46	21	20.79	28	27.72	73	72.28
Silj	1	0.78	22	17.19	105	82.03	37	28.91	72	56.25	19	14.84	31	24.22	97	75.78
Sild1	19	32.20	35	59.32	5	8.47	16	27.12	34	57.63	9	15.25	11	18.64	48	81.36
Sild2	11	9.91	31	27.93	69	62.16	33	29.73	55	49.55	23	20.72	27	24.32	84	75.68
Gosh	0	0.00	16	12.80	109	87.20	40	32.00	67	53.60	18	14.40	33	26.40	92	73.60
Domj1	16	29.09	37	67.27	2	3.64	11	20.00	35	63.64	9	16.36	14	25.45	41	74.55
Domj2	15	24.19	42	67.74	5	8.06	17	27.42	35	56.45	10	16.13	13	20.97	49	79.03
Kazi	11	12.94	41	48.24	33	38.82	22	25.88	52	61.18	11	12.94	21	24.71	64	75.29
Mohp	14	12.61	42	37.84	55	49.55	34	30.63	65	58.56	12	10.81	23	20.72	88	79.28
Koho2	13	17.11	36	47.37	27	35.53	20	26.32	44	57.89	12	15.79	18	23.68	58	76.32
Panb	16	37.21	26	60.47	1	2.33	12	27.91	22	51.16	9	20.93	6	13.95	37	86.05
Hati	21	42.00	29	58.00	0	0.00	10	20.00	35	70.00	5	10.00	12	24.00	38	76.00

Village	Fish extraction															
	Duration (in min)						Time (in 24 hours)						Aware of collected species			
	≥30		≥31-60		≤61		6:00-9:00		9:01-12:00		12:01-17:00		No		Yes	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Baga	5	4.31	30	25.86	81	69.83	31	26.72	64	55.17	21	18.10	33	28.45	83	71.55
Harm	12	13.79	42	48.28	33	37.93	25	28.74	53	60.92	9	10.34	22	25.29	65	74.71
Nanc	29	37.18	38	48.72	11	14.10	18	23.08	46	58.97	14	17.95	22	28.21	56	71.79
Naja	22	26.51	46	55.42	15	18.07	25	30.12	46	55.42	12	14.46	20	24.10	63	75.90
Bagh	28	39.44	37	52.11	6	8.45	18	25.35	41	57.75	12	16.90	21	29.58	50	70.42
Kawa	24	30.77	46	58.97	8	10.26	22	28.21	42	53.85	14	17.95	26	33.33	52	66.67
Band	5	4.13	31	25.62	85	70.25	29	23.97	68	56.20	24	19.83	29	23.97	92	76.03
Deop	7	6.31	37	33.33	67	60.36	34	30.63	65	58.56	12	10.81	23	20.72	88	79.28
Nahr	14	17.07	47	57.32	21	25.61	24	29.27	42	51.22	16	19.51	19	23.17	63	76.83
Bura1	17	28.81	33	55.93	9	15.25	17	28.81	37	62.71	5	8.47	14	23.73	45	76.27
Kanc	24	63.16	14	36.84	0	0.00	11	28.95	20	52.63	7	18.42	13	34.21	25	65.79
Pacg	0	0.00	24	20.00	96	80.00	31	25.83	67	55.83	22	18.33	37	30.83	83	69.17
Katb	2	1.47	21	15.44	113	83.09	41	30.15	77	56.62	18	13.24	42	30.88	94	69.12
Total	430	16.12	1027	38.49	1211	45.39	754	28.26	1498	56.15	416	15.59	686	25.71	1982	74.29

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, ≥- less than equals to, ≤- more than equals to and %- in percentages.

Appendix Table 6.93. Fish material extraction mode, delivery and end use by villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fish extraction													
	Extraction mode				Delivery mode				End use					
	Bamboo trap		Nylon fishing net		Cycle		Hand lifting		Self		Sale		Both	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	3	3.70	78	96.30	19	23.46	62	76.54	36	44.44	3	3.70	42	51.85
Belo	1	0.87	114	99.13	26	22.61	89	77.39	14	12.17	5	4.35	96	83.48
Tamp	8	9.30	78	90.70	21	24.42	65	75.58	48	55.81	7	8.14	31	36.05
Japp	0	0.00	111	100	25	22.52	86	77.48	47	42.34	4	3.60	60	54.05
Meth	15	37.50	25	62.50	11	27.50	29	72.50	38	95.00	0	0.00	2	5.00
Borj	14	28.57	35	71.43	14	28.57	35	71.43	46	93.88	1	2.04	2	4.08
Hali	0	0.00	101	100	22	21.78	79	78.22	32	31.68	6	5.94	63	62.38
Silj	0	0.00	128	100	24	18.75	104	81.25	10	7.81	15	11.72	103	80.47
Sild1	12	20.34	47	79.66	12	20.34	47	79.66	54	91.53	0	0.00	5	8.47
Sild2	0	0.00	111	100	20	18.02	91	81.98	24	21.62	11	9.91	76	68.47
Gosh	0	0.00	125	100	26	20.80	99	79.20	13	10.40	10	8.00	102	81.60

Village	Fish extraction													
	Extraction mode				Delivery mode				End use					
	Bamboo trap		Nylon fishing net		Cycle		Hand lifting		Self		Sale		Both	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Domj1	14	25.45	41	74.55	12	21.82	43	78.18	54	98.18	1	1.82	0	0.00
Domj2	8	12.90	54	87.10	13	20.97	49	79.03	57	91.94	1	1.61	4	6.45
Kazi	2	2.35	83	97.65	19	22.35	66	77.65	45	52.94	3	3.53	37	43.53
Mohp	0	0.00	111	100	26	23.42	85	76.58	41	36.94	4	3.60	66	59.46
Koho2	2	2.63	74	97.37	14	18.42	62	81.58	53	69.74	4	5.26	19	25.00
Panb	17	39.53	26	60.47	13	30.23	30	69.77	36	83.72	0	0.00	7	16.28
Hati	11	22.00	39	78.00	9	18.00	41	82.00	44	88.00	0	0.00	6	12.00
Baga	1	0.86	115	99.14	28	24.14	88	75.86	27	23.28	4	3.45	85	73.28
Harm	1	1.15	86	98.85	14	16.09	73	83.91	38	43.68	5	5.75	44	50.57
Nanc	7	8.97	71	91.03	18	23.08	60	76.92	62	79.49	1	1.28	15	19.23
Naja	5	6.02	78	93.98	15	18.07	68	81.93	60	72.29	1	1.20	22	26.51
Bagh	9	12.68	62	87.32	14	19.72	57	80.28	54	76.06	2	2.82	15	21.13
Kawa	11	14.10	67	85.90	19	24.36	59	75.64	63	80.77	0	0.00	15	19.23
Band	0	0.00	121	100	28	23.14	93	76.86	12	9.92	9	7.44	100	82.64
Deop	1	0.90	110	99.10	24	21.62	87	78.38	27	24.32	2	1.80	82	73.87
Nahr	10	12.20	72	87.80	20	24.39	62	75.61	63	76.83	2	2.44	17	20.73
Bura1	15	25.42	44	74.58	12	20.34	47	79.66	52	88.14	0	0.00	7	11.86
Kanc	14	36.84	24	63.16	9	23.68	29	76.32	38	100	0	0.00	0	0.00
Pacg	0	0.00	120	100	25	20.83	95	79.17	26	21.67	5	4.17	89	74.17
Katb	0	0.00	136	100	31	22.79	105	77.21	9	6.62	6	4.41	121	88.97
Total	181	6.78	2487	93.22	583	21.85	2085	78.15	1223	45.84	112	4.20	1333	49.96

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.94. Daily quantities of fish material extraction by villages selected for entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fish extraction					
	Total annual extraction quantity (day/kg)		Annual self-consumption quantity (day/kg)		Annual sale quantity (day/kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	162.81	16.28±0.58	104.98	10.50±0.57	123.44	12.34±0.95
Belo	275.53	27.55±1.28	112.11	11.21±0.41	191.98	19.20±1.08
Tamp	178.68	17.87±0.71	121.21	12.12±0.28	166.45	16.64±1.22
Japp	246.83	24.68±1.20	146.87	14.69±0.91	179.12	17.91±1.77
Meth	55.84	5.58±0.36	52.81	5.28±0.40	11.50	5.75±1.85

Village	Fish extraction					
	Total annual extraction quantity (day/kg)		Annual self-consumption quantity (day/kg)		Annual sale quantity (day/kg)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Borj	73.87	7.39±0.52	70.32	7.03±0.52	16.55	8.28±2.88
Hali	199.26	19.93±0.70	113.09	11.31±0.78	140.61	14.06±0.80
Silj	342.54	34.25±1.46	124.39	12.44±0.85	250.46	25.05±1.65
Sild1	90.81	9.08±0.50	83.80	8.38±0.56	28.70	9.57±2.64
Sild2	259.18	25.92±1.22	121.39	12.14±0.68	196.52	19.65±1.20
Gosh	329.02	32.90±1.42	131.98	13.20±1.19	227.18	22.72±1.66
Domj1	84.81	8.48±0.47	83.61	8.36±0.46	15.20	15.20±0.00
Domj2	104.69	10.47±0.49	100.13	10.01±0.44	10.80	10.80±0.00
Kazi	168.16	16.82±0.62	115.23	11.52±0.76	133.12	13.31±0.77
Mohp	208.05	20.81±0.76	119.10	11.91±0.59	153.37	15.34±0.94
Koho2	157.83	15.78±0.59	127.50	12.75±0.52	93.63	13.38±1.61
Panb	66.73	6.67±0.48	59.90	5.99±0.55	14.03	7.02±1.38
Hati	79.85	7.99±0.53	74.16	7.42±0.45	14.08	7.04±1.81
Baga	290.36	29.04±1.42	132.03	13.20±0.96	217.44	21.74±0.92
Harm	187.87	18.79±0.75	114.11	11.41±0.78	159.83	15.98±1.20
Nanc	120.68	12.07±0.49	103.15	10.31±0.33	77.89	12.98±2.11
Naja	136.03	13.60±0.54	106.75	10.67±0.56	84.56	12.08±1.27
Bagh	110.22	11.02±0.47	92.70	9.27±0.45	70.23	10.03±1.53
Kawa	114.98	11.50±0.46	97.56	9.76±0.53	70.16	10.02±1.49
Band	315.26	31.53±1.25	120.71	12.07±0.69	226.67	22.67±0.84
Deop	229.90	22.99±1.02	117.45	11.74±0.89	156.25	15.63±1.04
Nahr	127.15	12.72±0.52	104.71	10.47±0.73	78.45	13.08±1.97
Bura1	99.76	9.98±0.52	89.39	8.94±0.49	41.18	10.30±1.48
Kanc	43.16	4.32±0.39	43.16	4.32±0.39	0.00	0.00
Pacg	302.47	30.25±1.30	132.23	13.22±0.86	222.85	22.28±1.16
Katb	357.59	35.76±1.69	125.35	12.53±0.32	254.78	25.48±1.85
Total	5519.94	178.06±16.87	3241.86	104.58±4.50	3627.02	117.00±14.90

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, kg- kilograms and SE- standard error.

Appendix Table 6.95. Total mean annual quantities and income generated from the extraction of fish material by villages selected for the entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Village	Fish extraction (both inside and outside Reserve)									
	Total annual extraction quantity (in kg)		Annual self-consumption quantity (in kg)		Annual sale quantity (in kg)		Sale @INR/kg		Total annual income generated (in INR)	
	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE	Total	Mean±SE
Bamg	1702.03	170.20±14.30	1017.59	101.76±4.78	1406.98	140.70±13.38	460.25	46.03±2.55	64069.00	6406.90±683.14
Belo	3236.73	323.67±21.36	1293.96	129.40±4.03	2269.71	226.97±17.34	477.09	47.71±1.37	110473.04	11047.30±1069.21
Tamp	1898.35	189.83±17.00	1197.67	119.77±3.65	1846.36	184.64±20.35	485.75	48.58±1.94	93315.05	9331.51±1261.41
Japp	2775.47	277.55±22.37	1578.62	157.86±8.54	2074.41	207.44±24.42	505.40	50.54±2.27	100797.93	10079.79±1158.13
Meth	557.84	55.78±8.11	527.90	52.79±7.40	141.30	70.65±43.35	85.00	42.50±7.50	6655.50	3327.75±2372.25
Borj	675.88	67.59±8.52	641.99	64.20±8.57	159.75	79.88±25.88	100.00	50.00±5.00	7775.00	3887.50±1457.50
Hali	2140.67	214.07±17.59	1164.35	116.44±8.44	1583.24	158.32±13.41	493.01	49.30±1.72	76743.81	7674.38±731.02
Silj	4485.83	448.58±21.91	1566.59	156.66±10.01	3330.10	333.01±24.03	485.47	48.55±2.12	161123.81	16112.38±1688.19
Sild1	918.09	91.81±7.49	828.03	82.80±5.89	391.30	130.43±48.88	157.50	52.50±4.33	19623.00	6541.00±2131.38
Sild2	3086.93	308.69±21.57	1423.65	142.37±10.71	2333.22	233.32±19.78	506.16	50.62±3.52	119254.09	11925.41±1441.85
Gosh	4146.16	414.62±22.66	1640.14	164.01±13.36	2883.06	288.31±23.95	490.35	49.04±2.24	141030.90	14103.09±1420.91
Domj1	841.79	84.18±7.38	816.32	81.63±7.76	212.80	212.80±0.00	80.00	80.00±0.00	17024.00	17024.00±0.00
Domj2	1103.54	110.35±7.53	1043.45	104.34±5.11	140.24	140.24±0.00	53.00	53.00±0.00	7360.40	7360.40±0.00
Kazi	1780.09	178.01±15.65	1126.97	112.70±7.93	1561.84	156.18±10.85	515.83	51.58±3.07	78178.20	7817.82±488.09
Mohp	2338.39	233.84±17.45	1287.52	128.75±6.90	1746.68	174.67±15.09	481.66	48.17±1.99	84385.09	8438.51±821.37
Koho2	1637.19	163.72±13.72	1229.92	122.99±5.95	1136.83	162.40±20.58	389.25	55.61±3.87	63387.19	9055.31±1452.12
Panb	638.79	63.88±7.91	573.44	57.34±7.81	151.75	75.88±24.93	96.67	48.33±1.67	7532.67	3766.33±1273.67
Hati	766.80	76.68±7.68	701.65	70.16±4.90	197.00	98.50±60.35	108.75	54.38±1.88	10860.38	5430.19±3236.81
Baga	3527.32	352.73±23.06	1527.01	152.70±9.13	2734.22	273.42±15.43	458.41	45.84±1.89	124479.12	12447.91±1044.52
Harm	2018.95	201.90±18.58	1193.83	119.38±8.98	1651.31	165.13±15.91	536.22	53.62±2.06	89374.04	8937.40±899.94
Nanc	1292.97	129.30±9.02	1066.42	106.64±4.58	947.75	157.96±20.21	278.33	46.39±3.45	43065.43	7177.57±1145.53
Naja	1402.17	140.22±10.34	1073.41	107.34±6.49	959.90	137.13±22.66	384.33	54.90±3.15	52688.33	7526.90±1351.53
Bagh	1181.08	118.11±8.41	949.81	94.98±5.54	912.64	130.38±28.53	365.56	52.22±4.53	48049.17	6864.17±1488.21
Kawa	1233.23	123.32±8.77	1031.43	103.14±7.45	825.15	117.88±18.33	377.50	53.93±2.55	44273.17	6324.74±1204.19
Band	3916.95	391.70±24.01	1434.97	143.50±4.95	2865.63	286.56±14.47	505.84	50.58±1.23	142765.86	14276.59±832.54
Deop	2584.62	258.46±21.73	1253.72	125.37±9.39	1837.38	183.74±19.83	486.82	48.68±1.60	90614.37	9061.44±1109.60
Nahr	1332.72	133.27±10.09	1058.83	105.88±9.04	975.49	162.58±33.04	312.17	52.03±2.59	47958.40	7993.07±1363.16
Bura1	1022.60	102.26±8.00	903.41	90.34±7.28	473.80	118.45±17.18	229.17	57.29±1.78	26622.00	6655.50±835.76
Kanc	447.83	44.78±7.42	447.83	44.78±7.42	0.00	0.00	0.00	0.00	0.00	0.00
Pacg	3712.32	371.23±23.29	1550.79	155.08±7.00	2792.63	279.26±18.31	513.97	51.40±1.59	142855.53	14285.55±1151.81
Katb	4706.33	470.63±18.48	1640.22	164.02±5.34	3364.05	336.41±22.48	460.02	46.00±2.14	154793.28	15479.33±1662.31
Total	63109.70	2035.8±226.06	34791.47	1122.31±60.34	43906.51	1416.34±187.03	10879.47	350.95±31.58	2177127.74	70229.93±8971.35

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, kg- kilograms, INR- Indian Rupee and SE- standard error.

Appendix Table 6.96. List of extracted fish species by villages selected for the entry-point survey around Kaziranga Tiger Reserve, Assam, India.

Scientific name	Family	Use	Total	%
<i>Amblypharyngodon mola</i> (Hamilton, 1822)	Cyprinidae	Income source	192	7.20
<i>Anabas testudineus</i> (Bloch, 1792)	Anabantidae	Income source	242	9.07
<i>Bagarius bagarius</i> (Hamilton, 1822)	Sisoridae	Income source	26	0.97
<i>Bangana ariza</i> (Hamilton, 1807)	Cyprinidae	Income source	120	4.50
<i>Botia dario</i> (Hamilton, 1822)	Cobitidae	Income source	18	0.67
<i>Brachyura</i> spp.	Cancridae	Income source	138	5.17
<i>Cabdio morar</i> (Hamilton, 1822)	Cyprinidae	Income source	142	5.32
<i>Catla catla</i> (Hamilton, 1822)	Cyprinidae	Income source	156	5.85
<i>Chanda nama</i> (Hamilton, 1822)	Ambassidae	Income source	123	4.61
<i>Chandramara chandramara</i> (Hamilton, 1822)	Bagridae	Income source	131	4.91
<i>Channa marulius</i> (Hamilton, 1822)	Channidae	Income source	182	6.82
<i>Channa punctata</i> (Bloch, 1793)	Channidae	Income source	147	5.51
<i>Channa striata</i> (Bloch, 1793)	Channidae	Income source	167	6.26
<i>Chitala chitala</i> (Hamilton, 1822)	Notopteridae	Income source	288	10.79
<i>Cirrhinus cirrhosus</i> (Bloch, 1795)	Cyprinidae	Income source	146	5.47
<i>Cirrhinus mrigala</i> (Hamilton, 1822)	Cyprinidae	Income source	129	4.84
<i>Clarias batrachus</i> (Linnaeus, 1758)	Clariidae	Income source	145	5.43
<i>Ctenopharyngodon idella</i> (Valenciennes, 1844)	Cyprinidae	Income source	118	4.42
<i>Cyprinus carpio</i> (Linnaeus, 1758)	Cyprinidae	Income source	126	4.72
<i>Eutropiichthys vacha</i> (Hamilton, 1822)	Schilbeidae	Income source	265	9.93
<i>Gudusia chapra</i> (Hamilton, 1822)	Clupeidae	Income source	221	8.28
<i>Hemibagrus menoda</i> (Hamilton, 1822)	Bagridae	Income source	144	5.40
<i>Heteropneustes fossilis</i> (Bloch, 1794)	Heteropneustidae	Income source	134	5.02
<i>Labeo calbasu</i> (Hamilton, 1822)	Cyprinidae	Income source	127	4.76
<i>Labeo gonius</i> (Hamilton, 1822)	Cyprinidae	Income source	139	5.21
<i>Labeo nandina</i> (Hamilton, 1822)	Cyprinidae	Income source	39	1.46
<i>Labeo rohita</i> (Hamilton, 1822)	Cyprinidae	Income source	122	4.57
<i>Macrobrachium</i> spp.	Palaemonidae	Income source	153	5.73
<i>Macrognathus aral</i> (Bloch & Schneider, 1801)	Mastacembelidae	Income source	137	5.13
<i>Macrognathus pancalus</i> (Hamilton, 1822)	Mastacembelidae	Income source	124	4.65
<i>Mastacembelus armatus</i> (Lacepède, 1800)	Mastacembelidae	Income source	132	4.95
<i>Monopterusuchia</i> (Hamilton, 1822)	Synbranchidae	Income source	116	4.35
<i>Mystus bleekeri</i> (Day, 1877)	Bagridae	Income source	163	6.11
<i>Mystus cavasius</i> (Hamilton, 1822)	Bagridae	Income source	141	5.28
<i>Mystus tengara</i> (Hamilton, 1822)	Bagridae	Income source	143	5.36
<i>Nandus nandus</i> (Hamilton, 1822)	Nandidae	Income source	121	4.54
<i>Notopterus notopterus</i> (Pallas, 1769)	Notopteridae	Income source	188	7.05

Scientific name	Family	Use	Total	%
<i>Ompok pabo</i> (Hamilton, 1822)	Siluridae	Income source	305	11.43
<i>Parambassis ranga</i> (Hamilton, 1822)	Ambassidae	Income source	90	3.37
<i>Puntius sarana</i> (Hamilton, 1822)	Cyprinidae	Income source	232	8.70
<i>Puntius sophore</i> (Hamilton, 1822)	Cyprinidae	Income source	421	15.78
<i>Rasbora daniconius</i> (Hamilton, 1822)	Cyprinidae	Income source	181	6.78
<i>Salmostoma bacaila</i> (Hamilton, 1822)	Cyprinidae	Income source	205	7.68
<i>Sperata seenghala</i> (Sykes, 1839)	Bagridae	Income source	135	5.06
<i>Systomus sarana</i> (Hamilton, 1822)	Cyprinidae	Income source	260	9.75
<i>Tetraodon cutcutia</i> (Hamilton, 1822)	Tetraodontidae	Income source	115	4.31
<i>Trichogaster fasciata</i> (Bloch & Schneider, 1801)	Osphronemidae	Income source	33	1.24
<i>Wallago attu</i> (Bloch & Schneider, 1801)	Siluridae	Income source	219	8.21
<i>Xenentodon cancila</i> (Hamilton, 1822)	Belonidae	Income source	159	5.96

Appendix Table 6.97. Respondents attitude and awareness towards conservation (aware about reserve and its importance) among villages selected for a socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Aware of presence/status of KTR						If yes then, Is KTR important					
	Yes		No		Unsure		Yes		No		Unsure	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bang	9	100	0	0.00	0	0.00	3	33.33	4	44.44	2	22.22
Belo	26	100	0	0.00	0	0.00	20	76.92	5	19.23	1	3.85
Tamp	20	100	0	0.00	0	0.00	17	85.00	3	15.00	0	0.00
Japp	12	92.31	1	7.69	0	0.00	10	83.33	2	16.67	0	0.00
Meth	61	80.26	9	11.84	6	7.89	51	83.61	10	16.39	0	0.00
Borj	35	71.43	12	24.49	2	4.08	31	88.57	2	5.71	2	5.71
Hali	14	100	0	0.00	0	0.00	8	57.14	4	28.57	2	14.29
Silj	26	92.86	1	3.57	1	3.57	16	61.54	8	30.77	2	7.69
Sild1	20	95.24	1	4.76	0	0.00	11	55.00	8	40.00	1	5.00
Sild2	17	100	0	0.00	0	0.00	13	76.47	3	17.65	1	5.88
Gosh	44	100	0	0.00	0	0.00	35	79.55	7	15.91	2	4.55
Domj1	14	100	0	0.00	0	0.00	9	64.29	3	21.43	2	14.29
Domj2	4	66.67	1	16.67	1	16.67	2	50.00	2	50.00	0	0.00
Kazi	5	71.43	0	0.00	2	28.57	0	0.00	5	100	0	0.00
Mohp	21	100	0	0.00	0	0.00	19	90.48	2	9.52	0	0.00
Koho2	24	96	1	4.00	0	0.00	22	91.67	2	8.33	0	0.00
Panb	7	100	0	0.00	0	0.00	6	85.71	1	14.29	0	0.00
Hati	18	100	0	0.00	0	0.00	13	72.22	4	22.22	1	5.56
Baga	51	100	0	0.00	0	0.00	37	72.55	11	21.57	3	5.88
Harm	18	56.25	0	0.00	14	43.75	7	38.89	7	38.89	4	22.22
Nanc	9	100	0	0.00	0	0.00	9	100	0	0.00	0	0.00

Village	Aware of presence/status of KTR						If yes then, Is KTR important					
	Yes		No		Unsure		Yes		No		Unsure	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Naja	31	93.94	1	3.03	1	3.03	20	64.52	5	16.13	6	19.35
Bagh	23	95.83	1	4.17	0	0.00	16	69.57	5	21.74	2	8.70
Kawa	3	100	0	0.00	0	0.00	2	66.67	1	33.33	0	0.00
Band	9	90.00	1	10.00	0	0.00	4	44.44	3	33.33	2	22.22
Deop	25	96.15	1	3.85	0	0.00	14	56.00	8	32.00	3	12.00
Nahr	13	86.67	2	13.33	0	0.00	8	61.54	1	7.69	4	30.77
Bura1	2	100	0	0.00	0	0.00	1	50.00	0	0.00	1	50.00
Kanc	10	100	0	0.00	0	0.00	10	100	0	0.00	0	0.00
Pacg	19	100	0	0.00	0	0.00	15	78.95	2	10.53	2	10.53
Katb	14	100	0	0.00	0	0.00	12	85.71	2	14.29	0	0.00
Total	604	91.10	32	4.83	27	4.07	441	73.01	120	19.87	43	7.12

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, KTR- Kaziranga Tiger Reserve and %- in percentages.

Appendix Table 6.98. Respondents attitude and awareness towards conservation (important or not important) among villages selected for a socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	If yes, the why KTR is important								If no, then why KTR is not important					
	Wildlife conservation		Livelihood		Social/Cultural/Education/Aesthetic value		Ecological/Good wellbeing		Crop/livestock/human wildlife conflict		Restrictions on resource extraction		Restriction living around KTR	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	1	33.33	3	100	3	100	1	33.33	3	75.00	1	25.00	2	50.00
Belo	18	90.00	14	70.00	5	25.00	4	20.00	3	60.00	2	40.00	2	40.00
Tamp	11	64.71	14	82.35	11	64.71	4	23.53	3	100	1	33.33	1	33.33
Japp	10	100	9	90.00	7	70.00	2	20.00	2	100	1	50.00	1	50.00
Meth	35	68.63	47	92.16	8	15.69	10	19.61	8	80.00	4	40.00	3	30.00
Borj	25	80.65	27	87.10	14	45.16	6	19.35	2	100	0	0.00	0	0.00
Hali	5	62.50	8	100	4	50.00	2	25.00	1	25.00	2	50.00	2	50.00
Silj	10	62.50	15	93.75	6	37.50	4	25.00	8	100	2	25.00	3	37.50
Sild1	6	54.55	10	90.91	5	45.45	2	18.18	4	50.00	2	25.00	4	50.00
Sild2	7	53.85	11	84.62	2	15.38	2	15.38	1	33.33	1	33.33	3	100
Gosh	11	31.43	35	100	7	20.00	4	11.43	5	71.43	1	14.29	3	42.86
Domj1	2	22.22	9	100	3	33.33	1	11.11	3	100	0	0.00	1	33.33
Domj2	1	50.00	2	100	1	50.00	0	0.00	2	100	1	50.00	1	50.00
Kazi	0	0.00	0	0.00	0	0.00	0	0.00	3	60.00	2	40.00	1	20.00
Mohp	15	78.95	17	89.47	8	42.11	3	15.79	2	100	0	0.00	1	50.00

Village	If yes, the why KTR is important								If no, then why KTR is not important					
	Wildlife conservation		Livelihood		Social/Cultural/Education/Aesthetic value		Ecological/Good wellbeing		Crop/livestock/human wildlife conflict		Restrictions on resource extraction		Restriction living around KTR	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Koho2	19	86.36	19	86.36	12	54.55	4	18.18	1	50.00	1	50.00	0	0.00
Panb	4	66.67	4	66.67	0	0.00	1	16.67	1	100	0	0.00	1	100
Hati	6	46.15	13	100	3	23.08	1	7.69	3	75.00	2	50.00	3	75.00
Baga	16	43.24	37	100	8	21.62	4	10.81	8	72.73	3	27.27	6	54.55
Harm	2	28.57	7	100	2	28.57	1	14.29	7	100	2	28.57	2	28.57
Nanc	5	55.56	8	88.89	3	33.33	2	22.22	0	0.00	0	0.00	0	0.00
Naja	12	60.00	20	100	5	25.00	2	10.00	3	60.00	0	0.00	3	60.00
Bagh	8	50.00	13	81.25	6	37.50	2	12.50	5	100	3	60.00	1	20.00
Kawa	0	0.00	2	100	0	0.00	0	0.00	1	100	0	0.00	1	100
Band	3	75.00	4	100	1	25.00	1	25.00	2	66.67	0	0.00	1	33.33
Deop	9	64.29	10	71.43	3	21.43	3	21.43	7	87.50	2	25.00	5	62.50
Nahr	1	12.50	7	87.50	3	37.50	1	12.50	1	100	0	0.00	0	0.00
Bura1	0	0.00	1	100	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00
Kanc	7	70.00	10	100	4	40.00	1	10.00	0	0.00	0	0.00	0	0.00
Pacg	5	33.33	13	86.67	2	13.33	2	13.33	2	100	1	50.00	1	50.00
Katb	6	50.00	12	100	6	50.00	0	0.00	2	100	1	50.00	1	50.00
Total	260	58.96	401	90.93	142	32.20	70	15.87	93	77.50	35	29.17	53	44.17

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, KTR- Kaziranga Tiger Reserve and %- in percentages.

Appendix Table 6.99. Respondents attitude and awareness towards conservation (how to conserve Reserve) among villages selected for a socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Should conserve KTR				If yes, then how							
	Yes		No		Fencing		Restrict resource extraction		Sensitization/awareness programme		Don't know	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	5	55.56	4	44.44	5	100	2	40.00	2	40.00	0	0.00
Belo	23	88.46	3	11.54	19	82.61	8	34.78	8	34.78	1	4.35
Tamp	17	85.00	3	15.00	14	82.35	6	35.29	6	35.29	1	5.88
Japp	11	91.67	1	8.33	11	100	3	27.27	4	36.36	0	0.00
Meth	57	93.44	4	6.56	44	77.19	15	26.32	20	35.09	1	1.75
Borj	33	94.29	2	5.71	24	72.73	12	36.36	11	33.33	0	0.00
Hali	10	71.43	4	28.57	9	90.00	2	20.00	0	0.00	1	10.00
Silj	21	80.77	5	19.23	15	71.43	9	42.86	4	19.05	0	0.00

Village	Should conserve KTR				If yes, then how							
	Yes		No		Fencing		Restrict resource extraction		Sensitization/awareness programme		Don't know	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Sild1	15	75.00	5	25.00	12	80.00	4	26.67	2	13.33	2	13.33
Sild2	14	82.35	3	17.65	13	92.86	4	28.57	1	7.14	0	0.00
Gosh	38	86.36	6	13.64	35	92.11	14	36.84	7	18.42	3	7.89
Domj1	10	71.43	4	28.57	9	90.00	4	40.00	4	40.00	0	0.00
Domj2	4	100	0	0.00	4	100	0	0.00	1	25.00	0	0.00
Kazi	2	40.00	3	60.00	2	100	0	0.00	1	50.00	0	0.00
Mohp	21	100	0	0.00	17	80.95	8	38.10	5	23.81	2	9.52
Koho2	23	95.83	1	4.17	17	73.91	5	21.74	6	26.09	2	8.70
Panb	6	85.71	1	14.29	6	100	1	16.67	2	33.33	0	0.00
Hati	15	83.33	3	16.67	14	93.33	3	20.00	1	6.67	1	6.67
Baga	40	78.43	11	21.57	35	87.50	13	32.50	8	20.00	2	5.00
Harm	10	55.56	8	44.44	9	90.00	2	20.00	2	20.00	1	10.00
Nanc	9	100	0	0.00	8	88.89	2	22.22	1	11.11	0	0.00
Naja	22	70.97	9	29.03	19	86.36	5	22.73	9	40.91	1	4.55
Bagh	18	78.26	5	21.74	15	83.33	3	16.67	4	22.22	2	11.11
Kawa	3	100	0	0.00	3	100	0	0.00	1	33.33	0	0.00
Band	6	66.67	3	33.33	5	83.33	1	16.67	1	16.67	0	0.00
Deop	16	64.00	9	36.00	15	93.75	2	12.50	3	18.75	0	0.00
Nahr	9	69.23	4	30.77	8	88.89	3	33.33	2	22.22	1	11.11
Bura1	1	50.00	1	50.00	1	100	1	100	0	0.00	0	0.00
Kanc	10	100	0	0.00	7	70.00	2	20.00	5	50.00	0	0.00
Pacg	16	84.21	3	15.79	14	87.50	1	6.25	4	25.00	1	6.25
Katb	13	92.86	1	7.14	8	61.54	3	23.08	3	23.08	1	7.69
Total	498	82.45	106	17.55	417	83.73	138	27.71	128	25.70	23	4.62

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, KTR- Kaziranga Tiger Reserve and %- in percentages.

Appendix Table 6.100. Respondents attitude towards forest department and suggestion to improve Reserve and people relationship by villages selected for a socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Is KTR forest department cooperative						How to improve local people and forest department relationship?							
	Yes		No		Unsure		Employment in department		Secondary employment /alternative livelihood		Involve local people in KTR management		Other	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	2	22.22	6	66.67	1	11.11	2	22.22	5	55.56	2	22.22	4	44.44

Village	Is KTR forest department cooperative						How to improve local people and forest department relationship?							
	Yes		No		Unsure		Employment in department		Secondary employment /alternative livelihood		Involve local people in KTR management		Other	
	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%	Total	%
Belo	20	76.92	5	19.23	1	3.85	5	19.23	16	61.54	4	15.38	13	50.00
Tamp	6	30.00	13	65.00	1	5.00	3	15.00	9	45.00	2	10.00	10	50.00
Japp	7	53.85	5	38.46	1	7.69	2	15.38	6	46.15	1	7.69	5	38.46
Meth	51	67.11	22	28.95	3	3.95	9	11.84	43	56.58	7	9.21	34	44.74
Borj	33	67.35	10	20.41	6	12.24	5	10.20	26	53.06	4	8.16	22	44.90
Hali	3	21.43	10	71.43	1	7.14	1	7.14	7	50.00	2	14.29	6	42.86
Silj	19	67.86	6	21.43	3	10.71	3	10.71	17	60.71	2	7.14	11	39.29
Sild1	4	19.05	13	61.90	4	19.05	3	14.29	10	47.62	2	9.52	9	42.86
Sild2	5	29.41	11	64.71	1	5.88	2	11.76	11	64.71	3	17.65	6	35.29
Gosh	7	15.91	30	68.18	7	15.91	6	13.64	26	59.09	4	9.09	18	40.91
Domj1	8	57.14	5	35.71	1	7.14	2	14.29	7	50.00	1	7.14	6	42.86
Domj2	3	50.00	2	33.33	1	16.67	1	16.67	5	83.33	1	16.67	1	16.67
Kazi	0	0.00	7	100	0	0.00	1	14.29	2	28.57	0	0.00	4	57.14
Mohp	17	80.95	3	14.29	1	4.76	5	23.81	13	61.90	2	9.52	7	33.33
Koho2	18	72.00	6	24.00	1	4.00	3	12.00	16	64.00	3	12.00	11	44.00
Panb	3	42.86	4	57.14	0	0.00	2	28.57	4	57.14	0	0.00	2	28.57
Hati	13	72.22	4	22.22	1	5.56	3	16.67	11	61.11	2	11.11	5	27.78
Baga	25	49.02	23	45.10	3	5.88	10	19.61	32	62.75	7	13.73	19	37.25
Harm	3	9.38	27	84.38	2	6.25	5	15.63	16	50.00	4	12.50	9	28.13
Nanc	8	88.89	1	11.11	0	0.00	0	0.00	5	55.56	1	11.11	4	44.44
Naja	20	60.61	9	27.27	4	12.12	4	12.12	19	57.58	2	6.06	16	48.48
Bagh	6	25.00	17	70.83	1	4.17	2	8.33	10	41.67	2	8.33	12	50.00
Kawa	0	0.00	3	100	0	0.00	1	33.33	2	66.67	1	33.33	1	33.33
Band	2	20.00	7	70.00	1	10.00	1	10.00	5	50.00	1	10.00	4	40.00
Deop	10	38.46	15	57.69	1	3.85	2	7.69	9	34.62	3	11.54	14	53.85
Nahr	11	73.33	3	20.00	1	6.67	3	20.00	5	33.33	1	6.67	7	46.67
Bura1	1	50.00	1	50.00	0	0.00	0	0.00	1	50.00	0	0.00	1	50.00
Kanc	9	90.00	1	10.00	0	0.00	1	10.00	5	50.00	1	10.00	5	50.00
Pacg	16	84.21	3	15.79	0	0.00	3	15.79	8	42.11	2	10.53	8	42.11
Katb	10	71.43	4	28.57	0	0.00	2	14.29	8	57.14	2	14.29	6	42.86
Total	340	51.28	276	41.63	47	7.09	92	13.88	359	54.15	69	10.41	280	42.23

Bang- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti, KTR- Kaziranga Tiger Reserve and %- in percentages.

Appendix Table 6.101. Respondents suggestion to improve Reserve and people relationship by villages selected for a socio-economic survey around Kaziranga Tiger Reserve, Assam, India.

Village	Other options to improve local people and forest department relationship									
	Crop/livestock/human damage compensation/solutions		Regularized resource extraction		Improve forest department behaviour/attitude		No eviction		Resource extraction before burning	
	Total	%	Total	%	Total	%	Total	%	Total	%
Bamg	2	50.00	1	25.00	1	25.00	1	25.00	0	0.00
Belo	8	61.54	2	15.38	4	30.77	3	23.08	0	0.00
Tamp	6	60.00	3	30.00	3	30.00	2	20.00	1	10.00
Japp	4	80.00	1	20.00	1	20.00	0	0.00	1	20.00
Meth	22	64.71	12	35.29	11	32.35	6	17.65	5	14.71
Borj	10	45.45	6	27.27	7	31.82	4	18.18	2	9.09
Hali	3	50.00	2	33.33	1	16.67	2	33.33	0	0.00
Silj	8	72.73	3	27.27	3	27.27	2	18.18	2	18.18
Sild1	3	33.33	1	11.11	4	44.44	1	11.11	1	11.11
Sild2	2	33.33	2	33.33	3	50.00	1	16.67	1	16.67
Gosh	8	44.44	4	22.22	7	38.89	3	16.67	4	22.22
Domj1	2	33.33	2	33.33	3	50.00	1	16.67	0	0.00
Domj2	1	100	0	0.00	0	0.00	1	100	0	0.00
Kazi	3	75.00	0	0.00	2	50.00	0	0.00	0	0.00
Mohp	4	57.14	3	42.86	3	42.86	1	14.29	0	0.00
Koho2	10	90.91	4	36.36	5	45.45	2	18.18	2	18.18
Panb	2	100	0	0.00	0	0.00	0	0.00	0	0.00
Hati	3	60.00	1	20.00	3	60.00	1	20.00	1	20.00
Baga	8	42.11	5	26.32	7	36.84	2	10.53	3	15.79
Harm	4	44.44	3	33.33	3	33.33	1	11.11	0	0.00
Nanc	4	100	0	0.00	2	50.00	1	25.00	0	0.00
Naja	8	50.00	6	37.50	5	31.25	3	18.75	0	0.00
Bagh	5	41.67	4	33.33	2	16.67	2	16.67	1	8.33
Kawa	0	0.00	0	0.00	0	0.00	0	0.00	1	100
Band	1	25.00	0	0.00	1	25.00	1	25.00	2	50.00
Deop	5	35.71	4	28.57	6	42.86	1	7.14	2	14.29
Nahr	5	71.43	2	28.57	2	28.57	1	14.29	0	0.00
Bura1	1	100	0	0.00	1	100	0	0.00	0	0.00
Kanc	2	40.00	1	20.00	2	40.00	1	20.00	1	20.00
Pacg	4	50.00	2	25.00	4	50.00	1	12.50	5	62.50
Katb	4	66.67	2	33.33	3	50.00	0	0.00	2	33.33
Total	152	54.29	76	27.14	99	35.36	45	16.07	37	13.21

Bamg- Bamun Gaon, Belo- Beloguri, Tamp- Tamuli Pathar, Japp- Japari Pathar, Meth- Methoni Tea Estate, Borj- Borjuri Tea Estate, Hali- Halidhibari, Silj- Siljuri, Sild1- No.1 Sildubi, Sild2- No.2 Sildubi, Gosh- Goshanibar, Domj1- Domjan No.1, Domj2- Domjan No.2, Kazi- Kaziranga N.C, Mohp- Mohpara, Koho2- No.2 Kohora, Panb- Panbari Reserved Forest, Hati- Hatikhuli Tea Estate, Baga- Bagari, Harm- Harmati No.1, Nanc- Na-Jan N.C., Naja- Na-Jan, Bagh- Baghmari, Kawa- Kawaimari, Band- Bandar Dubi, Deop- Deopani, Nahr- Nahrubasti, Bura1- Burapahar No.1, Kanc- Kanchanjuri, Pacg- Pachi Gaon, Katb- Kathani Basti and %- in percentages.

Appendix Table 6.102. Results of socio-economic survey using Principal Component Analysis.

Resources extracted	Parameters	PC 1	PC 2	PC 3
Thatch extraction	Annual extraction quantity (in kg)	0.30	0.29	-0.04
	Distance from the Reserve (in km)	0.04	-0.13	-0.13
	Distance from the National Highway (in km)	-0.03	0.11	0.19
	Total forest area (in ha)	-0.02	-0.04	0.31
	Illiterate (%)	-0.12	0.06	-0.49
	Literate (%)	0.14	-0.07	0.57
	Family size	0.02	-0.06	0.08
	House area (in Katha)	0.08	0.02	0.25
	House type Kaccha (%)	-0.39	0.27	0.15
	House type Pucca (%)	0.40	-0.41	-0.08
	House type Semi Pucca (%)	0.33	-0.08	-0.22
	House roof top tin (%)	0.05	-0.03	-0.04
	House roof top thatched (%)	-0.25	0.35	0.04
	Annual income from occupation (in INR)	0.18	0.12	0.31

Resources extracted	Parameters	PC 1	PC 2	PC 3
	Involved in purchase (%)	-0.14	0.22	-0.18
	Annual purchase quantity (in kg)	0.16	0.46	-0.04
	Annual quantity self-consumption (in kg)	0.18	0.26	-0.04
	Annual quantity sale (in kg)	0.38	0.30	-0.03
	Annual income generated (in INR)	0.37	0.26	-0.05
Fodder extraction	Annual extraction quantity (in kg)	0.26	0.03	0.16
	Distance from the Reserve (in km)	-0.05	0.15	-0.21
	Distance from the National Highway (in km)	0.19	0.09	0.02
	Total forest area (in ha)	-0.03	-0.18	0.26
	Illiterate (%)	-0.08	-0.13	-0.16
	Literate (%)	0.10	0.15	0.19
	Family size	0.00	0.05	0.01
	House area (in Katha)	0.12	0.15	0.10
	House type Kaccha (%)	0.22	-0.41	-0.19
	House type Pucca (%)	-0.20	0.53	0.19
	House type Semi Pucca (%)	-0.21	0.21	0.17
	Annual income from occupation (in INR)	0.15	0.25	0.05
	Involved in purchase (%)	0.14	0.27	-0.27
	Annual purchase quantity (in kg)	0.18	0.37	-0.68
	Annual quantity self-consumption (in kg)	0.31	0.02	0.06
	Annual quantity sale (in kg)	0.42	0.12	0.25
	Annual income generated (in INR)	0.41	0.13	0.26
	Involved in grazing (%)	0.12	0.07	0.02
	Have livestock's (%)	0.12	0.02	0.03
	Total number of livestock's	0.22	-0.08	-0.11
	Involved in Animal husbandry (%)	0.27	-0.26	-0.12
	Annual income animal husbandry (in INR)	0.24	-0.01	0.00
Fuelwood extraction	Annual extraction quantity (in kg)	0.03	-0.20	0.37
	Distance from the Reserve (in km)	0.03	-0.04	0.10
	Distance from the National Highway (in km)	0.01	0.17	-0.22
	Total forest area (in ha)	-0.04	0.11	-0.02
	Illiterate (%)	-0.17	-0.26	-0.11
	Literate (%)	0.20	0.31	0.13
	Family size	0.06	0.04	-0.10
	House area (in Katha)	0.13	0.20	-0.01
	House type Kaccha (%)	-0.41	0.21	-0.07
	House type Pucca (%)	0.50	-0.25	-0.07
	House type Semi Pucca (%)	0.25	-0.13	0.22
	House roof top tin (%)	0.06	-0.04	0.00
	House roof top thatched (%)	-0.35	0.14	0.06
	Annual income from occupation (in INR)	0.18	0.23	-0.01
	Involved in purchase (%)	0.16	0.40	0.07
	Annual purchase quantity (in kg)	0.03	0.45	0.32
	Annual quantity self-consumption (in kg)	-0.07	-0.09	0.26
	Annual quantity sale (in kg)	0.04	-0.15	0.44
	Annual income generated (in INR)	0.02	-0.16	0.43
	Cooking source Liquid petroleum gas (%)	0.46	0.16	-0.09
	Cooking source Wood (%)	-0.09	-0.03	0.02
	Cooking source Kerosene (%)	-0.13	0.11	0.36
	Cooking source Dung (%)	-0.09	0.09	0.12
	Cooking source Biogas (%)	0.03	-0.21	-0.08
Fish extraction	Annual extraction quantity (in kg)	0.46	0.20	0.08
	Distance from the Reserve (in km)	-0.11	0.02	0.18
	Distance from the National Highway (in km)	0.08	-0.06	-0.25
	Distance from the nearby River/beel (in km)	-0.06	-0.18	0.12
	Illiterate (%)	0.03	-0.21	0.46
	Literate (%)	-0.03	0.25	-0.54
	Family size	-0.02	0.05	-0.07
	House area (in Katha)	0.08	0.18	-0.23
	House type Kaccha (%)	0.22	-0.49	-0.23
	House type Pucca (%)	-0.25	0.54	0.17
	House type Semi Pucca (%)	-0.15	0.36	0.26
	Annual income from occupation (in INR)	0.05	0.21	-0.34
	Involved in purchase (%)	-0.26	-0.15	0.09
	Annual purchase quantity (in kg)	0.08	-0.10	0.00
	Annual quantity self-consumption (in kg)	0.37	0.15	0.11
	Annual quantity sale (in kg)	0.46	0.11	0.13

Resources extracted	Parameters	PC 1	PC 2	PC 3
	Annual income generated (in INR)	0.45	0.11	0.15

Ha- hectare, km- kilometres, %- in percentages, kg-kilogram and INR-Indian standard rupees.

Appendix Table 103. Results of entry-point survey using Principal Component Analysis.

Resources extracted	Parameters	PC 1	PC 2
Thatch extraction	Annual extraction quantity (in kg)	0.39	0.18
	Distance home to extraction location (in km)	-0.13	0.51
	Distance travelled inside Reserve for extraction (in km)	-0.11	0.81
	Literate (%)	0.04	0.11
	Illiterate (%)	-0.02	-0.06
	Not aware of species (%)	0.00	0.00
	Aware of species (%)	0.00	0.00
	Annual self-consumption quantity (in kg)	0.39	0.19
	Annual sale quantity (in kg)	0.56	0.01
	Annual income generated (INR/annum)	0.59	-0.01
Fodder extraction	Annual extraction quantity (in kg)	0.31	-0.17
	Distance home to extraction location (in km)	-0.08	0.74
	Distance travelled inside Reserve for extraction (in km)	0.16	0.54
	Literate (%)	-0.04	0.14
	Illiterate (%)	0.02	-0.09
	Not aware of species (%)	0.01	-0.19
	Aware of species (%)	-0.01	0.09
	Annual self-consumption quantity (in kg)	0.28	-0.19
	Annual sale quantity (in kg)	0.65	0.07
	Annual income generated (INR/annum)	0.61	0.07
Fuelwood extraction	Annual extraction quantity (in kg)	0.46	0.05
	Distance home to extraction location (in km)	-0.17	0.55
	Distance travelled inside Reserve for extraction (in km)	-0.14	0.80
	Literate (%)	-0.07	-0.01
	Illiterate (%)	0.04	0.01
	Not aware of species (%)	-0.04	0.08
	Aware of species (%)	0.01	-0.03
	Annual self-consumption quantity (in kg)	0.46	0.10
	Annual sale quantity (in kg)	0.51	0.14
	Annual income generated (INR/annum)	0.51	0.14
Fish extraction	Annual extraction quantity (in kg)	0.56	0.00
	Distance home to extraction location (in km)	-0.03	0.47
	Distance travelled inside Reserve for extraction (in km)	0.13	0.87
	Literate (%)	0.02	0.01
	Illiterate (%)	-0.01	0.00
	Not aware of species (%)	0.09	-0.04
	Aware of species (%)	-0.03	0.01
	Annual self-consumption quantity (in kg)	0.42	-0.06
	Annual sale quantity (in kg)	0.51	-0.06
	Annual income generated (INR/annum)	0.47	-0.09

Km- kilometres, kg-kilogram, %- in percentages and INR-Indian standard rupees.

PLATES

Plate 1. Glimpses of (a) short grassland, (b) tall grasslands, (c) wetland (locally known as *beels*), and (d) woodland.



(a)



(b)



(c)



(d)

Plate 2. Glimpses of eight mega- and meso-herbivores, (a) greater one-horned rhino (*Rhinoceros unicornis*), (b) Asian elephant (*Elephas maximus*), (c) Asiatic wild buffalo (*Bubalus arnee*), (d) Indian bison (*Bos gaurus*), (e) swamp deer (*Rucervus duvaucelii*), (f) hog deer (*Axis porcinus*), (g) sambar (*Rusa unicolor*), and (h) Indian red muntjac (*Muntiacus muntjak*).



(a)



(b)



(c)



(d)



(e)



(f)



(g)



(h)

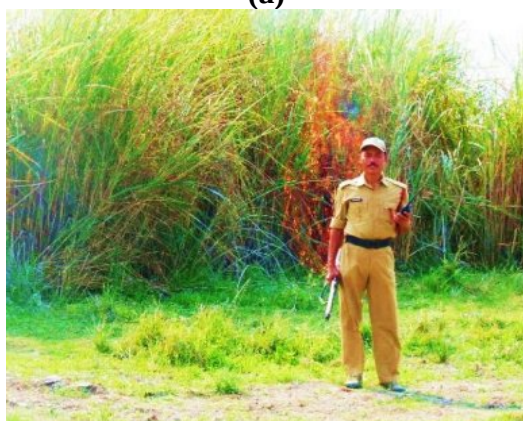
Plate 3. Glimpses of, (a) flood, (b) siltation, (c) controlled burning management, (d) invasives *Mimosa* spp. and *Mikania micrantha*, (e) ecotourism activities including elephant ride and jeep safari, and (f) local community settlements and occupations.



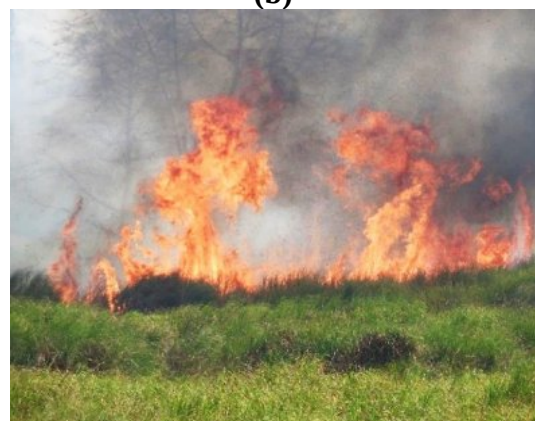
(a)



(b)



(c)





(d)



(e)



(f)

Plate 4. Glimpses of soil seed bank study (a) soil sample collection from short grasslands, (b) soil sample collection from tall grassland, (c) sun drying soil samples before sieving, (d) seed hand sorting process from soil sample using sieves, (e) types of seeds separated from soil samples, (f) types of seed surface identified from soil samples viz., smooth and rough, (g) types of seed conditions identified from soil samples viz., whole seeds, cracked seeds and split seeds, (h) soil sample processing for seed germination in greenhouse, (i) earthen pots arrangement for seed germination, and

(j) earthen pots showing plant species germinated under natural and flooding treatments.



(a)



(b)



(c)



(d)



(e)



(f)



(g)



(h)



(i)



(j)

Plate 5. Glimpses of (a) short grassland experimental sites, (b) herbivore exclusion and inclusion experiments conducted in short grassland, (c) herbivore exclusion experiment conducted in tall grassland, (d) herbivore inclusion experiment conducted in tall

grassland, (e) herbivore exclusion with burning experiment conducted in tall grassland, (f) flood inundation in short grassland experimental site, and (g) flood inundation in tall grassland experimental site.



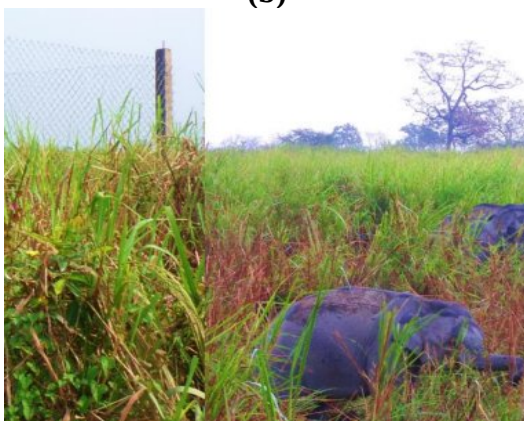
(a)



(b)



(c)



(d)



(e)



(f)



(g)

Plate 6. Glimpses of vegetation characteristics and biomass estimation studies (a) collection and identification of plant species, (b) experimental sites GPS location data collection, (c) abundance data collection using quadrat method to determine vegetation composition and structure, (d) biomass data collection using harvest method to determine aboveground biomass productivity, (e) harvested biomass plot, (f) hand sorting of individual plant species to determine wet and dry weight, (g) collection of roots and rhizomes to determine belowground biomass productivity, (h) roots and rhizomes material collected from below soil surface, (i) weighing balance to record wet and dry weight of individual plant species and roots and rhizomes material, (j) drying plant species and roots and rhizomes materials using electric oven, and (k) soil sample collection from short and tall grasslands for soil nutrient analysis using soil auger.



(a)



(b)



(c)



(d)



(e)



(f)



(g)



(h)



(i)



(j)



(k)

Plate 7. Glimpses of soil nutrient laboratory analysis (a) sun drying of soil samples for soil nutrient analysis, (b) weighing of soil samples for soil nutrient analysis, (c) soil carbon estimation using Walkley-Black titration method (d) soil phosphorus estimation using UV Visible Spectrophotometer.



(a)



(b)

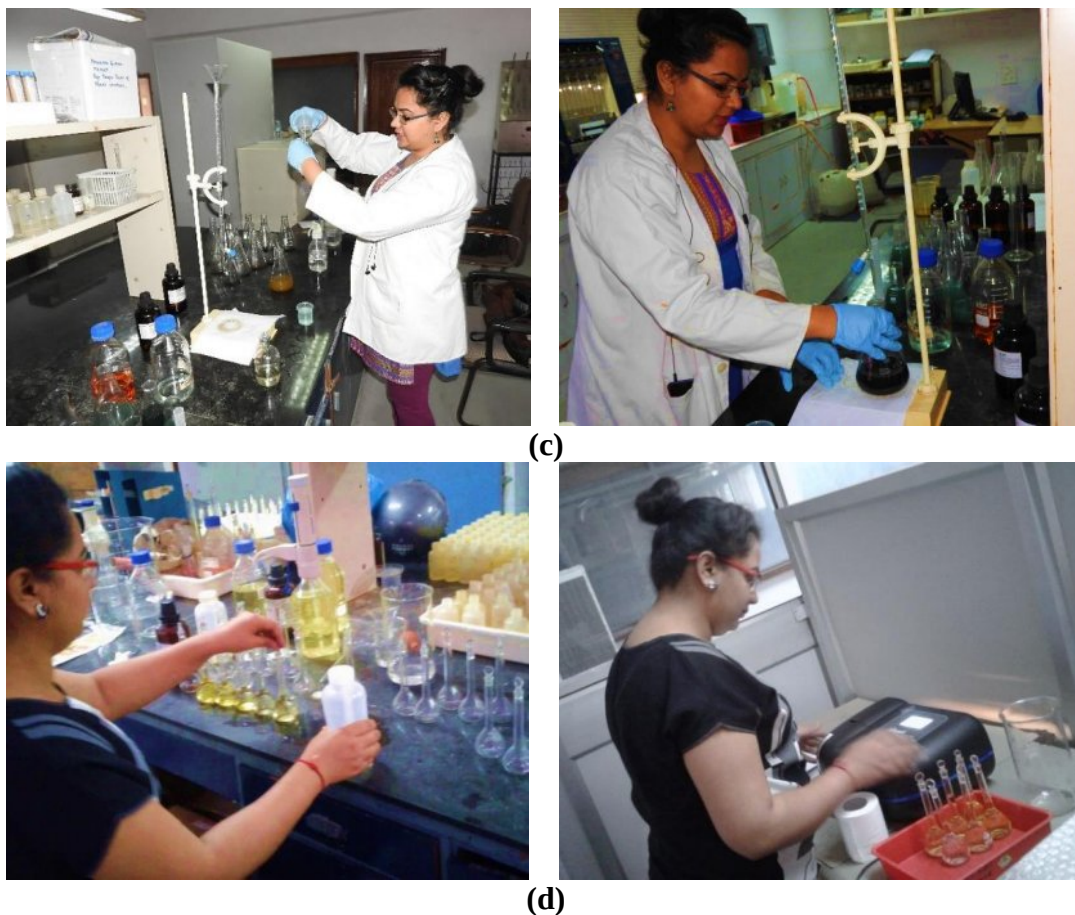


Plate 8. Glimpses of socio-economic and entry-point surveys (a) interaction with local communities using questionnaire survey, (b) livestock's grazing recorded along the fringes of Reserve, (c) collected *Saccharum* spp. bundles for thatching, (d) collected *Imperata cylindrica* bundles for thatching, (e) thatch construction using species viz., *Saccharum* spp., *Imperata cylindrica* and *Chrysopogon zizanioides*, (f) fodder collection for livestock, (g) wood collection along Reserve boundary (h) entry-point survey to determine quantity of resource extraction, (i) permanent and temporary nylon fishing nets for fish extraction, and (j) community fishing and extracted fish material.



(a)



(b)



(c)



(d)



(e)



(f)



(g)



(h)

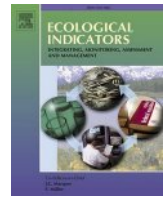




(i)



(j)



Impact of management practices on the tropical riverine grasslands of Brahmaputra floodplains: Implications for conservation

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ABSTRACT

Globally, the conservation value of tropical grasslands, unlike tropical forests, is underappreciated, and their degradation is widespread. Conservation of this vulnerable ecosystem requires scientifically validated management strategies. The present study examines the impact of flooding, herbivory, and other management practices on the riverine grasslands of Brahmaputra floodplains of Assam, India, for devising effective conservation strategies. Inundation period-based unsupervised classification was used to derive the types and extent of grasslands viz., short (SG) and tall (TG). Subsequently, the data on vegetation composition and nutrient status viz., soil carbon (C), nitrogen (N), phosphorus (P), and potassium (K), was collected from inside and outside of 15 exclosures that were subjected to different management regimes, including grazing (freely accessed by mega- and meso-herbivores), ungrazed (not accessed by mega- and meso-herbivores), ungrazed with controlled burning and ungrazed with invasive removal. A total of 1152 plots were monitored for two-year, from January 2014 to December 2015. The results of the study revealed that the areas inundated for a longer duration were dominated by SG and had higher species diversity, while areas inundated for the shorter duration were dominated by TG and had low species diversity. We further observed that grazing exclusion promoted heterogeneity, woody and invasive growth, and soil nutrient content. Burning and invasive removal reduced woody and invasive growth and enhanced soil nutrient conditions. Grazing and burning decreased heterogeneity, while invasive removal increased heterogeneity. Alteration of the flooding regime due to reduced water availability may affect the ratio of SG and TG extent in the long run, which may alter the vegetation composition and the productivity of these grasslands. We recommend short-term rotational grazing for SG and long-term for TG to promote heterogeneity and soil quality. Controlled burning can be carried out in dry and invaded areas post uprooting of invasives to mitigate the effect of succession.

1. Introduction

Tropical grasslands cover approximately 10% of Earth's landmass, accounting for about 15% of the carbon stored terrestrially, and 30% of global net primary productivity (Genxu et al., 2002; Buisson et al., 2019; Sinha et al., 2022). Unlike tropical forests, the conservation value of tropical grasslands is underappreciated, and their degradation is widespread and accelerating at an alarming rate (Buisson et al., 2021; Bardgett et al., 2021). Agriculture conversion, afforestation, sand mining, urbanization, changes in intensity and frequency of burning, biological invasion, overgrazing, altered edaphic conditions, and woody encroachment threaten these grasslands and their associated fauna (Buisson et al., 2019). Additionally, since flood inundation period (short

and long) defines grassland type, tropical grasslands are vulnerable to climate change induced frequent floods and droughts (Toogood and Joyce, 2009; Borah et al., 2018; IPCC, 2022). Globally, about 48% of vegetation areas have dried due to decreased precipitation and increased evapotranspiration (Lal et al., 2023). The duration of dry (drought) and wet (high precipitation and floods) seasons combined with management interventions like burning governs the vegetation and soil nutrient characteristics of tropical grasslands (Joyce et al., 2016). High precipitation in seasonally flooded tropical grasslands supports nutrient-rich soil and enhances the soil moisture content, which post-burning results in the reduction of woody species growth (Lehmkuhl, 1989). The flood-induced soil moisture content promotes plant productivity and nutrient uptake, while the decline in frequent floods or dry

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climatic conditions can decrease plant productivity and soil nutrient uptake (Van Oorschot et al., 1998). Apart from aforementioned climatic events, the changing frequency and intensity of grazing, burning and invasive uprooting are the major factors that govern the vegetation structure and function of tropical grasslands (Ratnam et al., 2016; Borah et al., 2018; Buisson et al., 2019).

Forest restoration strategies such as afforestation, suppressing fire, excluding large herbivores or soil fertilizers are commonly misapplied to tropical grasslands (Buisson et al., 2019). Due to paucity of scientific evidence-based studies from tropical grasslands, it remains unclear what management regime works best for the restoration and rewilding of tropical grasslands (Buisson et al., 2019). IPCC (2022) recommends controlled grazing, burning and invasive uprooting as adaptive management strategies to mitigate the impact of ongoing natural and anthropogenic pressures on tropical grasslands. Mega- and meso-herbivores modify vegetation characteristic (composition, structure and diversity) by controlling species colonization and extinction rates (Olff and Ritchie, 1998), and altering soil nutrient properties through defoliation, trampling, dung and urine depositions (Olff and Ritchie, 1998; Altesor et al., 2005). Experimental herbivore exclusion from tropical grasslands alters plant community compositions (Burns et al., 2009), enhances plant species diversity (Chaneton and Facelli, 1991), promotes woody encroachment (Smart et al., 1985) and proliferation of invasive species (Potter et al., 2021), and improves soil nutrient (C, N, P and K) content (Hatton and Smart, 1984; Singh et al., 1991). Prescribed or experimental burning removes aboveground biomass and enhances soil nutrient (C, N, P and K) content through volatilization and ash deposition (Harrington, 1974; Singh et al., 1991; Sankaran, 2016; Pathak et al., 2017), consequently impacting vegetation characteristics by altering plant community composition (heterogeneous) (Kumar et al., 2015), increasing plant species diversity (Adams et al., 1982; Nerlekar et al., 2022) and limiting woody growth and invasive species (Lonsdale and Miller, 1993; Clark and Wilson, 2001; Nerlekar et al., 2022).

According to the Convention on Biological Diversity, biological invasion of alien species is a major threat to biodiversity conservation, second only to habitat destruction (Nath et al., 2019). In tropical grasslands, invasive species with high plasticity of germination-related capability, modify plant community composition by replacing native flora and altering soil nutrient conditions (Clark and Wilson, 2001; Afreen et al., 2018; Srivastava and Raghubanshi, 2021). Drivers like habitat degradation and fragmentation, deforestation, human population expansion, land use and land cover changes, urbanization and climate change are accelerating the invasion processes (Nath et al., 2019). Invasive manual uprooting is an ecologically effective technique used for restoring invaded native grassland vegetation, as it effectively decreases the invasive and woody cover, recovers native species and promotes high plant species diversity (Guido and Pillar, 2017; Nerlekar et al., 2022; Sinha et al., 2022). Studies examining the impact of experimental invasive uprooting on edaphic conditions in tropical grasslands are limited, wherein non-invaded areas have higher soil nutrient (C, N, P and K) content compared to invaded areas (Choudhury, 2017; Srivastava and Raghubanshi, 2021).

Most of the aforementioned experimental studies assessing the impact of herbivory and management practices on tropical grassland vegetation characteristics and soil nutrient content have emerged from Africa and America, with very few studies from Asia. Protected Areas of India and Nepal are the last remaining strongholds of riverine alluvial grasslands, one of the last remaining highly productive subtropical grassland ecosystem, which are understudied with respect to impact of management interventions on grassland integrity and their associated mega- and meso-herbivores (Bezbaruha, 2007; Choudhury, 2017; Thapa et al., 2021; Sinha et al., 2022). Although, these riverine alluvial grasslands are legally protected through the Wild Life (Protection) Act, 1972 of India, and National Parks and Wildlife Conservation Act, 1973 of Nepal, they are vulnerable to flooding and subjected to herbivory and

management practices, including prescribed burning and invasive uprooting. The conservation of these vulnerable tropical grasslands requires scientifically validated effective management strategies.

The present study was thus conducted in the riverine alluvial grasslands of Kaziranga Tiger Reserve (KTR) in the Brahmaputra floodplains to generate baseline information from experimental studies to aid the management authorities in formulating and upgrading management practices. In KTR, floods of varying degrees and magnitude are an annual phenomenon due to its proximity to the Brahmaputra River and high precipitation in the monsoon season (June to October) (Sarma, 2005; Borah et al., 2018; Kumar et al., 2022). With varying degrees of flood intensities and fluctuations in water level, a large area of the Park gets inundated (Borah et al., 2018). Beside floods, the grasslands of KTR are subjected to combinations of herbivory, and management practices such as prescribed burning and manual uprooting of globally noxious invasive, *Mikania micrantha* and *Mimosa* spp. (Vasu, 2003; Vasu and Singh, 2015; Nath et al., 2019). Given the lack of scientific evidence regarding the effectiveness of manual uprooting and burning in controlling biological invasion in this Natural World Heritage Site, the United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Convention (WHC) strongly recommended that the efficacy of these management interventions be assessed (WHC, 2011). These grasslands support an assemblage of eight mega- and meso-herbivores, namely greater one-horned rhino (*Rhinoceros unicornis*), Asian elephant (*Elephas maximus*), Asiatic wild buffalo (*Bubalus arnee*), Indian bison (*Bos gaurus*), swamp deer (*Rucervus duvaucelii*), hog deer (*Axis porcinus*), sambar (*Rusa unicolor*) and Indian red muntjac (*Muntiacus muntjak*) (Devi et al., 2022). This study aims to provide conclusive evidences on the impact of flooding, managed herbivory, prescribed burning and manual invasive uprooting on the vegetation characteristics and edaphic conditions of these grasslands.

Based on the aforementioned studies, we hypothesized that in grassland ecosystems, post-flood, the duration of inundation will influence the grassland type (H_1); grazing exclusion promotes species diversity, woody and invasive species, and soil nutrient content, and vice versa for grazing inclusion (H_2); burning promotes species diversity and soil nutrient content, and decreases woody and invasive species (H_3); and invasive removal promotes species diversity and soil nutrient content, and decreases woody and invasive species (H_4). The present study aims to answer the following key questions: (1) does the duration of inundation influence short grassland (SG) and tall grassland (TG) extent in KTR; (2) what are the vegetation characteristics (composition, structure, diversity, woody individuals and invasive occurrence) and soil nutrient content (C, N, P and K) of SG and TG; (3) is there any similarity between species composition of SG and TG experimental sites (ES); and (4) do environmental variables such as rainfall (RF), maximum temperature (MAXT), minimum temperature (MINT) and soil nutrient (C, N, P and K) content influence plant species distribution in SG and TG.

2. Material and methods

2.1. Study area

Kaziranga Tiger Reserve (KTR) is spread over an area of 1030 km², between latitudes 26°34' N to 26°46' N and longitudes 93°08' E to 93°36' E, in the Brahmaputra floodplains of the Indian state of Assam (Fig. 1). Kaziranga was first declared as a Reserve Forest (1908) and later redesignated to Game Sanctuary (1916), Wildlife Sanctuary (1950), National Park (1974), UNESCO World Heritage Site (1985) and Tiger Reserve (2007) (Devi et al., 2022). The climate of the area is subtropical monsoon type (Vasu and Singh, 2015). From January 2014 to December 2015, the total annual precipitation in the study area varied from 1630.4 to 2247.8 mm, with mean annual precipitation of 1939.1 ± 308.7 mm. High precipitation was recorded in wet season (April to September), which varied from 1557 to 2021.2 mm with mean precipitation of 1789.1 ± 232.1 mm, and low precipitation in dry season

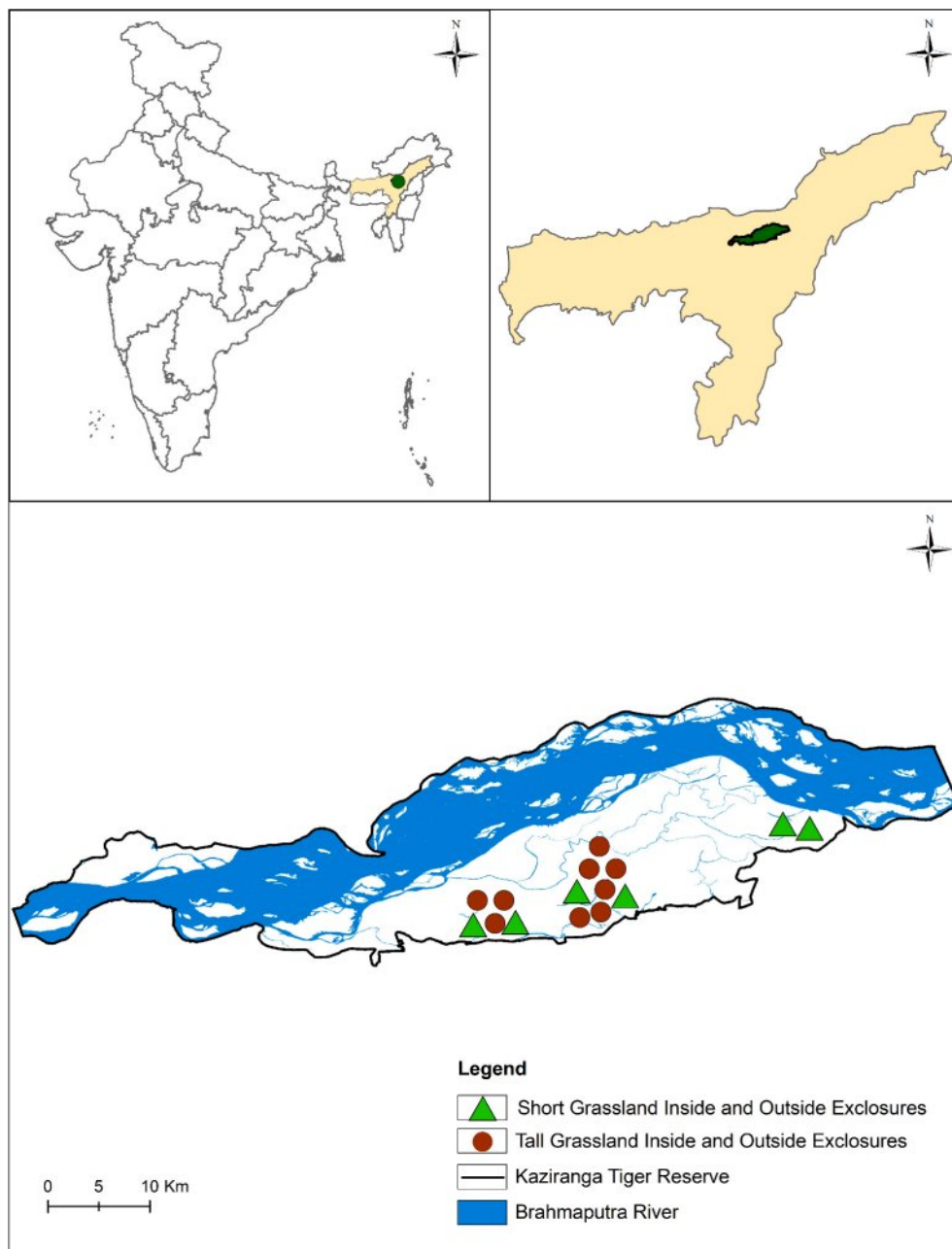


Fig. 1. Map showing study area and the location of experimental sites in riverine alluvial grasslands of Kaziranga Tiger Reserve, Assam, India.

(October to March), which varied from 73.4 to 226.6 mm with mean precipitation of 150 ± 76.6 mm. The MAXT ranged from 27 to 39 °C, and the MINT ranged from 5 to 23 °C (2014–15, Assam Forest Department) (Supplementary Fig. S1). Floods are an annual event in Kaziranga (from June to October), which not only replenish the soil with nutrient-rich alluvial deposits, regulate the water table throughout the year, but also take a heavy toll with respect to animal mortality (Yadava, 2015; Devi et al., 2022). KTR, with its flat terrain, is characterized by numerous permanent water bodies (locally termed as *beels*) (Vasu and Singh, 2015). The major vegetation types of KTR comprise of alluvial inundated short and tall grasslands, tropical wet evergreen forests, tropical semi-evergreen forests and aquatic flora (Hajra and Jain, 1994; Khatri and Barua, 2011). Apart from the eight sympatrically occurring mega- and meso-herbivores, the mosaic of habitats in this ecosystem harbours globally threatened species, including pygmy hog (*Porcula salvania*), hispid hare (*Caprolagus hispidus*), tiger (*Panthera tigris*), Bengal florican (*Houbaropsis bengalensis*), Gangetic river dolphin (*Platanista*

gangetica) and Eurasian otter (*Lutra lutra*). Due to its location at the junction of the East Asia/Australia flyway and Indo-Asian flyway, KTR also supports diverse avifaunal assemblages. WHC identified flood and habitat degradation due to rapid increase in periphery village population, agriculture development, biological invasion, and overgrazing by wildlife and livestock as key threats to Kaziranga (WHC, 2011).

2.2. Grassland mapping

Three satellite images of the Indian Remote Sensing Satellite (IRS-P6) LISS-IV (5.8 m resolution) datasets were acquired for 22nd October 2012 (Path:112, Row:053), 4th December 2012 (Path:111, Row:052) and 10th March 2013 (Path:111, Row:053). Satellite imageries were geo-rectified using the Survey of India toposheet. Images were processed using unsupervised classification (Borah et al., 2018). Based on the inundation period, KTR was categorized into seven classes viz., tall grass, short grass, waterlogged (seasonal waterbody), waterbody

(permanent), river, river sand and other (woodland/tree groves, river scrub, agriculture, settlements and tea gardens). The period of inundation was categorized into ≤ 6 months and > 6 months. Area of each class and patches (polygons of identified classes) were calculated from maps (Borah et al., 2018). Maps were prepared using Erdas Imagine 11.0 and ArcInfo 9.3.

2.3. Experimental design

The locations for experimental sites (ES) were selected based on the duration of accessibility. For heterogeneous sampling, the locations were selected in three different ranges of KTR, namely central (Kohora), eastern (Agoratoli), and western (Bagori). Due to limited resources, only 15 exclosures of size 10 m $\times$ 10 m with fixed chain link iron fencing and a mesh size of 0.05 m $\times$ 0.05 m were constructed. The data was collected from 30 ES, inside ($n = 15$) and outside ($n = 15$) of all fenced exclosures (Fig. 1). Inside ES represents the areas where mega- and meso-herbivores were excluded (henceforth referred to as herbivore exclusion), while the outside ES represents the areas with free access to mega- and meso-herbivores (henceforth referred to as herbivore inclusion) (Supplementary Table S1). The impact of ongoing management interventions was studied by subjecting (a) three herbivore exclusion ES to controlled annual burning at the end of February; consequently, the data was not collected for March to allow burned areas to recover, and (b) two herbivore exclusion ES to monthly invasive removal via manual uprooting of invasives *Mimosa* spp. and *M. micrantha*. ES were categorised into herbivore exclusion in short grassland (HES, $n = 6$), herbivore inclusion in short grassland (HIS, $n = 6$), herbivore exclusion in tall grassland (HET, $n = 4$), herbivore inclusion in tall grassland (HIT, $n = 9$), herbivore exclusion in tall grassland with burning (HETB, $n = 3$), and herbivore exclusion in tall grassland with invasive removal (HETIR, $n = 2$). The experimental exclosures constructed for the present study were designed to exclude the mega- and meso-herbivores only, but not the small rodents and birds, which may influence the vegetation structure and its functional traits (e.g., Howe and Brown, 1999). Further, post-flood senescent vegetation accumulation and sediment deposition inside exclosures may also influence the plant composition, biomass production, and soil nutrient contents (e.g., Van Oorschot et al., 1998; Deng et al., 2014).

2.4. Field sampling

Vegetation and soil samples were collected for two years, from January 2014 to December 2015 (excluding the flood period from August to October). The sampling period was divided into the dry (November to March) and the wet seasons (April to July). For vegetation composition and structure analysis, three random quadrates (1 m $\times$ 1 m) were laid in each ES (inside and outside the 15 exclosures), to collect abundance data (Mueller-Dombois and Ellenberg, 1974). Overall, 1152 plots were sampled, including 612 in the dry season and 540 in the wet season (Supplementary Table S2). The plant species were identified following 'Botany of Kaziranga and Manas' by Hajra and Jain (1994). For soil sampling, three random soil samples (15 cm deep) were collected from three different sides of each ES after removing the vegetation layer using a soil auger (length = 15 cm, diameter = 7.5 cm) (Chaturvedi and Sankar, 2006). The soil samples were air-dried for 2–3 days, sieved (2 mm mesh) to remove the stone and root particles, and packed in zip-lock bags for laboratory analysis. To make one composite sample, three soil samples collected from the same location were pooled together (Chaturvedi and Sankar, 2006). A total of 390 composite soil samples (dry season = 210; wet season = 180) were prepared and analysed using standard protocols (Supplementary Table S2 and S3). RF, MAXT and MINT data was collected from January 2014 to December 2015 (2014–15, Assam Forest Department).

2.5. Data analysis

Rainfall based hierarchical clustering was used to identify dry and wet seasons (Supplementary Fig. S2). For the sampling conducted throughout the study period, a species-area curve was plotted for each category of ES, to determine the adequate sampling efforts required to study vegetation composition and structure (Supplementary Fig. S3). In the species-area curve, the number of plots laid and the mean number of plants recorded from each ES were plotted (Colwell et al., 2012). Two-way indicator species analysis (TWINSpan) was used to identify and classify homogenous groups of vegetation into plant communities (Gauch and Whittaker, 1981; McCune and Mefford, 1999). Based on the TWINSpan results, the density, frequency, abundance and abundance to frequency ratio (A/F) of each species in each plant community was calculated (Curtis and McIntosh, 1950) (Supplementary Table S4). A/F values indicate whether the distribution pattern is regular (A/F < 0.025), random (A/F = 0.025–0.05) or contagious (A/F > 0.05) (Evans, 1953; David and Moore, 1954; Curtis and Cottam, 1956). Based on abundance, the frequency of occurrence of invasive species was estimated (from removed invasives in HETIR). Diversity indices viz., Richness (S), Evenness (E), Shannon-Weiner (H'), and Simpson's dominance (D), were calculated (Simpson, 1949; Margalef, 1958; Shannon and Weaver, 1963; Hill, 1973).

Pairwise similarities of plant species composition between ES was estimated using Bray-Curtis similarity index, ranging from 0 (no similarity) to 1 (complete similarity) (Bray and Curtis, 1957). Non-metric multidimensional scaling (NMDS) based on Bray-Curtis similarity index with 3-D ordination plots was used to visualize the similarities in the species composition. The permutation test perMANOVA (permutational multivariate analysis of variance) with 999 permutations was performed to test the null hypothesis of no differences between ES (Anderson and Walsh, 2013). Canonical correspondence analysis (CCA) was performed to elucidate the relationship between sites and species with their environmental parameters (C, N, P, K, RF, MAXT and MINT) (ter Braak and Verdonschot, 1995). Using Legendre and Legendre (1998), site-wise species data and environmental parameters were standardized, from 0 to 1. Following Cao et al. (2001), rare species occurring in each ES were not excluded, as they might be sensitive to habitat, herbivory and management interventions. For CCA, significant variables were identified using perMANOVA with 999 permutations and after Bonferroni corrections. Mann-Whitney and Kruskal-Wallis tests were performed to derive significant differences. Additionally, for multiple comparisons, Bonferroni corrections were performed (Kwak et al., 2020). Data analysis was carried out using TWINSpan, PC-ORD (version 4.20), PAST, R (version 2.5–7) and SPSS (version 22) software's (Hill, 1979; Hammer et al., 2001; Oksanen et al., 2020).

3. Results

3.1. Grassland mapping

Areas inundated for ≥ 6 months were dominated by short grass, waterlogged, waterbody, river and river sand classes, while areas inundated for < 6 months were dominated by tall grass, river and river sand (Fig. 2 and Supplementary Fig. S4a and S4b). Among the seven classes, river (24.56%) and tall grass (24.39%) covered the maximum area, whereas waterlogged (1.86%) and short grass (2.23%) covered the minimum area. A total of 2113 patches with a mean patch size of 6.18 ± 38.26 km² were recorded. The highest number of patches ($n = 515$) and smallest mean patch size (0.10 ± 0.23 km²) were recorded for waterbody, and the lowest number of patches ($n = 62$) and the largest mean patch size (4.08 ± 31.55 km²) were recorded for river (Supplementary Table S5).

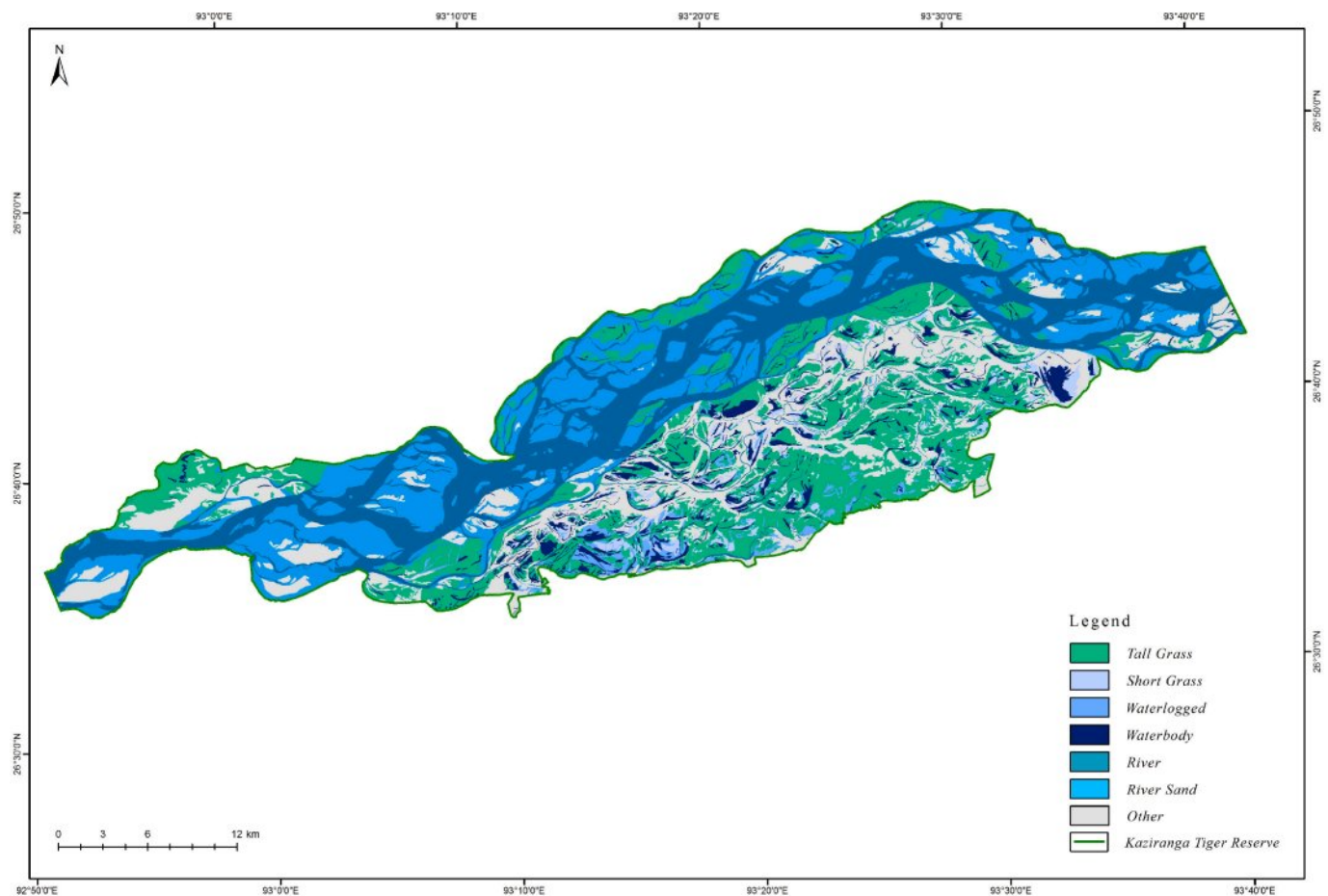


Fig. 2. Map depicting Land Use and Land Cover of Kaziranga Tiger Reserve, Assam, India.

3.2. Short grassland

Irrespective of seasons, both HES and HIS were dominated by the family Poaceae and growth form herbs (Table 1 and Supplementary Table S6). Plant communities in these sites were dominated by *Cynodon dactylon*, *Hemarthria compressa* and *Carex vesicaria*, and showed contagious distribution ($A/F \geq 0.05$) (Table 2 and Supplementary Table S7-8). Seasonally, high species diversity was recorded during the wet season in both HES ($H' = 1.38$, Mann-Whitney, $P = 0.001$) and HIS ($H' = 1.22$, Mann-Whitney, $P = 0.08$) (Table 3 and Supplementary Table S9). Between HES and HIS, high species diversity was recorded in HES overall ($H' = 1.22$, Mann-Whitney, $P = 1.00$), and in dry ($H' = 1.09$, Mann-Whitney, $P = 1.00$) and wet ($H' = 1.38$, Mann-Whitney, $P = 1.00$) seasons (Table 3 and Supplementary Table S10). Between HES and HIS, a significant seasonal difference was recorded in species diversity (Mann-Whitney, $P = 0.001$) (Supplementary Table S11). Seasonally, a higher number of woody individuals were recorded during wet season in HES ($n = 49$) and dry season in HIS ($n = 21$) (Supplementary Table S12). Compared to HIS, a higher number of woody individuals were recorded from HES overall ($n = 79$), and in dry ($n = 30$) and wet ($n = 49$) seasons. No invasives were recorded from HES and HIS. Compared to dry season, significantly high C, N, P and K content (Mann-Whitney, $P < 0.05$) was recorded in both HES and HIS during wet season (Supplementary Table S9). Compared to HIS, high C (1.98%, 1.51% and 2.57%), N (0.11%, 0.10% and 0.12%), P (0.07%, 0.05% and 0.08%) and K (0.49%, 0.43% and 0.57%) content was recorded in HES overall and in dry and wet seasons, respectively (Supplementary Table S13). Between HES and HIS, no significant differences were recorded in C, N, P and K content overall (Mann-Whitney, $P > 0.05$); in dry (Mann-Whitney, $P > 0.05$), wet seasons (Mann-Whitney, $P > 0.05$) (Supplementary Table S10).

Seasonally, between HES and HIS, significant differences were recorded in C, N, P and K content (Mann-Whitney, $P < 0.05$) (Supplementary Table S11).

3.3. Tall grassland

Irrespective of seasons, family Poaceae and growth form herbs dominated TG sites (Table 1 and Supplementary Table S6). Plant communities in these sites were dominated by *Saccharum* spp. and showed contagious distribution ($A/F \geq 0.05$) (Table 2 and Supplementary Table S14-17). Seasonally, high species diversity was recorded for HET ($H' = 1.32$, Mann-Whitney, $P = 0.02$), HIT ($H' = 1.27$, Mann-Whitney, $P = 0.02$) and HETIR ($H' = 1.23$, Mann-Whitney, $P = 0.25$) during wet season, and for HETB during dry season ($H' = 0.94$, Mann-Whitney, $P = 0.12$) (Table 3 and Supplementary Table S9). Among TG sites, high species diversity was recorded throughout the year and during wet season in HET ($H' = 1.21$ and 1.32 , respectively; Kruskal-Wallis, $P < 0.05$), and during dry season in HETIR ($H' = 1.17$; Kruskal-Wallis, $P = 0.003$) (Table 3 and Supplementary Table S18). Among TG sites, a significant seasonal difference was recorded in species diversity (Mann-Whitney, $P = 0.03$) (Supplementary Table S11). A higher number of woody individuals were recorded in HET ($n = 871$), HIT ($n = 502$) and HETB ($n = 140$) during wet season, and in HETIR ($n = 196$) during dry season (Supplementary Table S12). Highest number of woody individuals were recorded in HET overall ($n = 1418$), and in dry ($n = 547$) and wet ($n = 871$) seasons. Highest occurrence of *Mimosa* spp. and *M. micrantha* was recorded from HET overall (39.35%) and in dry (37.50%) and wet (41.67%) seasons; however, it was lowest in HETIR overall (18.52%) and in dry season (18.33%), and in HETB in wet season (6.94%) (Fig. 3). Seasonally, higher occurrence of *Mimosa* spp. and *M.*

Table 1
Plant species composition recorded from riverine alluvial grasslands during 2014–15 in Kaziranga Tiger Reserve, Assam, India.

Experimental Sites	Season	Species	Genus	Families	Number of species (n)														
					Group		Type			Growth Form							Life cycle		
					An	Pt	M	Di	F	Grass	Sedges	Climber	Herb	Fern	Shrub	Tree	Ann	Per	Deci
HES	Overall	89	79	32	86	3	29	57	3	20	7	3	51	3	5	0	43	46	0
	Dry	51	46	19	50	1	13	37	1	11	2	3	30	1	4	0	25	26	0
	Wet	77	70	30	75	2	27	48	2	18	7	1	46	2	3	0	39	38	0
HIS	Overall	46	44	23	45	1	11	34	1	9	2	1	30	1	3	0	23	23	0
	Dry	30	29	16	30	0	7	23	0	5	2	0	21	0	2	0	14	16	0
	Wet	43	41	21	42	1	11	31	1	9	2	1	28	1	2	0	22	21	0
HET	Overall	80	72	32	78	2	23	55	2	13	7	8	37	2	11	2	26	52	2
	Dry	45	45	26	43	2	15	28	2	8	4	5	15	2	9	2	6	37	2
	Wet	69	61	28	67	2	18	49	2	11	6	7	31	2	10	2	24	43	2
HIT	Overall	59	57	30	56	3	13	43	3	8	4	7	24	3	11	2	16	41	2
	Dry	42	41	25	40	2	11	29	2	6	4	4	16	2	8	2	10	30	2
	Wet	50	49	25	47	3	13	34	3	8	4	7	17	3	9	2	12	36	2
HETB	Overall	62	56	30	58	4	21	37	4	13	6	6	27	4	5	1	17	44	1
	Dry	29	29	17	27	2	11	16	2	6	4	3	9	2	4	1	5	23	1
	Wet	51	47	29	47	4	17	30	4	11	4	6	21	4	4	1	13	37	1
HETIR	Overall	55	49	26	53	2	16	37	2	10	5	5	28	2	5	0	19	36	0
	Dry	35	33	17	33	2	12	21	2	7	4	3	14	2	5	0	10	25	0
	Wet	46	41	25	44	2	14	30	2	9	4	5	21	2	5	0	14	32	0
Total	Overall	142	125	47	136	6	41	95	6	26	10	8	75	6	15	2	57	83	2
	Dry	96	89	38	93	3	24	69	3	16	5	7	51	3	12	2	36	58	2
	Wet	134	119	46	128	6	39	89	6	25	10	8	70	6	13	2	53	79	2

HES-herbivore exclusion in short grassland, HIS-herbivore inclusion in short grassland, HET-herbivore exclusion in tall grassland, HIT-herbivore inclusion in tall grassland, HETB-herbivore exclusion in tall grassland burning and HETIR-herbivore exclusion in tall grassland invasive removal, An-angiosperms, Pt-pteridophytes, M-monocot, Di- dicot, F-fern, Ann-annual, Per-perennial, Deci-deciduous and n-number of species.

Table 2

Overall plant communities recorded from riverine alluvial grasslands during 2014–15 in Kaziranga Tiger Reserve, Assam, India.

ES	Plant community	Division level			Dominating species	Density (m ⁻²)	F (%)	A	A/F
		N	n	Eigen					
HES	HES-PC1: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Setaria pumila</i>	51	41	0.24	<i>Hemarthria compressa</i>	94.71	100	94.71	0.95
					<i>Cynodon dactylon</i>	38.53	100	38.53	0.39
					<i>Setaria pumila</i>	30.16	98.04	30.76	0.31
	HES-PC2: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Paspalum conjugatum</i>	50	56	0.22	<i>Hemarthria compressa</i>	91.34	98.00	93.20	0.95
					<i>Cynodon dactylon</i>	62.54	98.00	63.82	0.65
					<i>Paspalum conjugatum</i>	16.90	72.00	23.47	0.33
	HES-PC3: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Polygonum plebeium</i>	93	54	0.18	<i>Cynodon dactylon</i>	62.03	100	62.03	0.62
					<i>Hemarthria compressa</i>	52.86	100	52.86	0.53
					<i>Polygonum plebeium</i>	6.74	53.76	12.54	0.23
	HES-PC4: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Grangea maderaspatana</i>	74	46	0.18	<i>Cynodon dactylon</i>	67.88	100	67.88	0.68
					<i>Hemarthria compressa</i>	55.22	100	55.22	0.55
					<i>Grangea maderaspatana</i>	4.01	48.65	8.25	0.17
	HES-PC5: <i>Carex vesicaria</i> - <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i>	56	37	0.34	<i>Carex vesicaria</i>	86.77	100	86.77	0.87
					<i>Hemarthria compressa</i>	69.07	100	69.07	0.69
					<i>Cynodon dactylon</i>	9.34	26.79	34.87	1.30
HIS	HIS-PC1: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Setaria pumila</i>	20	18	0.25	<i>Cynodon dactylon</i>	49.15	100	49.15	0.49
					<i>Hemarthria compressa</i>	39.60	100	39.60	0.40
					<i>Setaria pumila</i>	14.20	35.00	40.57	1.16
	HIS-PC2: <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i> - <i>Heliotropium indicum</i>	22	26	0.25	<i>Hemarthria compressa</i>	58.09	100	58.09	1.72
					<i>Cynodon dactylon</i>	42.68	100	42.68	2.34
					<i>Heliotropium indicum</i>	6.09	90.91	6.70	13.57
	HIS-PC3: <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i> - <i>Alternanthera sessilis</i>	76	34	0.22	<i>Cynodon dactylon</i>	39.12	100	39.12	0.39
					<i>Hemarthria compressa</i>	30.87	90.79	34.00	0.37
					<i>Alternanthera sessilis</i>	1.50	27.63	5.43	0.20
	HIS-PC4: <i>Carex vesicaria</i> - <i>Hemarthria compressa</i> - <i>Cynodon dactylon</i>	26	18	0.38	<i>Carex vesicaria</i>	55.96	100	55.96	0.56
					<i>Hemarthria compressa</i>	39.04	96.15	40.60	0.42
					<i>Cynodon dactylon</i>	10.35	30.77	33.63	1.09
HET	HET-PC1: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Christella parasitica</i>	73	27	0.22	<i>Saccharum</i> spp.	53.70	100	53.70	0.54
					<i>Merremia umbellata</i>	10.27	75.34	13.64	0.18
					<i>Christella parasitica</i>	7.23	64.38	11.23	0.17
	HET-PC2: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Alpinia nigra</i>	42	37	0.22	<i>Saccharum</i> spp.	65.48	100	65.48	0.65
					<i>Merremia umbellata</i>	17.79	92.86	19.15	0.21
					<i>Alpinia nigra</i>	6.81	80.95	8.41	0.10
	HET-PC3: <i>Saccharum</i> spp.- <i>Mikania micrantha</i> - <i>Merremia umbellata</i>	31	31	0.24	<i>Saccharum</i> spp.	34.61	100	34.61	0.35
					<i>Mikania micrantha</i>	18.23	93.55	19.48	0.21
					<i>Merremia umbellata</i>	6.13	41.94	14.62	0.35
	HET-PC4: <i>Saccharum</i> spp.- <i>Mimosa</i> spp.- <i>Paspalum conjugatum</i>	41	45	0.24	<i>Saccharum</i> spp.	43.00	100	43.00	0.43
					<i>Mimosa</i> spp.	11.37	63.41	17.92	0.28
					<i>Paspalum conjugatum</i>	9.10	41.46	21.94	0.53
	HET-PC5: <i>Saccharum</i> spp.- <i>Paspalum conjugatum</i> - <i>Hemarthria compressa</i>	29	35	0.27	<i>Saccharum</i> spp.	44.00	100	44.00	0.44
					<i>Paspalum conjugatum</i>	19.55	65.52	29.84	0.46
					<i>Hemarthria compressa</i>	14.31	37.93	37.73	0.99
HIT	HIT-PC1: <i>Saccharum</i> spp.- <i>Alpinia nigra</i> - <i>Lygodium flexuosum</i>	19	16	0.27	<i>Saccharum</i> spp.	34.11	100	34.11	0.34
					<i>Alpinia nigra</i>	3.63	84.21	4.31	0.05
					<i>Lygodium flexuosum</i>	4.84	52.63	9.20	0.17
	HIT-PC2: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Mikania micrantha</i>	29	19	0.27	<i>Saccharum</i> spp.	35.21	100	35.21	0.35
					<i>Merremia umbellata</i>	19.45	100	19.45	0.19
					<i>Mikania micrantha</i>	4.24	37.93	11.18	0.29
	HIT-PC3: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Christella parasitica</i>	77	36	0.21	<i>Saccharum</i> spp.	36.57	100	36.57	0.37
					<i>Merremia umbellata</i>	10.71	58.44	18.33	0.31
					<i>Christella parasitica</i>	5.16	63.64	8.10	0.13
	HIT-PC4: <i>Saccharum</i> spp.- <i>Scleria terrestris</i> - <i>Alpinia nigra</i>	45	39	0.28	<i>Saccharum</i> spp.	45.47	100	45.47	0.45
					<i>Scleria terrestris</i>	13.89	55.56	25.00	0.45
					<i>Alpinia nigra</i>	4.73	68.89	6.87	0.10
	HIT-PC5: <i>Saccharum</i> spp.- <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i>	46	31	0.28	<i>Saccharum</i> spp.	33.20	93.48	35.51	0.38
					<i>Cynodon dactylon</i>	19.59	76.09	25.74	0.34
					<i>Hemarthria compressa</i>	17.07	50.00	34.13	0.68
HETB	HETB-PC1: <i>Saccharum</i> spp.- <i>Hemarthria compressa</i> - <i>Merremia umbellata</i>	16	18	0.25	<i>Saccharum</i> spp.	116.06	100	116.06	1.16
					<i>Hemarthria compressa</i>	21.69	56.25	38.56	0.69
					<i>Merremia umbellata</i>	16.25	62.50	26.00	0.42
	HETB-PC2: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Alpinia nigra</i>	56	33	0.25	<i>Saccharum</i> spp.	66.66	100	66.66	0.67
					<i>Merremia umbellata</i>	15.18	75.00	20.24	0.27
					<i>Alpinia nigra</i>	6.46	66.07	9.78	0.15
	HETB-PC3: <i>Saccharum</i> spp.- <i>Alpinia nigra</i> - <i>Mikania micrantha</i>	44	29	0.34	<i>Saccharum</i> spp.	84.41	100	84.41	0.84
					<i>Alpinia nigra</i>	15.30	84.09	18.19	0.22
					<i>Mikania micrantha</i>	8.25	50.00	16.50	0.33
	HETB-PC4: <i>Saccharum</i> spp.- <i>Apluda mutica</i> - <i>Scleria terrestris</i>	28	31	0.34	<i>Saccharum</i> spp.	76.07	100	76.07	0.76

(continued on next page)

Table 2 (continued)

ES	Plant community	Division level			Dominating species	Density (m ⁻²)	F (%)	A	A/F
		N	n	Eigen					
					<i>Apluda mutica</i>	7.82	32.14	24.33	0.76
					<i>Scleria terrestris</i>	3.50	32.14	10.89	0.34
HETIR	HETIR-PC1: <i>Saccharum</i> spp.- <i>Cynodon dactylon</i> - <i>Hemarthria compressa</i>	32	26	0.28	<i>Saccharum</i> spp.	73.66	100	73.66	0.74
					<i>Cynodon dactylon</i>	15.38	62.50	24.60	0.39
					<i>Hemarthria compressa</i>	13.63	68.75	19.82	0.29
	HETIR-PC2: <i>Saccharum</i> spp.- <i>Alpinia nigra</i> - <i>Christella parasitica</i>	48	35	0.28	<i>Saccharum</i> spp.	69.44	100	69.44	0.69
					<i>Alpinia nigra</i>	8.48	85.42	9.93	0.12
					<i>Christella parasitica</i>	7.08	68.75	10.30	0.15
	HETIR-PC3: <i>Saccharum</i> spp.- <i>Merremia umbellata</i> - <i>Paspalum conjugatum</i>	28	43	0.28	<i>Saccharum</i> spp.	101.29	100	101.29	1.01
					<i>Merremia umbellata</i>	17.04	89.29	19.08	0.21
					<i>Paspalum conjugatum</i>	16.75	75.00	22.33	0.30

ES-experimental sites, HES-herbivore exclusion in short grassland, HIS-herbivore inclusion in short grassland, HET-herbivore exclusion in tall grassland, HIT-herbivore inclusion in tall grassland, HETB-herbivore exclusion in tall grassland burning, HETIR-herbivore exclusion in tall grassland invasive removal, PC-plant community, F (%)—frequency in percentages, N—number of plots, n—number of species, A—abundance and A/F—abundance to frequency ratio.

Table 3

Diversity indices recorded from riverine alluvial grasslands during 2014–15 in Kaziranga Tiger Reserve, Assam, India.

Diversity indices	Season	Experimental sites						Kruskal-Wallis		
		HES	HIS	HET	HIT	HETB	HETIR	χ^2	df	P
Species richness	Overall	6.1	4.5	5.7	4.7	4.2	6.2	23.47	5	0.00*
	Dry	4.8	3.8	4.8	3.7	3.8	5.3	16.27	5	0.01*
	Wet	7.8	5.2	6.9	5.6	4.5	7.4	23.06	5	0.00*
Species evenness	Overall	0.73	0.77	0.72	0.76	0.65	0.68	18.98	5	0.00*
	Dry	0.75	0.78	0.74	0.75	0.72	0.72	5.09	5	0.40
	Wet	0.69	0.76	0.70	0.76	0.57	0.63	21.28	5	0.01*
Shannon diversity	Overall	1.22	1.10	1.21	1.11	0.89	1.20	26.97	5	0.00*
	Dry	1.09	0.99	1.13	0.95	0.94	1.17	14.59	5	0.01*
	Wet	1.38	1.22	1.32	1.27	0.84	1.23	19.50	5	0.00*
Simpson dominance	Overall	0.62	0.60	0.60	0.58	0.47	0.57	27.39	5	0.00*
	Dry	0.60	0.57	0.59	0.53	0.52	0.58	11.56	5	0.04*
	Wet	0.65	0.64	0.62	0.64	0.43	0.56	22.51	5	0.00*

HES-herbivore exclusion in short grassland, HIS-herbivore inclusion in short grassland, HET- herbivore exclusion in tall grassland, HIT-herbivore inclusion in tall grassland, HETB- herbivore exclusion in tall grassland burning, HETIR- herbivore exclusion in tall grassland invasive removal, χ^2 - chi-square value, df- degree of freedom and *indicates significant result at $P < 0.05$.

micrantha was recorded during wet season in HET (41.67%), HIT (26.85%) and HETIR (18.75%), and during dry season in HETB (34.72%). Occurrence of *Mimosa* spp. was high in HET overall (20.83%) and in dry (13.33%) and wet (30.21%) seasons; however, it was low in HETB overall (2.08%) and in dry season (4.17%), and absent in wet season. Seasonally, high occurrence of *Mimosa* spp. was recorded during wet season in HET (30.21%) and HIT (14.81%), and during dry season in HETB (4.17%) and HETIR (11.67%). Occurrence of *M. micrantha* was high in HET (20.37%) overall, HETB (33.33%) in dry season, and HIT (16.67%) in wet season; however, it was low in HETIR overall (12.96 %) and in dry season (13.33%), and in HETB in wet season (6.94%). Seasonally, high occurrence of *M. micrantha* was recorded in HET (25%), HETB (33.33%) and HETIR (13.33%) in dry season, and in HIT in wet season (16.67%). Among TG sites, from dry to wet season, significantly high C, N, P and K content (Mann-Whitney, $P < 0.05$) was recorded (Supplementary Table S9). Among TG sites, high C (3.80%, 3.32% and 4.40%), N (0.17%, 0.14% and 0.20%), P (0.16%, 0.11% and 0.22%) and K (0.79%, 0.69% and 0.92%) content was recorded in HETB overall, and in dry and wet seasons, respectively (Supplementary Table S13). Among TG sites, significant differences were recorded in C, N, P and K content overall and in wet season (Kruskal-Wallis, $P < 0.05$), and in C, N and K content during dry season (Kruskal Wallis, $P < 0.05$) (Supplementary Table S18). Seasonally, among TG sites, significant differences were

recorded in C, N, P and K content (Mann-Whitney, $P < 0.05$) (Supplementary Table S11).

3.4. Experimental sites comparison

In total, 142 species belonging to 47 families were recorded (Table 1 and Supplementary Table S19). High pairwise similarities in species composition were recorded between HETIR-HIT overall ($BC_{ij} = 0.82$), HETB-HIT in dry season ($BC_{ij} = 0.82$), and HET-HIT in wet season ($BC_{ij} = 0.78$). High dissimilarity was recorded between HES-HETB overall, and in dry and wet seasons ($BC_{ij} = 0.03$, 0.01 and 0.04, respectively) (Supplementary Table S20). In NMDS ordination plots, perMANOVA test indicated significant dissimilarities in species composition of ES overall (adonis pseudo $F_{1152} = 41.62$, $df = 5$, $R^2 = 0.72$, $P \leq 0.001$), and in dry (adonis pseudo $F_{612} = 40.51$, $df = 5$, $R^2 = 0.84$, $P \leq 0.001$) and wet (adonis pseudo $F_{540} = 24.76$, $df = 5$, $R^2 = 0.78$, $P \leq 0.001$) seasons (Fig. 4 and Supplementary Fig. S5a and S5b). High species diversity was recorded from HES overall ($H' = 1.22$) and in wet season ($H' = 1.38$), and in dry season from HETIR ($H' = 1.17$). Low species diversity was recorded from HETB overall, and in dry and wet seasons ($H' = 0.89$, 0.94 and 0.84, respectively) (Table 3). Among ES, significant differences were recorded in species diversity overall, and in dry and wet seasons (Kruskal-Wallis, $P < 0.05$), and between dry and wet seasons (Mann-

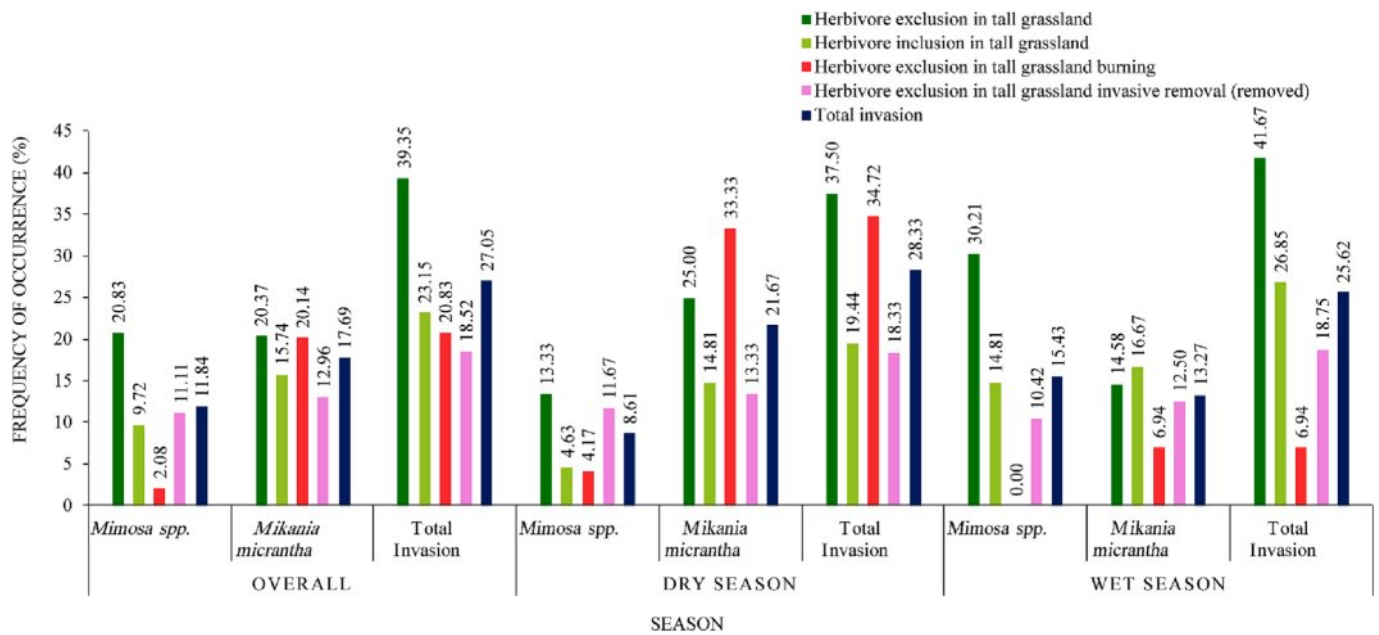


Fig. 3. Graph showing the occurrence of invasive (in percentages) in tall grassland experimental sites during 2014–15 in Kaziranga Tiger Reserve, Assam, India.

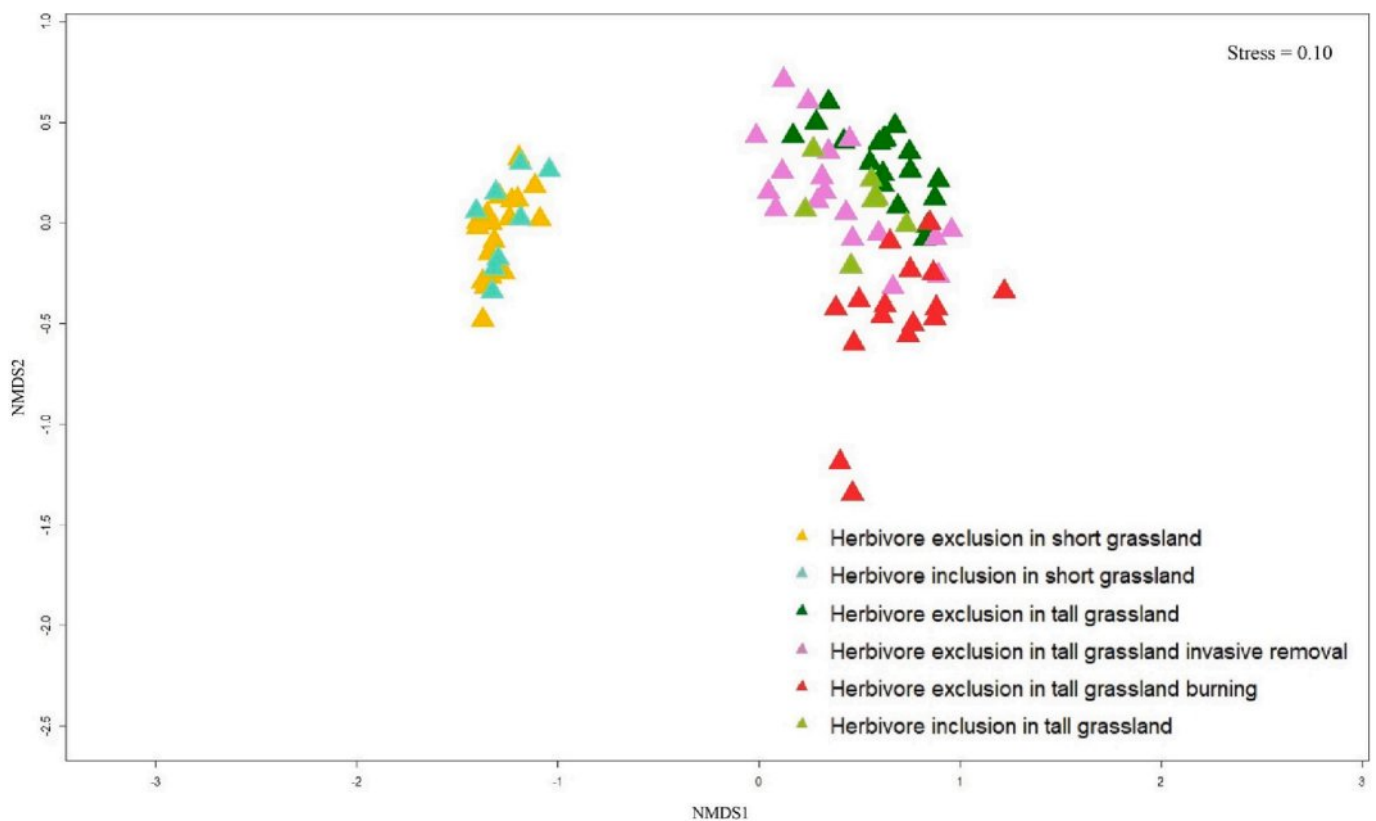


Fig. 4. Overall NMDS ordination plot depicting dissimilarities (adonis pseudo $F_{1152} = 41.62$, $df = 5$, $R^2 = 0.72$, $P \leq 0.001$) in plant species composition among experimental sites of riverine alluvial grasslands during 2014–15 in Kaziranga Tiger Reserve, Assam, India.

Whitney, $P = 0.0002$) (Table 3 and Supplementary Table S11). Highest number of woody individuals were recorded from HET overall, and in dry and wet seasons ($n = 1418$, 547 and 871, respectively), whereas lowest was recorded in HIS ($n = 34$, 21 and 13, respectively) (Supplementary Table S12). HETB had highest C, N, P and K content overall, and in dry and wet seasons, whereas HIS had lowest content (Supplementary Table S13). Among ES, significant differences were recorded in C, N, P

and K content overall and in dry and wet seasons (Kruskal Wallis, $P < 0.05$). Similarly, significant differences were recorded in C, N, P and K content between dry and wet seasons (Mann-Whitney, $P < 0.05$) (Supplementary Table S11).

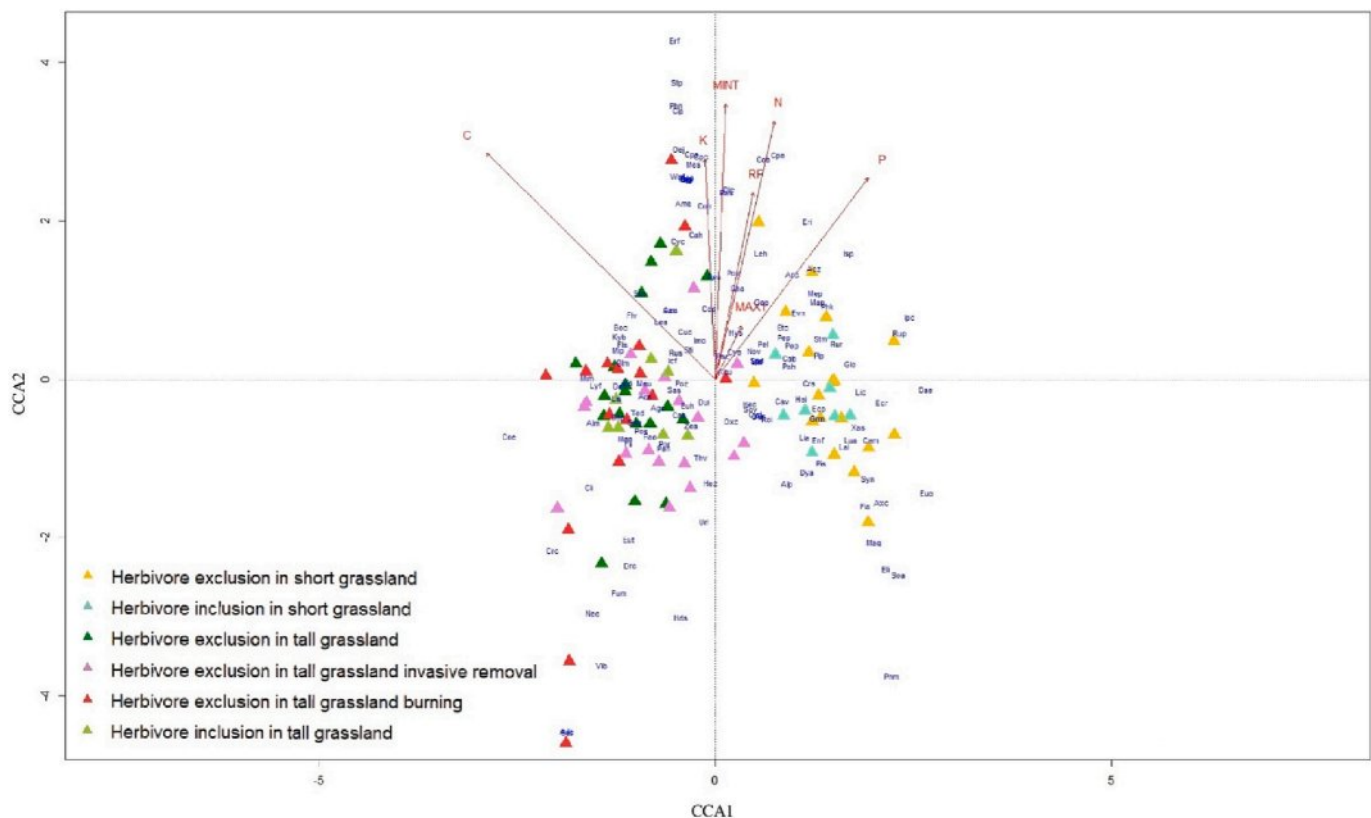


Fig. 5. Overall CCA triplot showing the plant species distribution in the experimental sites of riverine alluvial grasslands along the environmental gradient during 2014–15 in Kaziranga Tiger Reserve, Assam, India. Abbreviations of environmental gradient: C-organic carbon, N-nitrogen, P-phosphorus, K-potassium, RF-rainfall, MINT-minimum temperature and MAXT-maximum temperature. For plant species abbreviations refer to [Supplementary Table S19](#).

3.5. Effect of environmental factors on species distribution

Overall, two constrained axes explained 60% (CCA1 = 41%, CCA2 = 19%) of the total inertia ([Supplementary Table S21](#)). CCA1 axis ($F = 4.07$, $P = 0.01$) was significantly related to C, N and P content ([Supplementary Table S22](#)). SG sites and 68 species, primarily *Chromolaena odorata* and *Dactyloctenium aegyptium*, scored positively on CCA1 and showed affinity towards N and P. TG sites and 74 species, mostly *Colocasia esculenta* and *Crassocephalum crepidioides*, scored negatively on CCA1 and showed affinity towards C ([Fig. 5](#)). In dry season, two constrained axes explained 68% (CCA1 = 41%, CCA2 = 27%) of the total inertia ([Supplementary Table S21](#)). CCA1 axis ($F = 2.87$, $P = 0.01$) was significantly related to C and N ([Supplementary Table S22](#)). SG sites and 52 species, chiefly *Persicaria lapathifolia* and *Marsilea quadrifolia*, scored negatively on CCA1 and showed affinity towards N. TG sites and 44 species, primarily *Panicum notatum* and *C. crepidioides*, scored positively on CCA1 and showed affinity towards C ([Supplementary Fig. S6a](#)). In wet season, two constrained axes explained 69% (CCA1 = 44%, CCA2 = 25%) of the total inertia ([Supplementary Table S21](#)). The CCA1 axis ($F = 2.86$, $P = 0.01$) was significantly related to C ([Supplementary Table S22](#)). SG sites and 63 plant species, mostly *M. quadrifolia* and *Physalis minima*, scored negatively on CCA1 and showed affinity towards C. TG sites and 71 plant species, mostly *Adiantum philippense* and *Senna tora*, scored positively on the CCA1 and showed affinity towards C ([Supplementary Fig. S6b](#)).

4. Discussion

Understanding the role of climate and the applicability of managed herbivory, prescribed burning and invasive uprooting on tropical grasslands will ensure the long-term conservation of these habitats and their associated fauna. The present study provides experimental

validation that climatic events, grazing and management practices play a crucial role in defining the vegetation and soil characteristics of riverine alluvial grasslands ([Graphical abstract](#) and [Supplementary Fig. S7](#)). The findings support the hypothesis that the duration of inundation influences the grassland type (H_1) ([Supplementary Table S23](#)). Longer the period of inundation due to high flood and erratic precipitation greater the extent of SG, and shorter the period of inundation greater the extent of TG. The inundation period might be longer for SG due to their distribution closer to water bodies, and vice versa for TG ([Khatri and Barua, 2011](#)). Therefore, any changes in precipitation and flooding due to climate change might affect SG and TG extent, which may influence the habitat characteristics, behaviour, physiology and population dynamics of predators and prey. SG and TG differ in terms of community structure due to the dominance of short grasses viz., *C. dactylon*, *H. compressa* and *C. vesicaria*, in SG, and tall grasses, *Saccharum* spp., in TG. Intriguingly, the dominance of hydric wetland species, namely *C. vesicaria*, in SG plant communities might be due to the prolonged inundation period, which facilitates both wetland and grassland plant community associations ([Bezbarua, 2007](#); [Newman, 2014](#)). [Khatri and Barua \(2011\)](#) found that *C. dactylon* formed the dominant plant assemblages in SG, and *Saccharum spontaneum*, *Phragmites karka*, *Miscanthus fuscus* and *Chrysopogon zizanioides* formed the dominant plant assemblages in TG. This change in the community structure in both SG and TG might be due to herbivory. In TG, burning and invasive uprooting may promote the dominance of *Saccharum* spp. over time ([Khatri and Barua, 2011](#)). The dominance of *Mimosa* spp. and *M. micrantha* in plant communities was documented for the first time from the Kaziranga landscape, after just a span of seven years from the previous survey (2004–07 by [Khatri and Barua, 2011](#)), indicating that these invasives can potentially alter plant communities by dominating native species. The absence of invasives from SG sites may be due to their location near water bodies as longer inundation period controls

biological invasion (Bezbarua, 2007).

HES, HIS, HET and HIT had high species diversity, woody individuals (except for HIS) and soil nutrient content in wet season. HIS had fewer woody individuals in wet season, indicating that herbivores are feeding on them, possibly due to the sprouting of new leaves and shoots. Our findings support the hypothesis that in both SG and TG, grazing exclusion promotes species diversity, woody and invasive species, and soil nutrient content, and vice versa for grazing inclusion (H_2) (Supplementary Table S23). In the absence of mega- and meso-herbivores due to exclusion by fencing, high litter accumulation, including post-flood senescent vegetation inside the control exclosures (field observation), undisturbed plant growth, root turnover and microbial activities might have influenced the plant species diversity (e.g., Chaneton and Facelli, 1991), woody species growth (e.g., Smart et al., 1985) and invasive occurrence (e.g., Potter et al., 2021), as well as soil nutrient content (e.g., Hatton and Smart, 1984). Devi et al. (2022) reported that mega- and meso-herbivores in KTR act as grazers and mixed feeders, consuming both woody and invasive species, and possibly reducing species diversity, woody individuals and invasive species. The wildlife census from 1966 to 2014 in KTR indicates an increasing population of herbivores (Yadava, 2014), which may regulate the woody growth by reducing species diversity and soil nutrient content. Additionally, in the wet areas, the intermediate disturbance hypothesis predicts that moderately grazed areas result in higher plant species diversity compared to no-, low- and high-grazed areas (Milchunas et al., 1988; Gao and Carmel, 2020). In future, the applicability of intermediate disturbance hypothesis with respect to mega- and meso-herbivores can be tested in the wet grasslands of KTR to implement and explore better management practices.

Burning (HETB) showed high woody individuals and soil nutrient content in wet season, and high species diversity and invasive occurrence in dry season, possibly because it promotes rapid regrowth of few fire-adapted species. Our study showed mixed results for the hypothesis that burning in TG promotes species diversity and soil nutrient content, and decreases woody growth and invasive occurrence (H_3) (Supplementary Table S23). Grazing exclusion with burning decreases species diversity and woody individuals, including invasive *Mimosa* spp., and enhances the soil nutrient content and proliferation of invasive *M. micrantha*. Our findings suggest that burning decreases species heterogeneity by reducing species diversity, similar to the findings by Collins (1987), and supporting fire-resistant invasives. Present study showed that burning with herbivore exclusion promotes the proliferation of herbaceous invasive *M. micrantha* in dry season; possibly due to increasing soil nutrient content and the adaptation of species to fire (Swamy and Ramakrishnan, 1988). Intriguingly, burning with herbivore exclusion limits the growth of woody species including invasive *Mimosa* spp., possibly due to its intolerance to fire (Lonsdale and Miller, 1993; Clark and Wilson, 2001). Burning with herbivore exclusion also enhances soil nutrient content, as it converts the vegetation and litter into ash and limits nutrient uptake by plants, resulting in increased nutrient mineralization, root turnover and soil microbial activities (Sankaran, 2016).

Post manual uprooting of invasive species (HETIR), high species diversity and soil nutrient content was recorded in wet season, and high woody individuals and invasive occurrence in dry season; indicating that low precipitation and high temperature may be promoting woody individuals and invasive proliferation in dry season (Choudhury, 2017). Our findings support the hypothesis that invasive removal in TG promotes species diversity and soil nutrient content, and decreases woody growth and invasive occurrence (H_4) (Supplementary Table S23). Herbivore exclusion with invasive removal in TG limits the growth of woody and invasives *Mimosa* spp. and *M. micrantha*, and enhances species diversity and soil nutrient content. Uprooting *Mimosa* spp. and *M. micrantha* with their entire root system limits their growth, promotes the growth of native species, and limits the nutrient uptake from soil of woody vegetation and invasives, which further results in high litter

accumulation and soil nutrient retention (Swamy and Ramakrishnan, 1988; Choudhury, 2017; Nerlekar et al., 2022).

NMDS ordination revealed distinct species composition in SG and TG, which may be attributed to differences in habitat type, soil nutrient conditions, and frequency and intensity of management practices. In both SG and TG, the highest pairwise similarities of HIT with HETIR (overall), HETB (dry season) and HET (wet season) indicate that despite the low species diversity and limited soil nutrient content, the species composition of HIT was similar to other ES. Irrespective of seasons, high dissimilarities between HES-HETB were possibly attributed to differences in the herbaceous vegetation and soil nutrient content. HES, with high species diversity and woody growth, showed low pairwise similarities with TG sites (0.01 to 0.17%) and HIS (0.39 to 0.42%). Thus, herbivore removal from SG alters vegetation composition and may accelerate other growth forms including herbs and shrubs. Our results revealed that differences in soil C, N and P content defines the species distribution patterns in SG and TG. Within SG, soil N, and P content define species distribution. In TG, soil C content defines species distribution in both HET and HIT sites; C, N and P content in HETB and HETIR. Our study supports the findings of Zelnik and Cárni (2013), that edaphic parameters play crucial role in defining species distribution in tropical grasslands (wet grasslands). Additionally, our findings revealed that grazing exclusion from SG promotes proliferation of invasives like *Ageratum conyzoides*, *Eichhornia crassipes*, *Merremia umbellata*, *C. odorata* and *Ipomoea carnea*. Whereas in TG, grazing, burning and invasive removal encourages proliferation of invasives like *A. conyzoides* and *M. umbellata*. Woody species like *Lippia alba* and *Solanum viarum* in SG, and *Mimosa* spp., *Flemingia lineata*, *Flueggea virosa*, *Bombax ceiba*, *Litsea salicifolia* and *Glochidion multiloculare* in TG, may potentially accelerate the grassland succession processes (Supplementary Table S12). A study conducted in the adjacent riverine alluvial grasslands of Manas National Park, found that a combination of prescribed burning and herbivory has resulted in the proliferation of woody invasives including non-native *C. odorata* and natives like *B. ceiba* and *Leea asiatica* (Bezbarua, 2007). Therefore, it is recommended that the individualist biology of other invasive and woody species with respect to grazing and ongoing management interventions must be investigated to understand the ever-changing ecology and dynamics of riverine alluvial grasslands.

5. Conclusion and conservation implications

Grasslands, despite harbouring rich biodiversity and providing vital ecosystem services, have been largely ignored in sustainable development agendas. It is only recently that the United Nations Decade on Ecosystem Restoration (2021–2030) added ‘grasslands, shrublands and savannas’ to their focal ecosystems (Bardgett et al., 2021). To provide direction to restoration efforts targeted at conserving this rapidly degrading ecosystem, there is a need to provide scientific evidence regarding the management interventions adopted. Kaziranga Tiger Reserve, one of the last remaining strongholds of the highly productive riverine alluvial grasslands and home to a thriving population of eight mega- and meso-herbivores, including the iconic greater one-horned rhino, are subject to annual flooding, herbivory and management practices like burning and invasive uprooting. To meet the nutritional requirements of this large herbivore population that largely feeds on monocots to fulfil their dietary needs (Devi et al., 2022), it is necessary to maintain the mosaic of short and tall grasslands in the Kaziranga landscape. However, unscientific management practices may alter grassland vegetation composition in favour of other growth forms such as herbs, shrubs and trees. On examining the impact of fluvial processes, herbivory, burning and invasive uprooting via on-site experimentation, it was noted that not only did the duration of flood impact SG and TG extent, flood-induced moist conditions in SG may have retarded the development of invasives, which are proliferating in TG and multiplying more in dry season. Furthermore, it was observed that while herbivore exclusion improved species diversity and soil nutrient content, it also

promoted woody individuals in both SG and TG, and invasion in TG. Given the drastically higher presence of non-grass growth forms in herbivore inclusion SG sites versus herbivore exclusion, the conversion of SG to non-grassy ecosystem will be rapid. In TG, burning decreased species diversity and woody individuals including invasive *Mimosa* spp., and enhanced soil nutrient content and proliferation of herbaceous invasive *M. micrantha*; while invasive uprooting promoted species diversity and soil nutrient content, and decreased woody and herbaceous individuals, *Mimosa* spp. and *M. micrantha*, respectively. Based on the experiments, slight modifications to the adaptive management practices i.e., controlled herbivory, burning, and invasive uprooting, as suggested by IPCC (2022) to conserve grassland of tropical ecosystems are recommended. For rewilding SG, short-term rotational grazing must be incorporated into the management regime, and long-term rotational grazing for rewilding TG. Controlled burning must be carried out only in completely dry grassland patches, and in invaded patches post manual uprooting of fire-adapted invasives like *M. micrantha*. Additionally, manual uprooting of invasives must be carried out seasonally, during both dry and wet cycles. Compared to TG, less scientific and management focus has been given to SG, especially with respect to herbivory and invasive management. This study has provided evidence that if managed properly, the SG have the potential to provide more foraging ground and habitat not only to the mega- and meso-herbivores but also to other associated fauna. The successful implementation of the aforementioned recommendations is expensive, and adequate financial and human capital must be allotted.

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CRediT authorship contribution statement

Monika Sharma: Investigation, Data curation, Formal analysis, Visualization, Writing – original draft. **Anita Devi:** Investigation, Data curation, Formal analysis, Visualization, Writing – original draft. **Ruchi Badola:** Conceptualization, Funding acquisition, Methodology, Supervision, Project administration. **Rabindra Kumar Sharma:** Supervision, Methodology. **Syed Ainul Hussain:** Conceptualization, Methodology, Validation, Resources, Supervision, Project administration, Funding acquisition, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Appendix A. Supplementary data

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Seasonal pattern of food habits of large herbivores in riverine alluvial grasslands of Brahmaputra floodplains, Assam

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Jarman–Bell (1974) hypothesized that in the dry savanna of Africa, small-bodied herbivores tend to browse more on forage with high protein and low fibre content. This implies browsing on high nutritive forage by meso-herbivores, and grazing and mixed feeding on coarse forage by mega-herbivores. We tested this hypothesis in the riverine alluvial grasslands of the Kaziranga National Park (KNP), where seasonal flood and fire play an important role in shaping the vegetation structure. We analyzed the feeding habits and quality of major forage species consumed by three mega-herbivores, viz. greater one-horned rhino, Asian elephant, and Asiatic wild buffalo, and three meso-herbivores, viz. swamp deer, hog deer, and sambar. We found that both mega and meso-herbivores were grazers and mixed feeders. Overall, 25 forage plants constituted more than 70% of their diet. Among monocots, family Poaceae with *Saccharum* spp. (contributing > 9% of the diet), and, among dicots, family Rhamnaceae with *Ziziphus jujuba* (contributing > 4% of the diet) fulfilled the dietary needs. In the dry season, the concentration of crude protein, neutral detergent fibre, calcium, sodium, and phosphorous varied significantly between monocots and dicots, whereas only calcium and sodium concentrations varied significantly in the wet season. Dicots were found to be more nutritious throughout the year. Compared to the dry season, the monocots, viz. *Alpinia nigra*, *Carex vesicaria*, *Cynodon dactylon*, *Echinochloa crus-galli*, *Hemarthria compressa*, *Imperata cylindrica*, and *Saccharum* spp., with their significantly high crude protein, were more nutritious during the wet season. Possibly due to the availability of higher quality monocots in the wet season, both mega and meso-herbivores consume it in high proportion. We concluded that the Jarman–Bell principle does not apply to riverine alluvial grasslands as body size did not explain the interspecific dietary patterns of the mega and meso-herbivores. This can be attributed to seasonal floods, habitat and forage availability, predation risk, and management practices such as controlled burning of the grasslands. The ongoing succession and invasion processes, anthropogenic pressures, and lack of grassland conservation policy are expected to affect the availability of the principal forage and suitable habitat of large herbivores in the Brahmaputra floodplains, which necessitates wet grassland-based management interventions for the continued co-existence of large herbivores in such habitats.

Understanding the niche of an animal is crucial for understanding the community dynamics of dependent consumers. Foraging is one of the fundamental elements of a niche^{1,2}. In sympatric herbivores, the foraging patterns provide insights into the utilization patterns of the occupied habitat, which is important for making assumptions about the behaviour, physiology, morphology, and population dynamics of the predators, prey, and competitors³. In the early 1960s, the ecological succession and separation theory described forage resource partitioning as the reason for the co-existence of herbivores of different body sizes^{4–6}. Bell⁷ and Jarman⁸ explained the co-existence of mega and meso-herbivores as a function of body mass and digestive physiology, whereas Hofmann and Stewart⁹ reasoned digestive physiology as the explanation for foraging style. The Jarman–Bell principle emphasized that the quality and quantity of large herbivore diet correlates with their body size; specifically, the diet quality decreases as body size increases. Depending on body size, herbivores consume a large or small amount

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of coarse forage to fulfil their body requirement^{8,10}. The allometric theory¹¹ and digestive physiology¹² explained the mechanism behind the Jarman–Bell principle. The allometric theory explained that the length of the digestive tract is directly proportional to the body mass, and consequently, the metabolism rate is inversely proportional to the body mass. Demment and Van Soest¹² provided evidence that the capability to digest coarse forage increases with the increase in gut capacity. Hence, the digestive capability of mega and meso-herbivores plays a crucial role in their dietary selection^{13,14}. Thus, depending on both nutritional (crude protein content, mineral content, and digestibility) and anti-nutritional parameters (plant secondary metabolites or fibre), meso-herbivores need to browse on forage with high protein and low fibre content. In contrast, mega-herbivores may feed on forage with low protein and high fibre content^{15,16}.

The preponderance of the studies that examined the ecology of large assemblages of sympatric herbivores and tested the body mass principle have primarily emerged from Africa and North America^{17,18}. The studies conducted to test the Jarman–Bell principle in the African savannas^{19–24} and the protected areas of North America²¹ primarily covered dry tropical grasslands, forests, or savannas. These studies provided insight into resource segregation, competition, and habitat utilization along the temporal^{19,20}, and spatial gradients^{21–25}.

Of the 19 terrestrial mammalian herbivore species with a body mass greater than 100 kg, in South and South-East Asia, 14 are found in India²⁶. Though the herbivore species found in India are distinct from those in Africa, the similarities in the diverse range of body sizes, from mega-herbivores like elephant, with a body weight of 3000 to 5400 kg, to meso-herbivores like mouse deer, with a body weight of 2 to 4 kg, provide the opportunity to test the Jarman–Bell principle^{6,27,28}. The literature available to understand the science of wild large herbivore foraging ecology at the community level is limited from Asia²⁹. Most of the research conducted in India studied up to four wild herbivore species and contributed mostly to their biology and ecology^{6,29}. Ahrestani⁶ tested the Jarman–Bell principle for chital (*Axis axis*), sambar (*Rusa unicolor*), gaur (*Bos gaurus*), and elephant (*Elephas maximus*) in the dry tropical forests of India, where he concluded that body size does not explain the graze to browse ratio of sambar and chital. Wegge et al.²⁹ tested the Jarman–Bell principle for rhinoceros (*Rhinoceros unicornis*), swamp deer (*Rucervus duvaucelii*), and hog deer (*Axis porcinus*) in riverine alluvial grasslands of Nepal, where they concluded that the body size does not explain the consumption of higher graminoids by smaller herbivores. There is little understanding of how this principle explains the foraging pattern and resource partitioning among large herbivores along the temporal and spatial gradients in the riverine alluvial grassland ecosystem. Large assemblages of mega and meso-herbivores in the Brahmaputra valley provide an opportunity to examine the applicability of the Jarman–Bell principle in a moist grassland ecosystem, which is subjected to anthropogenic pressure and is vulnerable to climate change.

In the last few decades, climate change and habitat loss have impacted biological systems. It is estimated that since 1970, 58% of animal populations have faced the threat of extinction^{30–32}. Climate change poses a serious threat to herbivores directly by influencing rainfall and temperature, and indirectly through the occurrence of extreme climatic events such as fires, floods, and droughts, which may affect the availability and quality of forage and threaten their fitness, survival, migration, and reproductive success^{33,34}. Globally, riverine alluvial grasslands in floodplains are threatened, primarily due to fragmentation and degradation of such habitats³⁵. In the Brahmaputra valley, remnant riverine alluvial grasslands found mainly in and around protected areas are restricted in their spatial extent thereby, limiting the range of obligate large herbivores^{35,36}. The decreasing trend of riverine alluvial grasslands has resulted in low species richness of large herbivore assemblages; consequently, the sample size to validate community ecology theory is often inadequate, which prompts this study³⁵.

Based on feeding styles, herbivores are generally categorized as grazers (feeding mainly on graminoids or monocots), browsers (feeding mainly on browse or dicots), or mixed feeders (feeding on both monocots and dicots, according to their availability). Any change in the consumption of monocots (grazing) and dicots (browsing) results in changed diet compositions. Experimental studies conducted in the Serengeti–Mara ecosystem in the last 100 years have highlighted the importance of mega and meso-herbivores in converting open grassland to dense woodland and back to grassland³⁷. Thus, in succession, both the absence and presence of mega and meso-herbivores plays an important role^{38,39}. Browsers and mixed-feeders generally affect the savannas of Africa⁴⁰.

Even though the Brahmaputra floodplains in India harbour a large assemblage of mega and meso-herbivores, there is a dearth of studies on their community ecology. The limited information that is available is from Pobitora Wildlife Sanctuary^{41,42}, Rajiv Gandhi Orang National Park⁴³, Manas National Park⁴⁴, and Kaziranga National Park (KNP)^{45–48}, and is based on two to three species. Besides, there is little understanding of the habitat dynamics and the impact of seasonal change on the moist alluvial grasslands and their associated fauna. The riverine alluvial grasslands of KNP in the Brahmaputra floodplains are one of the few strongholds of several threatened species including the greater one-horned rhino (*R. unicornis*), Asian elephant (*E. maximus*), Asiatic wild buffalo (*Bubalus arnee*), swamp deer (*R. duvaucelii*), hog deer (*A. porcinus*), and sambar (*R. unicolor*), which necessitates their conservation (Fig. 1). This study was carried out to gain insight into how the body mass principle explains the co-existence of these six mega and meso-herbivores in riverine alluvial grasslands with respect to their diet composition and nutritional quality of principal forage. For the present study, based on the literature on body size and diet composition, the less selective mega-herbivores with very large body sizes (> 1000 kg), viz. rhino, elephant, and buffalo, were categorized as coarse feeders^{13,49}. Whereas the more selective meso-herbivores with small to medium body sizes (> 5 kg and < 500 kg), viz. swamp deer, hog deer, and sambar, were categorized as soft feeders^{14,50,51}.

Based on the information from riverine alluvial grasslands^{18,29}, we predicted that both mega and meso-herbivores would consume more graze-based diet in the wet season (H₁), and compared to dry season, the principal monocot forage of mega and meso-herbivores would be more nutritious in the wet season (H₂). This study aims to provide an overview of the feeding habits of mega and meso-herbivores with the following research questions: (1) is there any difference in the diet compositions of the mega and meso-herbivores in each season in terms of (a) monocot and dicot, (b) the six categories of growth form, viz. grass, sedge, herb, shrub, climber and

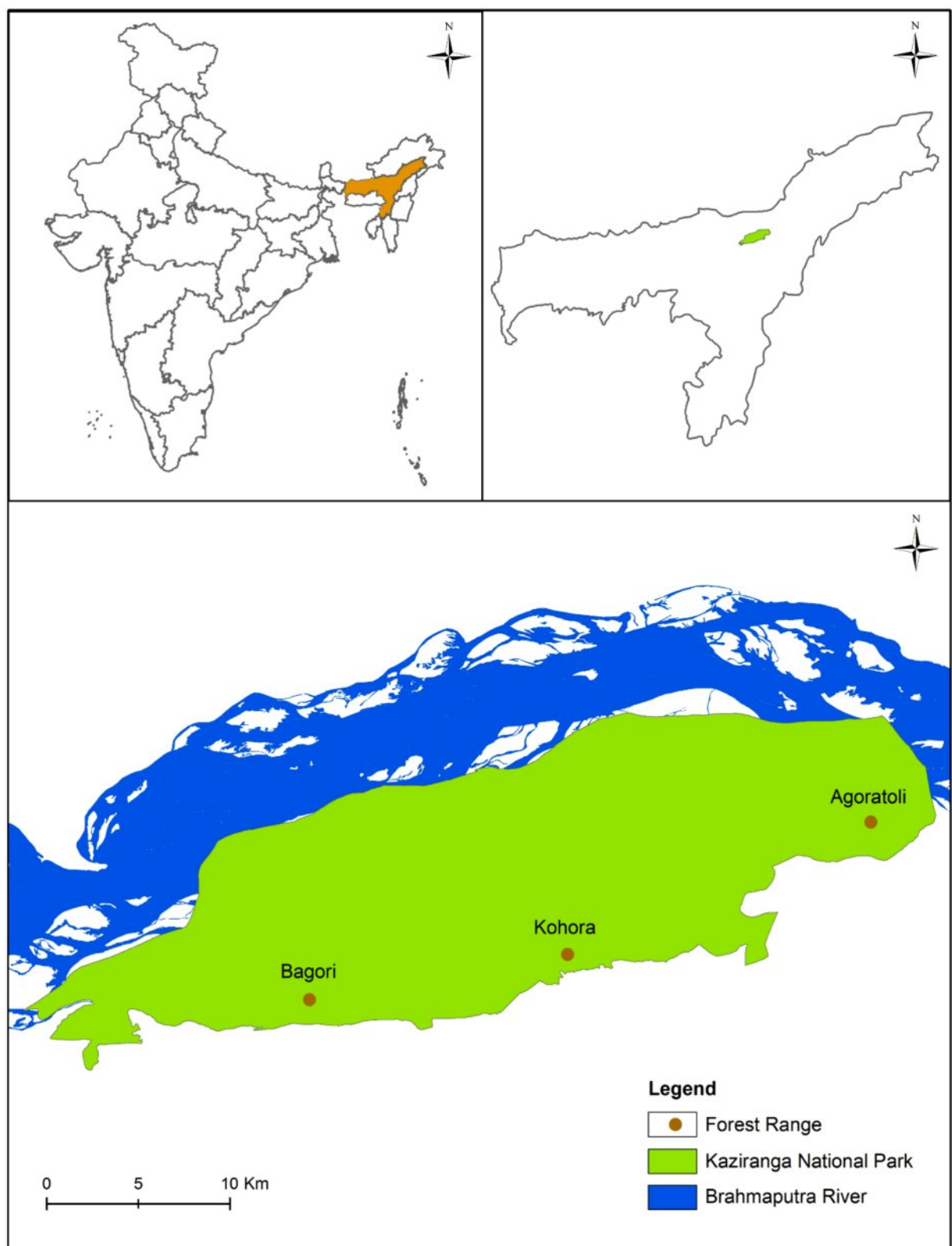


Figure 1. Map showing the location of the riverine alluvial grasslands in Kaziranga National Park, Assam. The map was created using ArcGIS v.10.2.2 software developed by ESRI (<https://www.esri.com>).

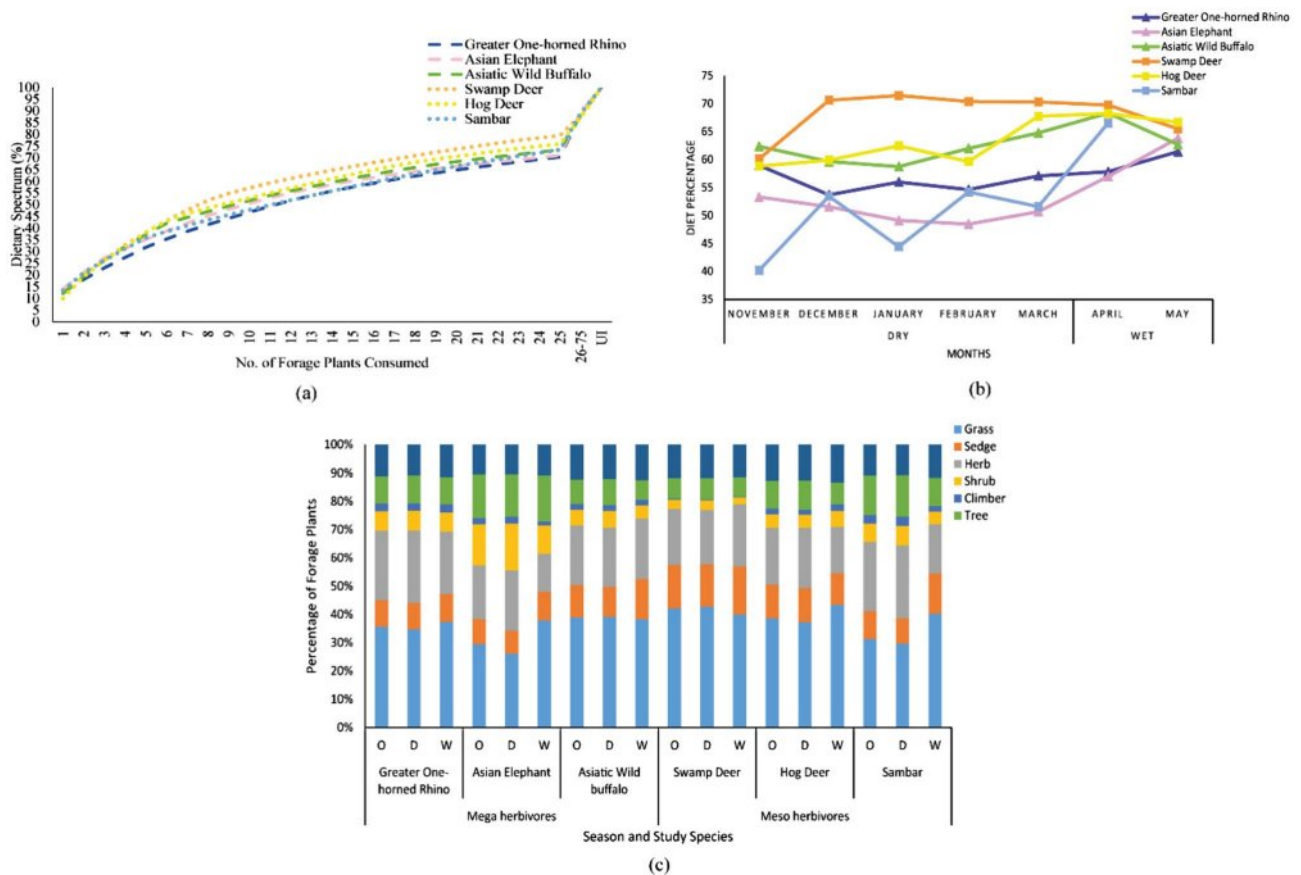


Figure 2. Graph showing (a) overall dietary spectrum (%) of major contributing forage plants to the diet, (b) monthly consumption of monocots by the six large herbivore species. A high value of the diet percentage suggests a graze-based diet, whereas a low value of the diet percentage suggests a browse-based diet and (c) diet composition of mega and meso-herbivores in terms of six growth forms of different forage plants in Kaziranga National Park, Assam.

tree, and (c) the forage plant species contributing to the diets of the mega and meso-herbivores; (2) is there any difference in the seasonal nutrient parameters of major forage plants consumed by mega and meso-herbivores; and (3) which nutrient factors govern the forage utilization by mega and meso-herbivores.

Results

Dietary spectrum. Throughout the year, 25 major forage plants constituted more than 70% of the diet of large herbivores (Fig. 2a), specifically 79.48% of swamp deer's, 75.87% of hog deer's, 73.42% of sambar's, 73.38% of buffalo's, 71.04% of elephant's, and 70.29% of rhino's diet. The 22 principal forage plant species, namely *Saccharum* spp., *Echinochloa crus-galli*, *Cynodon dactylon*, *Ziziphus jujuba*, *Hemarthria compressa*, *Alpinia nigra*, *Carex vesicaria*, *Kyllinga brevifolia*, *Mallotus nudiflorus*, *Lippia alba*, *Fimbristylis aestivalis*, *Amaranthus spinosus*, *Ageratum conyzoides*, *Duchesnea indica*, *Calamus tenuis*, *Oxalis corniculata*, *Imperata cylindrica*, *Acmella uliginosa*, *Amaranthus viridis*, *Dillenia indica*, *Solanum americanum*, and *Setaria pumila* contributed more than 2% each. The highest number of identified principal forage species ($n=22$) were recorded for hog deer ($n=14$; 61.15%) followed by rhino ($n=13$; 53.89%), elephant ($n=12$; 55.00%), sambar ($n=12$; 51.90%), buffalo ($n=11$; 53.97%), and swamp deer ($n=11$; 59.29%).

Diet comparison. The mega and meso-herbivores consumed more monocots during the wet season than the dry season (Fig. 2b). There were significant seasonal differences in the consumption of monocots & monocots, dicots & dicots, and monocots & dicots among the six large herbivores. Between the mega and meso-herbivores, there were significant seasonal differences in the consumption of dicots & dicots and monocots & dicots, and no significant seasonal difference in the consumption of monocots & monocots. Among the six growth forms, grasses were dominant in the diet of all the six herbivores (Fig. 2c). There were significant seasonal differences in the consumption of grasses and herbs among the six large herbivores, and no significant differences in the consumption of sedges, shrubs, climbers, and trees. Between the mega and meso-herbivores, there were significant seasonal differences in the consumption of grasses and trees, and no significant seasonal differences in the consumption of sedges, herbs, shrubs, and climbers. A total of 31 families of forage plants were identified in the diet of the mega-herbivores and 29 in the diet of the meso-herbivores. Overall, the Bipartite Ecological

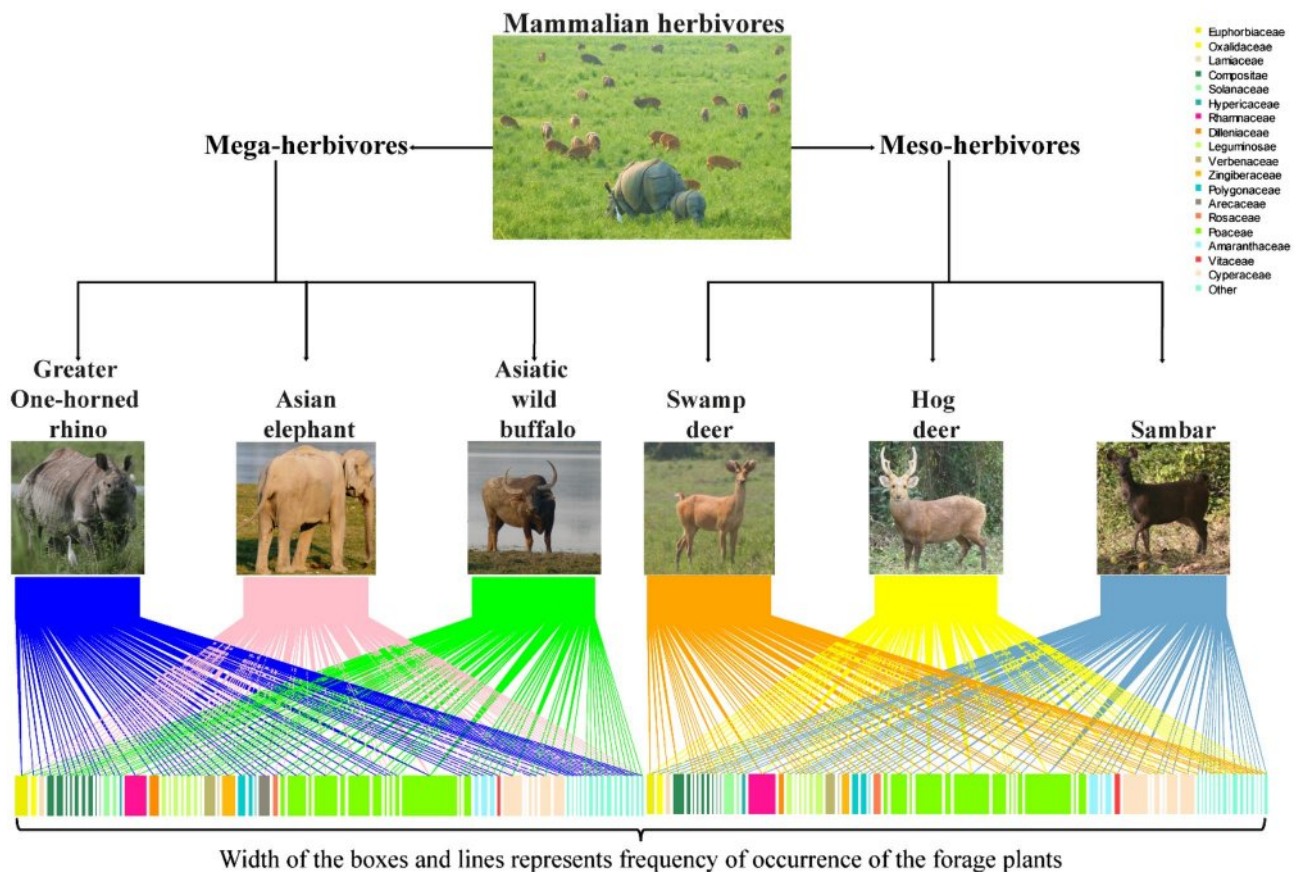


Figure 3. Flow diagram representing the overall bipartite ecological network, which illustrates the diet composition of mega and meso-herbivores. Study species (upper boxes) connected by lines to forage plants (lower boxes) are coloured by family. The width of the lines and lower boxes represent the frequency of occurrence of the forage plants and their respective families in the diet of mega and meso-herbivores in Kaziranga National Park, Assam.

Network (BEN) shows that the members of the family Poaceae contributed the most to the diet of mega and meso-herbivores (Fig. 3). It also shows that the contribution of forage species belonging to the families Poaceae and Cyperaceae, to the diet of both mega and meso-herbivores, increased from dry (34.33 to 57.70%) to wet season (47.27 to 57.06%) (Fig. 4a,b). *C. tenuis* (family Arecaceae) was consumed mostly by the elephant. BEN further revealed that the mean number of shared forage plants in the diet of both mega and meso-herbivores in the dry and wet seasons were 57.6 and 51, respectively. The tall grass *Saccharum* spp. constituted a major part of the diet of mega and meso-herbivores during the wet season. A significant seasonal difference in the consumption of *Saccharum* spp. was observed among the six large herbivores, whereas no significant difference was observed in the consumption of *Saccharum* spp. between the mega and meso-herbivores during different seasons.

Monocots dominated the diet of both mega and meso-herbivores throughout the year (Table 1). Only elephant and sambar consumed a significantly higher proportion of monocots than dicots in the wet season (Table 2). In contrast, there was no significant seasonal difference in the consumption of monocots & dicots by rhino, buffalo, swamp deer, and hog deer. Compared to the dry season, the six herbivores consumed a significantly higher proportion of monocots and a significantly lower proportion of dicots in the wet season.

Grasses dominated the diet of both mega and meso-herbivores throughout the year (Fig. 2c). Between the dry and wet seasons, the six herbivores consumed significantly different proportions of grasses, herbs, climbers, and trees; and only elephant and sambar consumed a significantly different proportion of shrubs. Excluding hog deer, the study species consumed significantly different proportions of sedges (Table 2).

Among the monocots, *Saccharum* spp., *E. crus-galli*, *C. dactylon*, *H. compressa*, and *A. nigra* contributed the most to the rhino diet, while among the dicots, *Z. jujuba*, *M. nudiflorus*, *L. alba*, *A. spinosus*, and *A. conyzoides* contributed the most (Supplementary Table S1). In the elephant diet, *Saccharum* spp., *C. tenuis*, *C. vesicaria*, *E. crus-galli*, and *H. compressa* contributed the most among the monocots, and *Z. jujuba*, *M. nudiflorus*, *D. indica*, *L. alba*, and *A. conyzoides* contributed the most among the dicots (Supplementary Table S2). In the buffalo diet, *Saccharum* spp., *H. compressa*, *E. crus-galli*, *C. vesicaria*, and *C. dactylon* contributed the most among the monocots and, *Z. jujuba*, *O. corniculata*, *L. alba*, *S. americanum*, and *M. nudiflorus* contributed the most among the dicots (Supplementary Table S3). In the diet of swamp deer, among the monocots, *H. compressa*, *Saccharum* spp., *E. crus-galli*, *C. vesicaria*, and *I. cylindrica* contributed the most, and among the dicots, *Z. jujuba*, *A. uliginosa*, *L. alba*, *S. americanum*, and *O. corniculata* contributed the most (Supplementary Table S4). In the hog deer diet, *H. compressa*, *Saccharum* spp., *E. crus-galli*, *C. vesicaria*, and *C. dactylon* contributed the most among the

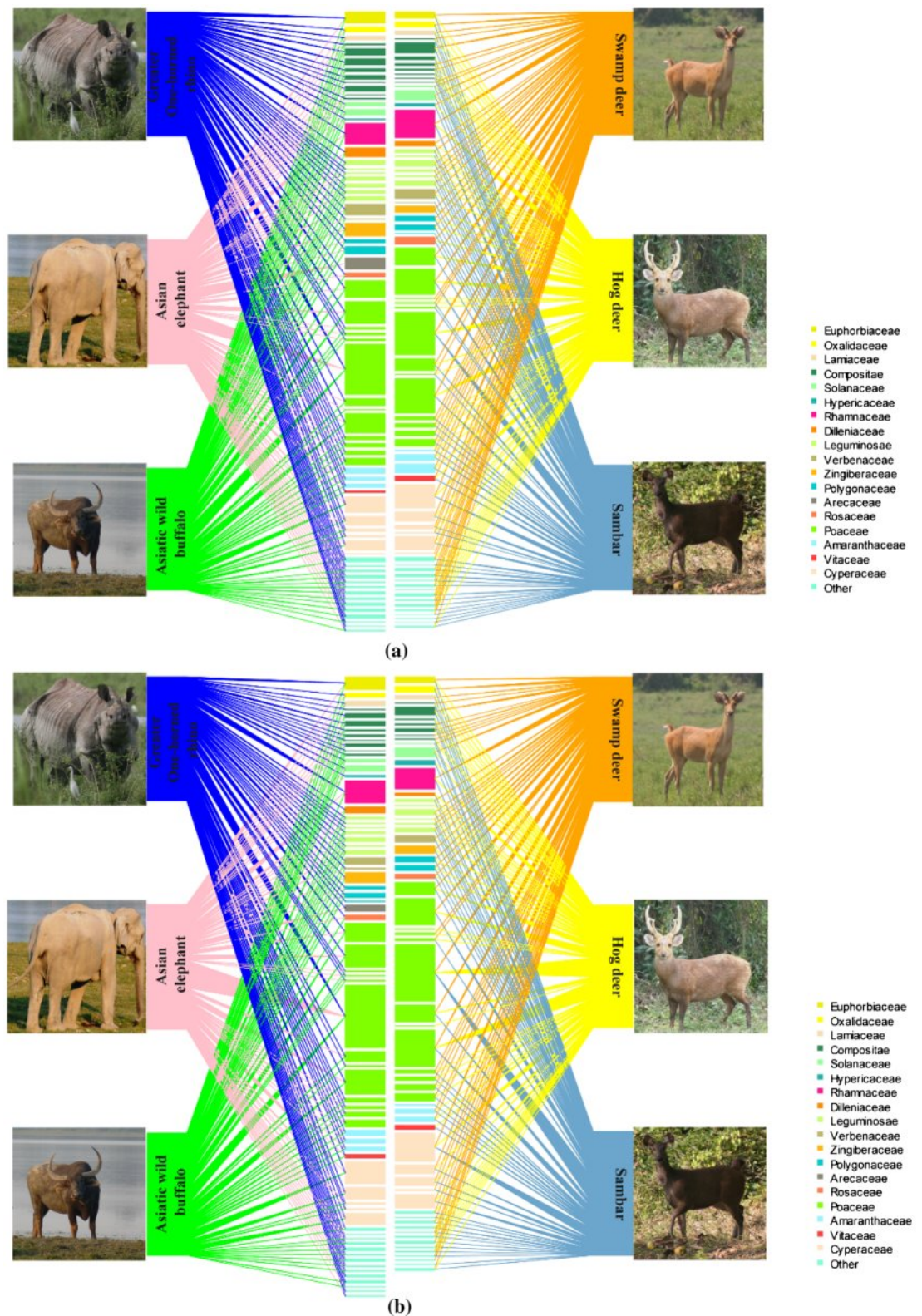


Figure 4. The bipartite ecological network illustrates the diet composition of mega and meso-herbivores. Study species (upper boxes) connected by lines to forage plants (lower boxes) are coloured by family. The width of the lines and lower boxes represent the frequency of occurrence of the forage plants and their respective families in the diet of mega and meso-herbivores in (a) dry and (b) wet season in Kaziranga National Park, Assam.

Study species	Fragments									Forage plants				
	I	I %	UI	UI %	Total	M	M%	D	D%	I	I %	UI	UI %	Total
Greater One-horned Rhino	7519	88.99	930	11.01	8449	4827	57.13	3622	42.87	69	88.99	55	11.01	124
Asian Elephant	7184	89.55	838	10.45	8022	4295	53.54	3727	46.46	67	89.55	38	10.45	105
Asiatic Wild Buffalo	6403	87.77	892	12.23	7295	4567	62.60	2728	37.40	62	87.77	34	12.23	96
Swamp Deer	6595	88.23	880	11.77	7475	5111	68.37	2364	31.63	59	88.23	31	11.77	90
Hog Deer	6419	87.23	940	12.77	7359	4628	62.89	2731	37.11	59	87.23	32	12.77	91
Sambar	6277	89.19	761	10.81	7038	3622	51.46	3416	48.54	63	89.19	29	10.81	92

Table 1. Identified and unidentified fragments and forage plants recorded in the diet of mega and meso-herbivores throughout the year during 2013–15 in Kaziranga National Park, Assam. *I* identified, *UI* unidentified, *M* monocots, *D* Dicots.

Forage category	Six large herbivores			Mega and meso-herbivore			Greater one-horned rhino			Asian elephant			Asiatic wild buffalo			Swamp deer			Hog deer			Sambar		
	χ^2	df	p	χ^2	df	p	χ^2	df	p	χ^2	df	p	χ^2	df	p	χ^2	df	p	χ^2	df	p	χ^2	df	p
M & M	11.29	5	0.05	3.19	1	0.07	65.60	1	0.00	46.59	1	0.00	71.36	1	0.00	88.78	1	0.00	68.19	1	0.00	99.11	1	0.00
D & D	31.21	5	0.00	4.69	1	0.03	63.48	1	0.00	86.58	1	0.00	57.97	1	0.00	39.80	1	0.00	62.11	1	0.00	173.97	1	0.00
M & D	56.63	5	0.00	6.59	1	0.01	0.64	1	0.43	5.63	1	0.02	1.03	1	0.31	0.08	1	0.78	2.00	1	0.16	11.06	1	0.00
Grass	14.81	5	0.01	4.18	1	0.04	37.64	1	0.00	14.29	1	0.00	47.88	1	0.00	68.79	1	0.00	35.64	1	0.00	62.04	1	0.00
Herb	25.28	5	0.00	0.23	1	0.63	10.88	1	0.00	7.23	1	0.01	8.45	1	0.00	16.64	1	0.00	19.05	1	0.00	16.29	1	0.00
Tree	10.45	5	0.06	4.56	1	0.03	47.02	1	0.00	50.29	1	0.00	24.97	1	0.00	13.26	1	0.00	39.68	1	0.00	85.92	1	0.00
Sedge	2.44	5	0.79	1.34	1	0.25	8.33	1	0.00	37.69	1	0.00	15.51	1	0.00	4.55	1	0.03	3.46	1	0.06	21.56	1	0.00
Shrub	6.79	5	2.37	0.06	1	0.81	3.56	1	0.06	9.00	1	0.00	3.27	1	0.07	2.78	1	0.10	1.14	1	0.29	10.89	1	0.00
Climber	4.30	5	0.51	0.22	1	0.64	10.24	1	0.00	15.71	1	0.00	15.00	1	0.00	9.00	1	0.00	20.43	1	0.00	47.82	1	0.00
<i>Saccharum</i> spp ^a	16.62	5	0.01	1.61	1	0.21	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Table 2. Chi-square test for food choices of the mega and meso-herbivores between dry and wet season (M-monocots; D-dicots) during 2013–15 in Kaziranga National Park, Assam. ^aPrincipal forage of mega and meso-herbivores.

monocots, and *Z. jujuba*, *A. viridis*, *D. indica*, *S. americanum*, and *L. alba* contributed the most among the dicots (Supplementary Table S5). In the diet of sambar, among the monocots, *Saccharum* spp., *E. crus-galli*, *H. compressa*, *C. vesicaria*, and *I. cylindrica* contributed the most, and among the dicots, *Z. jujuba*, *A. uliginosa*, *S. americanum*, *D. indica*, and *M. nudiflorus* contributed the most (Supplementary Table S6).

Forage quality. Throughout the year, the highest crude protein (CP) was recorded for *E. crus-galli* (12.16%) and lowest for *Saccharum* spp. (6.02%), among the monocots. In the dry season, the highest CP was recorded for *C. tenuis* (10.87%) and lowest for *Saccharum* spp. (4.75%), whereas in the wet season, the highest CP was recorded for *E. crus-galli* (16.47%) and lowest for *A. nigra* (9.11%) (Supplementary Tables S7–S9). Compared to the dry season, the monocots showed a higher mean concentration of CP, calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), and phosphorous (P), and a lower mean concentration of ash content (AC), acid detergent lignin (ADL), acid detergent fibre (ADF), and neutral detergent fibre (NDF) in the wet season. There were significant differences in AC, CP, ADL, Na, K, and P content (Mann–Whitney, $p < 0.05$) in monocots between the dry and wet seasons (Supplementary Table S10). The most consumed monocot species in mega and meso-herbivores diet, viz. *Saccharum* spp., showed significant differences in AC, CP, ADL, and K concentrations (Mann–Whitney, $p < 0.05$), between the dry and wet seasons. The monocots, *A. nigra*, *C. vesicaria*, *C. dactylon*, *E. crus-galli*, *H. compressa*, and *I. cylindrica* showed a significant difference in CP concentration (Mann–Whitney, $p < 0.05$), between the dry and wet seasons. Among the dicots, throughout the year and in both the dry and wet seasons, the highest CP concentration was recorded for *A. viridis* and lowest for *D. indica*. Compared to the dry season, dicots showed a higher mean concentration of ADF, NDF, Mg, Na, K, and P, and a lower mean concentration of CP, ADL, and Ca in the wet season. However, there was no significant difference in the nutrient concentration of dicots between dry and wet seasons. In dicots, the most consumed forage species in the diet of mega and meso-herbivores, viz. *Z. jujuba*, showed a significant difference only in ADL concentration (Mann–Whitney, $p < 0.05$), between the dry and wet seasons.

Throughout the year and in both the dry and wet seasons, dicots with their high CP and mineral concentrations were more nutritious than monocots. While there were significant changes in the nutritional quality parameters of monocots from the dry to wet season, no significant seasonal changes in the nutritional quality of dicots were recorded (Supplementary Table S10). Throughout the year, there were significant differences in CP, ADL,

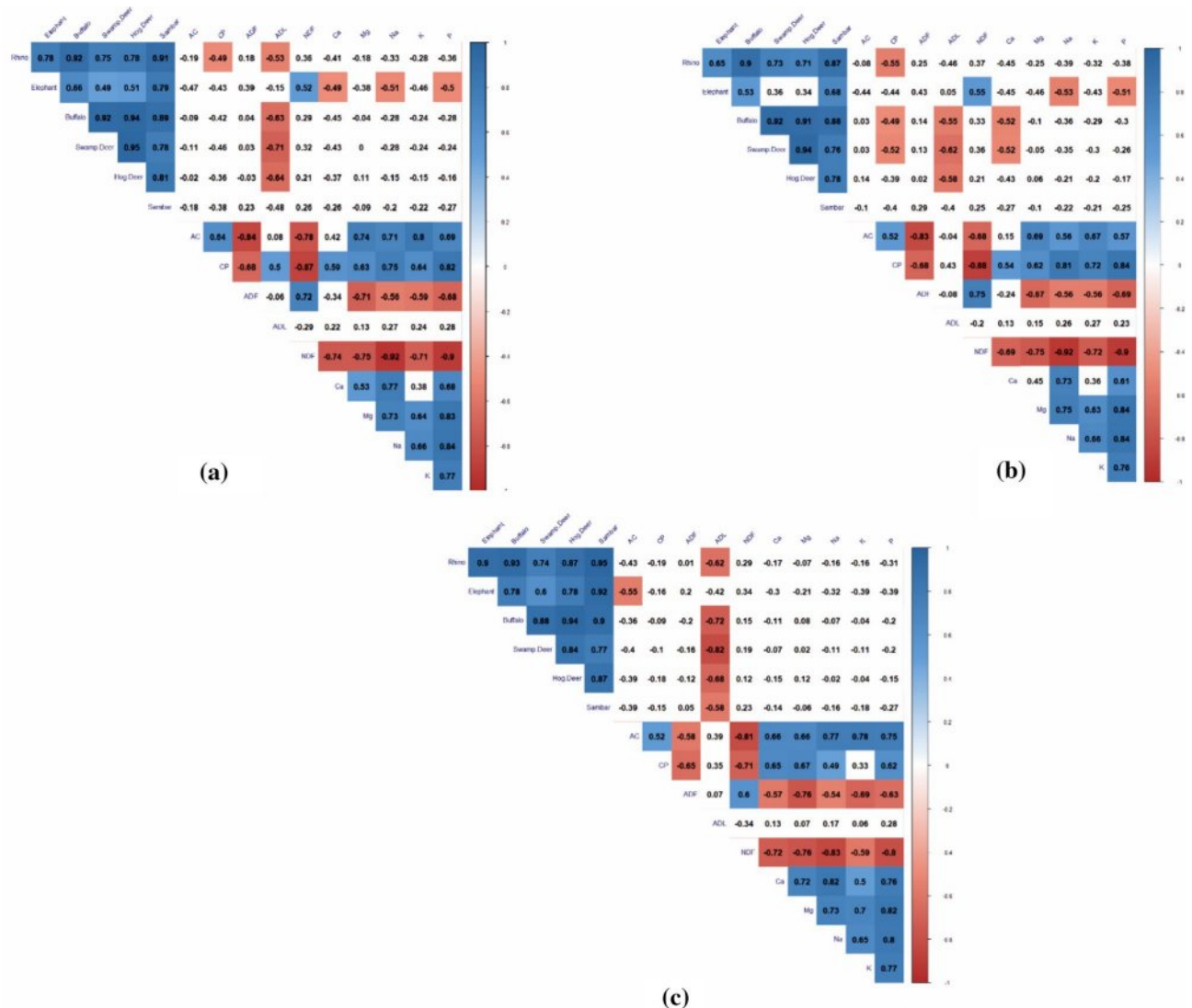


Figure 5. Correlogram showing the relationship between nutrient parameters and the major forage consumed by mega and meso-herbivores in (a) overall, (b) dry and (c) wet season. The values within white boxes represent the insignificant correlation ($p > 0.05$) whereas the values within red (negative correlation) and blue (positive correlation) boxes represent the significant correlation ($p < 0.05$).

NDF, Ca, Na, and P concentrations (Mann–Whitney, $p < 0.05$), between monocots and dicots. In the dry season, there were significant differences in CP, NDF, Ca, Na, and P concentrations (Mann–Whitney, $p < 0.05$) between monocots and dicots. In the wet season, between monocots and dicots, there were significant differences in Ca, and Na concentrations (Mann–Whitney, $p < 0.05$). The concentrations of ADL, Na, K, and P (Mann–Whitney, $p < 0.05$) in monocots and dicots differed significantly between the dry and wet seasons.

The top model selection for forage consumption revealed that throughout the year and in the dry season, ADL concentration influenced forage use by mega and meso-herbivores, excluding elephant, whose forage use was influenced by NDF concentration (Supplementary Table S11). In the wet season, AC and ADL concentrations influenced the major forage use. The correlogram revealed that throughout the year, rhino significantly consumed forage with low CP and ADL concentrations; elephant significantly consumed forage rich in NDF and low in Ca, Na, and P; and buffalo, swamp deer, and hog deer significantly consumed forage with low ADL content (Fig. 5a). In the dry season, rhino significantly consumed forage with low CP; elephant significantly consumed forage rich in NDF and low in Na and P; buffalo and swamp deer significantly consumed forage with low CP, ADL, and Ca; and hog deer significantly consumed forage with low ADL concentration (Fig. 5b). In the wet season, rhino, buffalo, swamp deer, hog deer, and sambar significantly consumed forage with low ADL concentration, whereas elephant significantly consumed forage with low AC (Fig. 5c).

Discussion

With their large body size, the rhino and elephant require almost 150 kg and 240 kg of fodder, respectively, every day, and thus spend most of their time foraging^{41,49,52}. Mega and meso-herbivores consumed more monocots in the wet season than in the dry season, although the swamp deer consistently consumed more monocots than

other herbivores species. An increase in graze from the dry to the wet season has been recorded in different studies, which also reported 22 to 283 forage plants in the diet of rhino^{18,44}, 46 to 112 forage plants in the diet of elephant^{18,53,54}, 183 forage plants in the diet of buffalo⁴⁸, 13 to 42 forage plants in the diet of swamp deer^{2,29,50}, and 15 to 20 forage plants in the diet of hog deer^{29,55}. The diet of sambar is flexible and changes according to the availability of forage^{56,57} and studies have recorded 15 to 180 forage plants in the diet of sambar^{50,58}.

In the present study, 124 forage plants in the diet of rhino were recorded of which 69 were identified up to species level and 55 were identified as monocots and dicots. For the elephant, 105 forage plants were recorded in the diet, of which 67 were identified up to species and 38 only as monocots and dicots. For buffalo, 96 forage plants were recorded in diet, of which 62 were identified up to species and 34 only as monocots and dicots. For swamp deer, 90 forage plants were recorded in the diet, of which 59 were identified up to species and 31 only as monocots and dicots. For hog deer, 91 forage plants were recorded in the diet, of which 59 were identified up to species and 32 were only identified as monocots and dicots. For sambar, 92 forage plants were recorded in the diet, of which 63 were identified up to species and remaining 29 only as monocots and dicots. BEN shows that in both the dry and wet seasons, graminoids constituted 50% or more of the diet of both mega and meso-herbivores and Poaceae and Cyperaceae as the most recorded families. In the family Poaceae, the tall grass *Saccharum* spp. was dominant, which might be because of its availability throughout the year. The diet of swamp deer and hog deer had more of the short grass species *H. compressa* in the dry season and more of the tall grass species *Saccharum* spp. in the wet season. *C. tenuis* (family Arecaceae) was mostly consumed by elephant, the possible reason for this could be their ability to exploit resources that are not accessible to other species studied in the area because of its trunk.

We could not detect the presence of important fodder species such as *Mallotus philippinensis* in the diet of any of our study species, even though they were common in the study area and the evidence of browsing on it was observed. In other studies, in similar habitats, its presence could not be detected in the diet of elephant, swamp deer, and hog deer through faecal analysis (e.g., Pradhan et al.¹⁸, Wegge et al.²⁹, and Steinheim et al.⁵⁹). This is an inherent problem in the feeding habit study using micro-histological methods. Further, we failed to detect the presence of *Bombax ceiba*, another common species in the area, though elephants eat its bark. In several other studies (e.g., Brahmachary et al.⁴⁵, and Patar⁴⁷), it was concluded that the large herbivores do not eat *B. ceiba* leaves but debarking, particularly by elephants, is a common feature. A major proportion of the unidentified dicot forage in the diet thus can be attributed to woodland species like *M. philippinensis*, *Terminalia* spp., *Syzygium fruticosum*, *Mangifera indica*, and *Ficus* spp. These are the reported forage species for rhino and elephant^{18,29,41,43,59}.

Experimental studies conducted in North America and Europe showed that mega-herbivores meet their physiological needs by feeding more on dominant species. In high productive ecosystems, this favors plant diversity, whereas in low productive ecosystems, this negatively affects plant diversity⁶⁰. In contrast, selective feeding by meso-herbivores negatively affects plant diversity⁶¹. Therefore, feeding choices, population, and physiological demand of mega and meso-herbivores can alter the vegetation composition⁶². The present study revealed that throughout the year, among dicot plants, *Z. jujuba* was mostly consumed by both mega and meso-herbivores. Similarly, among monocot plants, *Saccharum* spp. was largely consumed by rhino, elephant, buffalo, and sambar throughout the year. Whereas, *H. compressa* was largely consumed by swamp deer, and hog deer. This suggests the dependence of mega and meso-herbivores on these particular dicots and monocots. The nutrient analysis of major forage also revealed that the major forage species consumed throughout the year by mega and meso-herbivores were more nutritious in the wet season. In the future, any changes in the availability, accessibility, and nutrient content of the major forage plants might affect the population of these mega and meso-herbivores. Therefore, further experimental studies explaining the factors responsible for feeding choices as well as the impact of mega and meso-herbivores on plant vegetation are required, to understand the community vegetation dynamics in KNP.

Conclusions and conservation implications

The information on the diet composition provides insight into the feeding habits of the mega and meso-herbivores in the wet grasslands of the Brahmaputra floodplains. The findings of this study support the hypothesis that both mega and meso-herbivores consumed a more graze-based diet in the wet season than in the dry season (H_1). The mega and meso-herbivores grazed more during the wet season, although browse also formed a significant portion of the diet; indicating that both mega and meso-herbivores were grazers and mixed feeders. As monocots were found to be dominant in the forage of rhino, buffalo, swamp deer, and hog deer throughout the year, these species may be more involved in grazing during both the dry and wet seasons. The herbivores, while foraging on nutrient-rich forage, might consume chemically defended forage, resulting in the consumption of toxic plant secondary metabolites (tannins and polyphenols). The detoxification of the secondary metabolites requires more energy. Therefore, to avoid toxic plant secondary metabolites, herbivores might feed on low nutrient quality forage⁶³. The shifting of elephant and sambar in the wet season from browsing to grazing indicates their flexibility in utilization of the available forage. The availability of green and nutrient-rich forage is due to the higher moisture regime and controlled burning of wet grasslands. This could be the reason why mega and meso-herbivores feed more on monocots in the wet season¹⁸. The present study also supports the hypothesis of more nutritious principal monocot forage in the wet season (H_2). Compared to other herbivores, the diet of rhino, elephant, and sambar consisted more of browse. This contradicts the Jarman–Bell principle, according to which large-bodied herbivores feed mostly on less nutritious graminoids. The seasonal changes in forage availability, mouth size, gut physiology, and predation risk might be responsible for the differences in the forage consumption among mega and meso-herbivores as observed in other studies (e.g., Pradhan et al.¹⁸, Wegge et al.²⁹, Steinheim et al.⁵⁹).

The study suggests that tall and short grasses play a crucial role in meeting the dietary requirements of both mega and meso-herbivores and the importance of riverine alluvial floodplain grasslands in conserving the mega

and meso-herbivores. In KNP, the ongoing processes of succession and invasion threaten the grasslands, which in the future might affect the availability of the principal forage plants consumed by mega and meso-herbivores. Thus, grassland-based effective management interventions for conserving the crucial habitat of mega and meso-herbivores are suggested. In the climate crisis and habitat degradation era, the present study will help Park managers to formulate effective conservation strategies for conserving mega and meso-herbivores.

Materials and methods

Study area. KNP, in the north-eastern Indian state of Assam, is situated in the floodplains of the Brahmaputra River, which runs along the northern boundary of the Park; and the Karbi Anglong Hills form the southern boundary. KNP, with an area of 429.93 km², lies between latitudes 26° 34' N and 26° 46' N and longitudes 93° 08' E and 93° 36' E (Fig. 1). An effort to conserve the rhino started with the declaration of Kaziranga as a Reserve Forest in 1908. It was later declared a Wildlife Sanctuary in 1950 and upgraded to a National Park in 1974. Subsequently, it was declared a UNESCO World Heritage Site in 1985 and a Tiger Reserve in 2007⁶⁴. After more than 100 years of conservation efforts, the population of the wildlife in the area has increased⁶⁴. KNP, with its flat terrain and rich alluvial soil, is characterized by numerous permanent water bodies, locally known as *beels*. The climate is of the typical subtropical monsoon type. The total annual precipitation in the study area varies from 1592.8 to 2247.8 mm (2011–2015, Assam Forest Department) with a mean annual precipitation at 1802.7 ± 118.5 mm.

Floods from the Brahmaputra River play a crucial role in the maintenance of the wet grassland ecosystem in KNP, which largely constitutes of tall grasses, short grasses, wetlands, and semi-evergreen forests⁶⁵, and supports one of the world's largest population of rhino and buffalo, and significant populations of the Eastern swamp deer and elephant⁶⁴. KNP is home to eight mega and meso-herbivores, viz. *R. unicornis*, *E. maximus*, *B. arnee*, *Bos gaurus*, *R. duvaucelii*, *A. porcinus*, *R. unicolor*, and *Muntiacus muntjak*⁶⁶.

Food habit study. The micro-histological analysis was used to study the feeding habits of the mega and meso-herbivores^{2,29,55,67}. This technique involves the preparation of reference slides from the plant material (leaf, stems, flower, and fruit) and comparing it with the slides prepared from the known faecal samples of mega and meso-herbivores^{29,68}. The microscopic identification of forage plant fragments was carried out using the keys from Satkapan⁶⁹ and Johnson et al.⁷⁰. For reference samples, 75 potential forage plants were collected from the field, based on literature review and direct field observations^{2,29,67} (Supplementary Table S12). The taxonomic identification of reference plant materials was based on flora of the Kaziranga and Manas National Parks^{71–73}. The samples were oven-dried at 60 °C for 48 h⁷⁴, stored in labelled paper bags, and brought to the headquarter for laboratory analysis. The reference samples were processed using the micro-histological technique²⁹ in the laboratory (Fig. 6a).

Seventy-five potential forage plants belonging to 31 families were collected. Twenty-eight percent (n = 21) of these were monocots, and 72% (n = 54) were dicots. Among the six growth forms, 17.33% (n = 13) were grasses, 8% (n = 6) were sedges, 6.66% (n = 5) were climbers, 44% (n = 33) were herbs, 17.33% (n = 13) were shrubs, and 6.66% (n = 5) were trees. Of these 75 forage plants, 42.67% (n = 32) were collected from short grasslands, 29.33% (n = 22) from tall grasslands and 28% (n = 21) from woodlands (Supplementary Table S12).

Fresh dung samples of mega-herbivores, viz. rhino, elephant and buffalo, and pellets of the meso-herbivores, viz. swamp deer, hog deer, and sambar, were collected each month from November 2013 to April 2015 (excluding the flood period from June till October, during which Park remains closed and sample collection was not possible)^{64,75}. For the elephant, buffalo, swamp deer, hog deer, and sambar, the faecal samples were collected opportunistically, whereas, for rhino, the faecal samples were collected from latrine sites⁷⁶. These faecal samples were collected from random locations in the short and tall grasslands and woodlands within three forest ranges of KNP, namely Kohora (central), Agoratoli (eastern), and Bagori (western) (Supplementary Table S13). Overall, 1975 faecal samples were collected for both mega and meso-herbivores, of which 1500 samples were collected in the dry season (from November to March) and 475 samples in the wet season (April to May) (Supplementary Table S14). For mega-herbivores, a fresh dung sample, weighing about 400 gm was collected^{29,59}. Based on the study by Jachmann and Bell⁷⁷, which showed a positive linear relationship between elephant size, and weight and circumference of boli (individual faeces), we used boli as a guideline for elephant dung sample collection to ensure representation from varied body size individuals⁵⁹. The faecal samples collected from randomly selected habitats within similar locations and ranges were used to make composite samples. For mega-herbivores, five dung samples collected from the same location on the same date were selected randomly and mixed thoroughly to make one composite sample. From this composite sample, 25 g of grounded dung sample was used for micro-histological analysis following Wegge et al.²⁹. Similarly, five faecal pellets of the meso-herbivores from each five randomly collected pellet samples were pooled together to make one composite sample. The composite samples were processed using the micro-histological technique following Wegge et al.²⁹

Five slides were prepared from each composite sample. Seventy composite samples and 350 slides each were prepared (no. of observations, n = 3500) for rhino and elephant. Sixty-five composite samples and 325 slides each were prepared for buffalo, swamp deer, and hog deer (n = 3250), and 60 composite samples and 300 slides were prepared for sambar (n = 3000). Observations with at least two identifiable fragments were considered for the detection of forage plant species consumed. Whenever possible, identification up to species level was attempted by comparing each sample with the reference plant samples that included leaf, stems, flower, and fruit. We have taken only leaves, stems, flower, and fruit for the preparation of reference materials, and not the bark or roots. Fragments with identifiable features where identification up to species or genus level was difficult due to damaged fragments were categorized as unidentified monocots (including *Bambusa* spp.), and unidentified dicots (including *M. philippinensis*, *Terminalia* spp., and *S. fruticosum*)¹⁸.

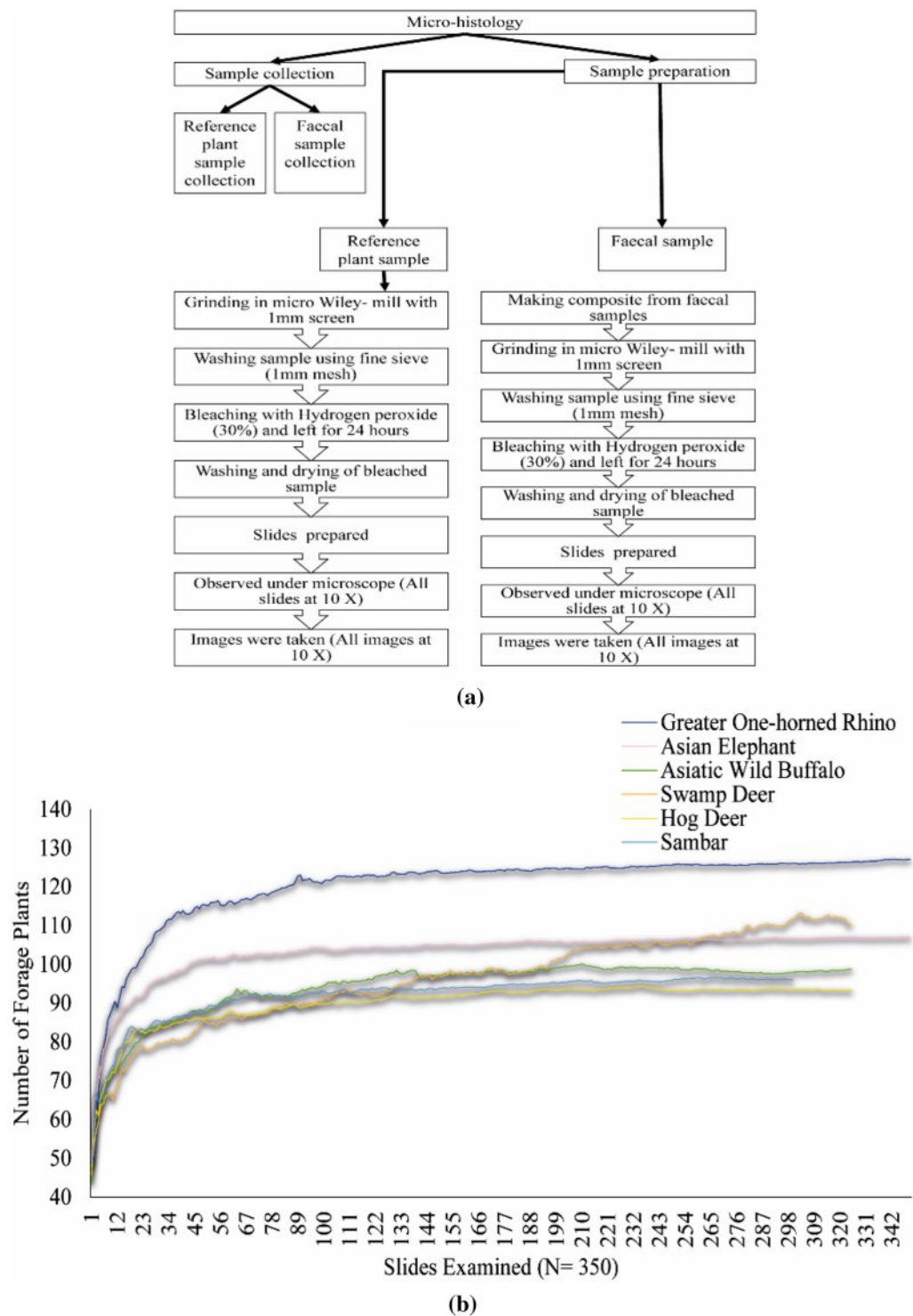


Figure 6. Graph showing (a) pathway for micro-histological analysis of plant reference samples and faecal samples and (b) overall species accumulation curve for mega and meso-herbivores (Greater one-horned rhino and Asian elephant: N = 350; Asiatic wild buffalo, swamp deer and hog deer: N = 325; sambar: N = 300).

The species accumulation curve was asymptotic at a sample size below the number of slides examined, indicating a sufficient sample size (Fig. 6b). Overall, rhino utilized the maximum number of forage species ($n = 124$, including both identified and unidentified plants), followed by elephant ($n = 105$), buffalo ($n = 96$), sambar ($n = 92$), hog deer ($n = 91$), and swamp deer ($n = 90$) (Table 1).

Forage quality. Based on the results from the micro-histological analysis, the forage plants consumed in the highest proportion by mega and meso-herbivores were collected twice every month from November 2015 to May 2016. These samples were oven-dried at 60 °C for 48 h in the field and finely ground in 1 mm mesh screen of a Cyclotech's micro-Wiley mill and stored in airtight plastic bags for estimation of CP, AC, fibre (NDF, ADF, and ADL), and minerals (Ca, P, Mg, K, and Na). Standard protocols were followed to estimate nutrient content (Supplementary Table S15). For Ca and Mg estimation, AAAnalyst 700 Atomic Absorption Spectrometer was used with MERCK Certipur Single-Element Standards of Ca and Mg. Similarly, for P estimation, the SMART Spectro 2 Spectrophotometer was used with standard phosphate solution (KH_2PO_4)⁷⁸.

Data analysis. To determine the diet composition of mega and meso-herbivores more precisely, the forage plants identified were categorized further on the basis of (1) graze-to-browse ratio (on monocot and dicot consumption), (2) growth form (grass, sedge, herb, shrub, climber and tree), (3) family, and (4) species. The percentage occurrence of each forage type (graze-to-browse, growth form, family, and species) in the diet of mega and meso-herbivores was determined using the equation of Sparks and Malechek⁶⁸ and Tuboi and Hussain⁵⁵:

$$\% \text{ contribution of forage plants} = \frac{\text{Number of identifiable fragments of each category}}{\text{Total number of identifiable fragments of all plant species}} \times 100.$$

A species accumulation curve was plotted to determine the sampling effort required to adequately examine the diet composition of mega and meso-herbivores. EstimateS version 9 with a 95% confidence interval was used to produce the species accumulation curve⁷⁹. The number of slides examined and the forage plants identified from the faecal samples of the mega and meso-herbivores were plotted in the species accumulation curve⁸⁰. The dietary spectrum of the mega and meso-herbivores was obtained to visualize the pattern of forage utilization on the basis of the major contributing plants. The chi-square test of association and Fisher's Exact Test were carried out to identify seasonal differences in the forage consumed between the mega and meso-herbivores and among the six herbivores. The tests were performed using SPSS version 22. BEN was used to visualize the forage utilization by mega and meso-herbivores, using R package "bipartite" version 2.11⁸¹. The forage plants were grouped by family, and only the top 20 abundant families, contributing more than 80% to the diet of mega and meso-herbivores, were highlighted and the rest of the families were grouped under the other category.

The seasonal differences in the nutrient content of major monocot and dicot forage plants were analyzed using a non-parametric Mann–Whitney *U*-test in SPSS version 22. The effect of nutrient factor (predictor) on the use of major forage plants (response) was modelled using a generalized linear model (GLM) and Pearson's correlation analysis. For GLM, R package "MuMin" vers.1.43.17 and for correlogram, R package "Hmisc" vers. 4.4-0 and "corrplot" vers. 0.84 were used^{82–84}.

Statement for handling plants/plant materials. Experimental research and field studies including collection of plant/plant material for this study, is compliant with the relevant institutional, national, and international guidelines and legislations. The biological samples examined were collected with the permission from the Principal Chief Conservator of Forest (Wildlife) & Chief Wildlife Warden, Government of Assam under section 12 of the Indian Wild Life (Protection) Act, 1972 in O.O No. 868 dated 20th August, 2013. A permission was also obtained from the Director, Kaziranga National Park, Assam in KNP/FG647WII/Research dated 31st October, 2013.

Ethics approval. Experimental research and field studies including collection of plant/plant material for this study, is compliant with the relevant institutional, national, and international guidelines and legislations.

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Author contributions

S.A.H. developed the concept, raised funds and design the research methods. A.D. and M.S. collected the field data. A.D. conducted the experiment and analyzed the data. R.B. and G.G.V. facilitated the field data collection. A.D. and S.A.H. wrote the manuscript. A.D., S.A.H., M.S. and R.B. reviewed and edited the manuscript.

Competing interests

The authors declare no competing interests.

Additional information

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Abstracts of Speed-Talk Poster Presentations*

**Ordered in alphabetically by surname*



PS47**NEW ALIEN INVASIVE PLANT SPECIES IN THE FLORA OF ADJARA (GEORGIA)****Irakli Mikeladze¹**¹Institute of Phytopathology and Biodiversity, Batumi Shota Rustaveli State University (BSU), Kobuleti, Adjara,**E-mail:** Georgia. irakli.mikeladze@bsu.edu.ge

Adjara floristic region is located in the South Western part of Georgia, on the Black Sea coast, at an altitude of 0-2995 m above sea level. Area 2919 km², is divided into two parts: coastal Adjara and inner mountainous Adjara. Floristically rich and various. There are over 2000 species, among them about 500 species are alien. Between them 178 species are of woody plants - trees and shrubs, the rest are herbaceous.

156 species of Adjara alien flora are of Mediterranean origin and it is 32% of the whole flora, 134 species (27%) of East Asian origin is on the second place, 108 species (22%) are of European origin, other continents are represented with the following number of species - North America 59, South America 23 and Australia 8.

The appearance of alien plants in Adjara is connected to the introduction of cultural plants. The introduction of southern (sub-tropical) plants and distribution into culture has been going on since ancient times.

At the end of the XIX century there were 134 alien species in the flora of Adjara. In the 1920s -168, in the forties 281, since 1950 the number of alien plants grow by 30-40 species in every 10 years, which reached to 450 species in 2010. After 2010 many new alien species were described by us.

As a result of research conducted the last period, we have described several new alien species, among them is remarkable dangerous invasive species, they are:

Sicyos angulatus L., - widely spread on the agricultural grounds, particularly maize field, citrus crops and represents as a serious weed for farmers. It is also found in semi-natural habitats, on the riverbanks and nearby territories, roadsides, mainly in the swampy and moist soils.

Solidago canadensis L., - wide spread in seaside on roadsides, canals, ruderal areas, tea plantation, cultivated fields, forest margins and semi natural areas. Its invasive potential is high.

Cenchrus longispinus (Hack.) Fernald (= *Cenchrus pauciflorus* var. *longispinus* (Hack.) Jansen & Wacht.) - at this stage it is not wide spread. Found in the Kobuleti lowlands, on the seaside dunes. But they are characterized by abundant fruiting and rapid spread. It is dangerous invasive plant.

Verbena brasiliensis Vell., - is spread out seaside Adjara, roads, ruderal sites, abandoned pastures, forest margins and abandoned lawns. In spreading areas, it takes the dominant position and completely changes plant environment.

PS49**VEGETATION COMPOSITION OF WET GRASSLANDS OF KAZIRANGA NATIONAL PARK, ASSAM, INDIA****Monika Sharma¹, Anita Devi¹, Syed Ainul Hussain¹ & Ruchi Badola¹**¹Wildlife Institute of India, Post Box # 18, Chandrabani, Dehra Dun 248001, Uttarakhand, India.**E-mail:** monikasharma77777@gmail.com

Questions: Wet grasslands are biologically diverse ecosystems maintained by climate, hydrology, soil condition, and management interventions. Climate change is threatening the biodiversity, vegetation composition and ecosystem processes of these grasslands directly by affecting rainfall and temperature and indirectly by extreme climate conditions. The wet grasslands in the Brahmaputra floodplains of Kaziranga National Park (KNP), Assam, India are maintained by annual floods and burning practices. The consequence of the change in the intensity of these processes to the vegetation composition of the park is understudied. Necessitating the up-gradation of the available information on vegetation composition of the park. This study aims to provide information on vegetation composition of KNP in terms of species groups viz., angiosperms, pteridophytes and gymnosperms; monocots and dicots; and growth forms such as grasses, sedges, climbers, herbs, ferns, shrubs and trees.

Methods: Information on the vegetation composition of the park was gathered through an extensive literature review of available offline and online scientific articles, reports and books between 1970 and 2020. Offline, the literature available in the Wildlife Institute of India's library was reviewed. Online, the literature available was accessed through search engines like Google Scholar, Research Gate, Mendeley and scientific databases like Shodhganga and Biodiversity Heritage Library, using keywords like 'flora of KNP, vegetation composition of KNP, medicinal plants and trees of KNP' for review.

Results: One thousand and five plant species belonging to 585 genera and 147 families were documented. Of these, 965 were angiosperms, followed by 39 pteridophytes and one gymnosperm. In angiosperms, the highest number of species were represented by dicots (n=691) followed by monocots (n=274). *Ficus* with 23 species was the dominating genera, followed by *Cyperus* (n=15) and *Panicum* (n=10). Poaceae with 134 species was the dominating family, followed by Leguminosae (n=82) and Compositae (n=38). Among seven growth forms, the highest number of plant species were documented in herbs (n=272), followed by trees (n=263), shrubs (n=187), grasses (n=133), climbers (n=78), ferns (n=38) and sedges (n=34).

Conclusions: We conclude that KNP is rich in terms of flora although more scientific studies are needed to explore the pteridophytes and gymnosperms of the area. In the future, updated information on the vegetation composition of KNP will provide baseline information to understand the effects of climate change on vegetation composition. Which will further help develop sustainable grassland species-specific conservation strategies.



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BOOK OF ABSTRACTS

OP03**BIOLOGICAL INVASION BY LIVESTOCK AND DOGS IN WET GRASSLANDS OF BRAHMAPUTRA FLOODPLAINS OF ASSAM AFFECTING ITS INTEGRITY****Anita Devi¹, Syed Ainul Hussain¹, Monika Sharma¹ & Ruchi Badola¹**¹Wildlife Institute of India, Post Box # 18, Chandrabani, Dehra Dun 248001, Uttarakhand, India**E-mail:** anushrn4@gmail.com

Questions: Protected Areas are increasingly facing the challenges of livestock grazing and incidents of feral dogs interacting with wildlife, increasing the probability of transmission of zoonotic diseases. Additionally, livestock competes with wild ungulates for forage, pushing the wild ungulates to inferior habitats. Grazing by livestock also alters the vegetation structure, with a preponderance of invasive plant species. The dogs (feral, stray or domestic) deplete the prey base for carnivores. Expansion of human settlements around the Kaziranga Tiger Reserve (KTR), a wet grassland in Assam, India, has increased the livestock and dog populations around the reserve. The impact of these changes is poorly studied. This study aims to provide information on the incidence of livestock grazing, the presence of dogs, and identifying its consequence on the integrity of KTR.

Methods: The fieldwork was conducted from January 2014 to May 2016. Observations were recorded from three habitats: tall grassland (TG), short grassland (SG), and woodland. For livestock (buffalo, cow and goat), opportunistic sightings of their grazing were recorded. The observations of dogs chasing wild herbivores were also recorded.

Results: In 416 grazing observations, a total of 58,000 livestock individuals were recorded, of which the highest sightings were recorded from TG (90.53%), followed by SG (9.17%) and woodland (0.31%). Among livestock, cows with the highest number of individuals ($n=40914$) and mean group size (MGS) of $106.27 (\pm 5.89)$ were recorded primarily from TG (92.66%), followed by SG (7.14%) and woodland (0.21%). Similarly, goats with 16,923 individuals and MGS of $42.31 (\pm 1.56)$ were recorded mainly from TG (85.29%), followed by SG (14.15%) and woodland (0.56%). Buffaloes with 163 individuals and MGS of $27.17 (\pm 4.09)$ were recorded only in TG. In 55 dog observations, 111 individuals with MGS of $2.02 (\pm 0.20)$ were recorded chasing wild herbivores, of which the maximum numbers of chasings were recorded from TG (53.15%), followed by SG (45.95%).

Conclusions: We conclude that TG is under high pressure as compared to other habitat types due to livestock grazing. Among livestock, cows exert more grazing pressure on the KTR, which is exacerbated by dogs often attacking the wild animals. We recommend regular monitoring, regulating livestock grazing, formulating livelihood programmes for villagers to reduce livestock dependency, improving veterinary assistance and dog sterilization programmes to manage their population. However, scientific evidence is needed to understand the impact of biological invasion on the grasslands habitat dynamic, wild animals population, disease transmission, and competition.

OP45**GEOGRAPHICAL DISTRIBUTION AND DRIVERS OF BIODIVERSITY IN INNER MONGOLIA****Gang Feng¹**¹School of Ecology and Environment, Inner Mongolia University**E-mail:** qaufenggang@163.com

Geographical distribution of biodiversity is associated with multiple spatial and temporal scale factors, e.g., geological events, paleoclimate change, current climate, topographic heterogeneity, and local biotic interactions. However, so far, no studies have systematically assessed the links between these factors and biodiversity distribution in Inner Mongolia. This presentation will first introduce the geographic distribution of bird, mammals, plant and insect diversity, and then discuss their associations with paleoclimate change, current climate, topographic heterogeneity and local biotic interactions. In addition, this presentation will also talk about the effects of land use changes on similarities/beta diversity of bird communities across Inner Mongolian grassland. The results showed that in addition to the effects of regional climate factors, local biotic interactions (i.e., inter-specific competition and food diversity) are also highly correlated with geographical distribution biodiversity in Inner Mongolia. The conversion from nature grassland to woodland, cropland and residual area has significantly promoted the biotic homogenization of bird communities, in terms of dimensions of taxonomic, phylogenetic and functional diversity. These findings suggest that the massive human activities in this region have caused serious biodiversity loss. Future biodiversity conservation should avoid the further disturbance of human beings, pay more attention on the ecosystem restoration, and keep the whole ecosystem healthy and intact.



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Patterns of biomass production by the wet grasslands of Kaziranga National Park

-Monika Sharma

Altered hydrology in the floodplains may affect the availability of consumable plant biomass to large herbivores, causing a cascading effect on the ecosystem. Thus, this study aims to examine the above ground biomass (AGB) productivity of the seasonally flooded grasslands of the Brahmaputra floodplains.

The study was carried out in Kaziranga National Park (KNP), Assam, characterised by the alluvial deposits of the Brahmaputra River and its tributaries.

The 'Harvest Method' was used to estimate the AGB production for a period of two years. Fifteen enclosures, 10 m x 10 m in dimension, were constructed, out of which nine were in areas that remain inundated for less than 6 months and are characterized by tall grass communities (TG) and six in areas that remain inundated for more than 6 months and are characterized by short grass communities (SG). To quantify the AGB production, the grassland vegetation close to the soil surface was harvested monthly from the enclosures in 1 m x 1 m quadrates in triplicates. The productivity assessment is based on 121 plant species recorded from these enclosures.

The overall mean biomass productivity was $8421.29 \pm 824.01 \text{ g m}^{-2}$ (N=18). In 2014, the mean annual productivity was $6658.08 \pm 962.70 \text{ g m}^{-2}$ and, in 2015, it was $10184.5 \pm 1087.07 \text{ g m}^{-2}$. The overall productivity varied significantly among the two sampling years (t-test, $p = 0.01$). There was significant difference in AGB of TG, $5285.80 \pm 682.09 \text{ g m}^{-2}$, and SG, $3135.49 \pm 489.72 \text{ g m}^{-2}$ ($p = 0.01$). AGB productivity is directly related environmental factors such as rainfall, number of rainy days and temperature. Overall, highest productivity was observed in the month of July in TG and during May in SG. Among TGSaccharum spp. was the highest contributor to biomass followed by *Alpinia nigra*, *Ipomea* sp., *Mimosa* sp. and *Cuphea procumbens*. In SG, *Hemarthria* sp. contributed the most to the AGB productivity followed by *Cynodon dactylon*, *Cyperus* sp., *Saccharum* spp. and *Lippia javanica*.

The overall biomass productivity between the two study years varied significantly, which could be due to the synergistic effects of varied precipitation, temperature and flooding of the grasslands and, subsequent, nutrient enrichment. Further analysis on the role of these environmental variables may reflect factors affecting the productivity of this dynamic ecosystem.

Keywords: Biomass production, grasslands, floodplains, temperature, precipitation.

Project Title	: Pattern of biomass production by wetlands and its use by wild ungulates in Kaziranga landscape
Principal Investigator(s)	: S.A. Hussain, Ruchi Badola and Gopi G.V.
Researcher(s)	: Monika Sharma (Junior Research Fellow), Anita Devi (Project Fellow)
Funding Agency	: Department of Science and Technology, Govt. of India
Project Duration	: 2013-2016

Food habits of large herbivores in Kaziranga National Park, Assam

-Anita Devi

The successful management of sympatric large herbivores in a landscape requires knowledge on resource partitioning and overlap among them, as mammalian herbivore species coexist by partitioning the key niche dimensions of diet and habitat. This study aims to examine the diet composition of six large herbivore species, with varying body size, occurring sympatrically in Brahmaputra flood plains, Assam.

This study was carried out in Kaziranga National Park, Assam (428.71 km²).

The food habits of one-horned rhinoceros (*Rhinoceros unicornis*), Asian elephant (*Elephas maximus*), wild buffalo (*Bubalus arnee*), swamp deer (*Rucervus duvaucelii*), hog deer (*Axis porcinus*) and sambar (*Rusa unicolor*) were examined through the micro-histological analysis of a total of 1975 faecal (both dung & pellet) samples collected during 2013-15. The forage availability was determined in terms of above-ground biomass via the harvest method wherein three replicates were clipped every month from 1 m x 1 m plots within ten enclosures of 10 m x 10 m. Forage preference and diet overlap was derived using Ivlev's Electivity Index and Pianka's Index, respectively.

The diet of large herbivores in Kaziranga comprised of 57-66 forage species in the dry season and 49-66 species in the wet season. Graminoids dominated the diet of all the species studied, except elephant and sambar. In both the dry and wet seasons, *Saccharum* spp. contributed the most to the diet of large bodied mammals such as elephant, rhinoceros, wild buffalo and sambar, whereas *Hemarthria compressa* contributed the most to the diet of hog deer. The diet of swamp deer was dominated by *Saccharum* spp. in the dry season and by *H. compressa* in the wet season. In the dry season, *Oxalis corniculata* was the most preferred forage species by all the studied species (IV 0.99) whereas, in the wet season, *Echinochloa crus-galli* was most preferred (IV 0.99). Results indicated a significant overlap in the diet of the six herbivores, in both the dry and wet seasons (Pianka's index - 0.86 and 0.89).

In the wet season, grasses are more nutrient rich, thus, graminoid dominated the diet of all the studied species. Rhinoceros, elephant, wild buffalo and sambar feed more on tall grasses while swamp deer and hog deer feed more on short grasses.

Keywords: Diet composition, dietary overlaps, forage preference, mega-herbivores, forage availability

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