FINAL TECHNICAL REPORT

Assessment of Biological Diversity in Tripura

Project for Sustainable Catchment Forest Management in Tripura (SCATFORM),
Project Management Unit,
Tripura JICA Project,
Sanction Letter No.F.3-65/JICA/SCATFORM/Dev/2020/7548-51

2023

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Technical Details

1. Date of MoU between SCATFORM and Tripura University: **September 4th, 2021.**
2. Project Title: ***"Assessment of Biological Diversity in Tripura".***
3. Duration of the Project: **1 year (sanctioned).**
4. Principal Investigator: **Prof. B. K. Datta**

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6. Key objectives of the study:

1. **To assess the Floral biodiversity of the proposedproject sites and quantification of baseline data.**
2. **To assess floristic biodiversity at the potential siteswhich has risk of biodiversity loss.**

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INTRODUCTION

The vast arc of the Himalayan mountain range that covers much of Northeast India is one of the most important and most threatened global biodiversity hotspots. The region has been a center of evolutionary novelty, harboring thousands of endemic species today. Northeast India is also home to hundreds of indigenous ethnic communities with their associated languages and cultures. Its landscapes are sacred to several of the world's major religions. In terms of ecosystem services such as freshwater, no region is more vital to the future environmental security of humanity than the Himalayas. The 15,000 Himalayan glaciers constitute the world's largest freshwater ice storehouse outside the North and South Poles. Eight of Asia's largest rivers originate in these mountains, their basins sustaining more than 1.3 billion people downstream. However, the landscapes of Northeast India are under extreme pressure from extrinsic and intrinsic factors, including climate change and changes in land use and land cover. The dramatic glacial retreat in the Himalayas increases the risks of flooding, landslides, and droughts downstream in the region.

Further, expanding human populations, industrial and agricultural development pressures, and the lack of coordination in governance and policy threaten biodiversity. Due to its extraordinary topographical, meteorological, and biogeographical complexity, the biodiversity of the Northeast remains under-explored. The area receives intense seasonal monsoon rainfall and harbors an estimated 65% of India's total biodiversity. Between 1998 and 2014, over 550 new species were described in the Eastern Himalayas. Important discoveries will continue if and when the region receives systematic exploration. However, the institutional capacity to fully explore the biodiversity of the Northeast region, assess its value in the regional economy, examine the impact of climate change on biodiversity and biodiversity-based livelihoods, and craft an adequate policy response to the negative impacts of global environmental change is limited, due to inadequate institutional and policy frameworks and weak human resources.

Northeast India is one of the most biodiversity rich, and the state Tripura is part of it and the least explored part of the world. With some of the world's richest biological diversity, the Northeast region amounts to more than one-third of the country's total biodiversity (Chatterjee et al., 2006). By sharing a biogeographic affinity with China, Malaya, and other parts of the Indian subcontinent, the Northeast region is known for high species diversity and endemism in several floral and faunal elements (Myers et al. 2000). Moreover, several of these species are not found anywhere else in the world (Chakravarty et al., 2012). For instance, India has an enormous diversity of lower plants, with 7357 species of algae, 15115 fungi, 2511 lichens, 2748 bryophytes, and 1289 pteridophytes making up 60% of Indian flora (Singh & Dash, 2017). Lower plants are treated as a neglected branch of botany, with only a few researchers involved in their study. Therefore, several interesting regions of India, such as Northeast India, remain under-explored. Because of this high biological richness and unexplored diversity of flora and fauna in the region, new species of plants and animals are still being discovered from the Northeast. From 2009 to 2014, 133 plants, nine invertebrates, 26 fish, one amphibian, one reptile, one bird, and one mammal were discovered in the Indian part of the Eastern Himalayas alone.

(http://www.worldwildlife.org/stories/hundreds-of-new-species-discovered-in-the-eastern-himalayan-region;https://www.worldwildlife.org/publications/hiddenhimalayas-asia-s- wonderland). Systematic inventories are needed to explore and document the Northeast region's biodiversity fully. However, such inventories in the Northeast are lacking. During the last decade, considerable work has been done on biodiversity mapping at a landscape level in the Northeast using technologies of remote sensing and geographic information system (GIS) (IIRS, 2003; Roy et al., 2015) and transect inventories to assess distribution and population status of plant resources (Ganeshaiah et al., 2013). However, these studies cannot reveal the overall pattern of species richness and abundance across space and time.

The region is facing a wide range of threats and pressures, with deforestation the most serious. According to FSI, about 2 Mha forest area of Northeast India has been affected due to shifting cultivation. In most of Northeast India, dense primary forests have been degraded into secondary open forests or shrublands within a few decades. Such degradation leads to biodiversity loss. According to FSI figures, from 2001 to 2011, the annual forest cover loss of forests with>10% cover ranged from 0.1 % in Manipur to 1.22% in Tripura. Further, the FSI (2015) report for 2013 to 2015 suggests a decrease in the forest cover in the Northeast by 628 sq km primarily because of shifting cultivation and increased biotic pressure. Apart from shifting agriculture, factors such as overgrazing, poaching, wildlife trade, mining, pollution, and hydropower development have all contributed to the pressures on the fragile ecosystems in the region. Another grave threat to biodiversity in the region is climate change (Xu et al., 2009; Shrestha et al., 2012). Climate change has influenced rapid glacial retreat in the Himalayas (Balga, 2009; Imnan, 2010) and changed temperature and precipitation patterns. As a result, many flowering plants have changed their flowering pattern (Shrestha et al., 2012) and shifted their habitat towards higher altitudes. Systematic and biological resource inventory efforts are required to generate quantitative biodiversity and biological resource data to conserve biodiversity in the face of climate change and anthropogenic pressures. These efforts require baseline information, quantitative estimates, and monitoring from species to ecosystems. Thus, the broad goal of this proposal is to develop a program that will strengthen the collaborations among institutions to assess the biodiversity of the proposed project sites, quantify baseline data, and assess biodiversity at the potential sites at risk of biodiversity loss.

BACKGROUND OF THE PROJECT

Globally, there are good examples of multi-institutional collaborative efforts (CFTS-ForestGeo (http://www.forestgeo.si.edu), RAINFOR (http://www.rainfor.org), and TEAM (www.teamnetwork.org) to assess and monitor biodiversity across large spatial scales. These efforts have yielded important insights into the ecological and evolutionary processes determining biodiversity patterns both at regional and local scales. Using monitoring and biodiversity assessment data from 1170 plots established by a network of institutions, Steege et al. 2013, reported that despite the high diversity of tree species (~16,000), the Amazonian forest is dominated by only 227 tree species and concluded that both 38 competitive superiority and pre-1492 cultivation by humans might be responsible for hyper dominance pattern of tree species. Further, data from two decades of monitoring biodiversity in permanent plots established along an elevation gradient in Andean mountains has shown that abiotic and biotic variables are essential determinants of tree species turnover and productivity in Andean mountains (Baez et al., 2015).

The biodiversity-rich continents such as South America, Africa, and a few countries in south and southeast Asia have given greater importance to biodiversity assessment and monitoring programs than other biodiversity-rich countries such as the Indian sub-continent and have become pioneers in biodiversity research (Hubbell & Foster, 1983).

Though there are some collaborative efforts to inventory and monitor biodiversity in India (Sukumar et al., 1992; John et al., 2002; Sukumar et al., 2004; Ramesh et al., 2010), these efforts face three major problems: 1) the geographic coverage of extant biodiversity monitoring programs is insufficient and uneven; 2) monitoring schemes are typically not implemented at large spatial scales, and few deliver long-term data, making it difficult to monitor biodiversity change across space and time; 3) due to lack of computational skills, biodiversity data from large-scale inventory and monitoring programs have not been utilized to gain insights about basic processes determining biodiversity patterns and sensitivity of biodiversity to climate change and anthropogenic impacts. As a result, India is lagging behind many countries in biodiversity assessments and monitoring programs.

In recent decades, the southern part of India has received more attention in biodiversity assessment and monitoring programs to gain insights into changes in the structure and function of plant communities across broad environmental gradients and to understand vegetation responses to changing environmental drivers (Sukumar et al., 1992; John et al., 2002; Sukumar et al., 2004; Ramesh et al., 2010; Ganeshaiah et al., 2009) (unpublished); http://lemonindia.weebly.com. Northeast India contains some of the highest mountains in the world with an extensive range of ecoclimatic zones (Dobremez, 1976) and harbors biodiversity next only to the biodiversity in the Andes and the Hengduan Mountains of China. The biodiversity of the region is under constant threat from human activities, hydroelectric and developmental projects, and climate change accelerated by the rapid glacial retreat of the Himalayan mountains.

With the basic information about the distribution of biological resources in the region, one can understand how these biologically rich mountains of the Northeast region can sustain biodiversity in the face of ever-increasing anthropogenic impacts and global climate change. Thus, the biodiversity inventory and monitoring program in the Northeast Indian mountain region will not only provide an excellent opportunity for evaluating ecological and biogeographical patterns of biodiversity and theories of species richness (Korner, 2000) but also provide essential insights into the impacts on biodiversity due to climate change and bioresource use by humans. Furthermore, such data will be foundational to the other four program components described in the "Origin of the Proposal" section.

ABOUT THE TRIPURA SCATFORM PROJECT

In the MoD of the Tripura SCATFORM Project, a component, namely; Biodiversity Assessment has been kept for implementation of the same under the project. Broadly, biodiversity assessment is related to the assessment of RET (Rare, endangered, and threatened) species of the state. In phase-I JICA Project (2006-2016), biodiversity documentation of major flora and fauna and some indicator animal taxa was done. That study result may also list some RET species of interest in the state of Tripura. Understanding the conservation status of earlier RET species at present is significant from a management point of view because the habitat is the best-suited condition for a species and provides ideal conditions for a species to grow, adapt, reproduce, and flourish. It is the energy or nutrient-providing area for an organism. The habitat of a species describes the totality of abiotic factors to which the species is exposed in the area. The relationship between habitat size and species diversity is that the smaller the habitat, the less diversity of species there will be and the more vulnerable they are to further disturbance or climate change. Species population trends: through a better understanding of what drives population numbers down, especially if the animal is endangered (e.g., Diane Fossey #39 research impact on the conservation of gorillas and the rate of poaching). The protection of a larger habitat: Studying a single species means studying the elements that help it survive, such as nesting sites and preferred food. Climate change aggravation: Efficient conservation leads to climate change mitigation by preventing accidental wildfires or eliminating key organisms (specific plankton species) from the carbon chain. Public awareness: As society #39;s awareness of its actions and effects grows, people understand what measures they can take to preserve and enjoy the natural environment for longer. Ecological studies carried out in the field are important because they allow for the testing and application of ecological (scientific) theories. Theory and experimentation suggest that the impacts of such change on ecosystem functioning should be predictable based on the biological traits of the species involved.

OBJECTIVES

There had been several lists developed for taxonomic groups of plants and animals of Tripura. Dept. of Botany, Tripura University, Tripura Forest Department, Tripura Biodiversity Board, JICA assisted several projects that have many checklists of plants and animals. However, in most cases, most of the work was focused on medicinal plants and certain animal groups of the state. There are also taxa-specific studies and region-specific floral and faunal inventories in the form of Ph.D. dissertations from the region. All this information can be easily collated and organized into databases. The region-specific platform within the India Biodiversity Portal (www.Indiabiodiversity.org) can accommodate the documented biodiversity of the Northeast. In the recent past, several efforts were made by Dept. of Botany, Tripura University, to map and quantitatively assess the geographic distribution and population status of plant resources in the region (Majumdar et al., 2012; 2014a,b,c; 2015; 2016; 2018; Majumdar&Datta, 2016).

In the MoD of the Tripura SCATFORM Project, a component, namely, Biodiversity Assessment has been kept for implementation of the same under the project. In broad, biodiversity assessment is related to the assessment of RET species (Rare, Endangered and Threatened) of the State. In phase-I JICA Project (2006-2016), biodiversity documentation of major flora and fauna and some indicator animal taxa was done. Hence, the main objectives of the study were:

1. **To assess the Floral biodiversity of the proposed project sites and quantification of baseline data.**
2. **To assess floristic biodiversity at the potential sites which has risk of biodiversity loss.**

METHODOLOGY OF THE STUDY

STUDY AREA

The state of Tripura (22°57 '& 24°32'N and 9°10 '& 92°20'E), with an area of 10,491 km2, is hilly surrounding the deltaic basin. The recorded forest area of the state is 6,294 km2. Reserved Forest constitutes 66.33%, Protected Forest 0.03%, and Unclassified Forests 33.64% of the total forest area. About 60% of the state's geographic area is under-recorded forests. Based on the classification system proposed by Champion & Seth (1968), Deb (1981), and FSI (2009), the existing primary native forests of Tripura can be classified mainly into four types viz. Cachar Tropical Semi-Evergreen Forest (2B/2s2/c2), Moist Mixed Deciduous Forest (3C/C3), East Himalayan Lower Bhabar Sal (3C/C1b (ii) and Moist Bamboo Brakes (2B/E3). The secondary forests can be categorized into the degraded form of Northern Secondary Moist Mixed Deciduous Forest (3C/2s1), Low Alluvial Savanna Woodland (3B/E3), and Secondary Moist Bamboo Brakes (2B/1S1).

The forest types of Tripura state are mainly tropical evergreen, semi-evergreen, and moist deciduous. Secondary forests are dominated by bamboo breaks, which result from historical "shifting cultivation" practices by the indigenous community. Most of Tripura is drained by rivers from the adjoining mountainous landscape, and one could notice abundant and extensive swamps and wetlands. With monsoonal weather, Tripura receives about 2500mm of rainfall annually. The forests of Tripura provide diverse, economically important NTFP sources. Diverse indigenous communities depend on the forest-based biological resources for most of the year. There are about 19 bamboo species in Tripura state, forming an extensive part of the landscape. It provides important livelihood options in addition to taking care of domestic requirements such as building and food. Diverse rattan species are also one of the important forest products from Tripura.

Though Tripura is a smaller state, it is botanically one of the richest by harboring about 1463 flowering plants out of the 17,000 species accounted for in India. Phytogeographically, Tripura is at the junction of the Himalayan and Indo-Burma hotspots of biodiversity. Floristically, the state represents both Himalayan and Patkai mountain forests. With a tropical climate, the forests of Tripura lack coniferous/alpine plants and are unique. With monsoonal weather, Tripura receives maximum rainfall during the southwest monsoon season, and the total average annual rainfall is about 2100mm.

Tripura SCATFORM Project is working on 07 Districts and Gumti WLS, which includes 135 beats. Project components are implemented in scientifically identified Project Priority Areas (PPAs), which are selected based on predetermined indicators such as slope aspect, forest degradation, etc. Under the SCATFORM Project, several plantations were developed throughout its project sites during 2020-2022.

TARGET SITES OF SAMPLING:

Survey sites were selected from AR/ANR treatment sites. A treatment area with larger scrub forests is selected based on the available maps of the micro plan.

1. Proposed sites of artificial regeneration (AR)
2. Proposed sites of aided natural regeneration (ANR)
3. Proposed sites of river bank plantation (RP),
4. Proposed sites of filter strip (FS) plantation
5. Proposed site of upper parts of check dams
6. Proposed site of submerged area of check dam.

The proposed study will be conducted using the stratified random sampling method. As proposed, there are six different categories of targets mentioned above. Categories 1-4 (artificial regeneration, aided natural regeneration, river bank plantation, filter strip plantation) will contain each of the 7 sites. Each site of the same category will be assessed by 10 plots per site/JFMCs. Hence, each target category will result in 70 plots in total.

Target categories 5 & 6 (upper parts of check dams and Model 3 check dam construction sites) will contain each 8 sites (at least one in each district/project division). There will be 4 plots in each site/ district; in total, 64 plots will be laid for target categories 5 & 6. Hence, the whole study will be conducted in 44 sites in Tripura, containing 344 plots in total.

Table 1: Total backup of field plots for the proposed study.

Category	Number of sites	Number of plots per site	Total plots
1	**7**	**10**	**70**
2	**7**	**10**	**70**
3	**7**	**10**	**70**
4	**7**	**10**	**70**
5	**8**	**4**	**32**
6	**8**	**4**	**32**
Total	**44**	**48**	**344**

FIELD SAMPLING STRATEGIES

For flowering plants, each site will contain ten transects, having 10 m width and 100 m length (10×100m= 0.1ha) to document all trees, woody shrubs, and climbers≥10cm dbh. There will be three 5×5m quadrats in each transect, one at the starting point, one at the middle, and one at the end of the transects to record all the shrubs, tree saplings, and regenerating species ≥2cm gbh. For herbs and grass, there will be three 1×1 sub-quadrats in the middle of 5×5 quadrats to count all the herbs, seedlings, and grass species. GBH and height of the trees will be measured, and voucher specimens will be collected for identification. Further geographic coordinates (Lat and Long), suite of environmental variables (altitude, temperature, rainfall, moisture, slope, and aspect), and habitat information (canopy cover, canopy height, litter cover, litter depth, invasive species, soil temp, soil pH, moisture, disturbance, human use, etc.) will also be collected from each transect as part of metadata collection. The epiphytes (orchids) and non-flowering plants (mushrooms, bryophytes, and pteridophytes) will be recorded for checklist preparation as and when encountered during the survey.

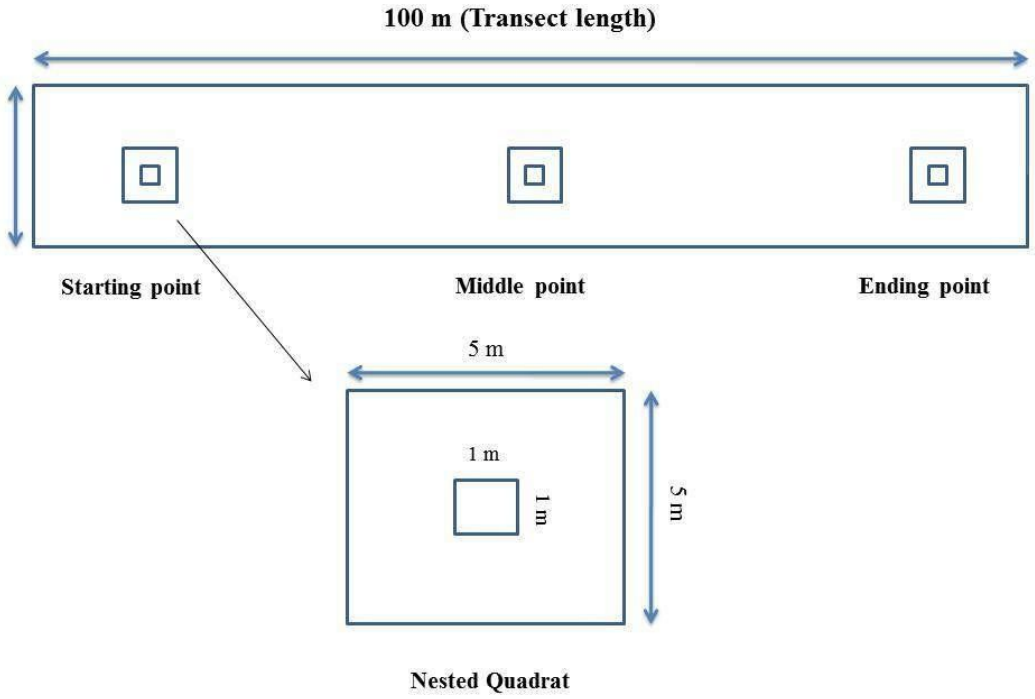


FIGURE 1: PROPOSED TRANSECT LAYOUT FOR SAMPLING IN ARTIFICIAL REGENERATION, AIDED NATURAL REGENERATION, RIVER BANK PLANTATION AND FILTER STRIP PLANTATION SITES.

Sampling method for artificial regeneration, aided natural regeneration, river bank plantation and filter strip plantation sites:

Sampling method for upper parts of check dams:

Line transects will be established in the gullies of check dams to investigate potential vegetation cover. The sampling will be used to measure the effect of check dams on the vegetation in the gully bottom and immediate banks and control for potential variability due to aspect, slope, and whether the check dams are in the headwaters or further downstream. Gullies will select at random. Line transects will be established, placing a 25 m tape measure down the center.

Sampling method for the submerged area of the check dam:

The in-water method consists of haphazardly tossing (**Krebs, 1989**) a weighted 4 m2 PVC quadrat to a location near the shore. A conventional method will be employed, then collection of rooted submerged plants by hand from the area bounded by the frame. The plant stems are broken at the sediment surface, then placed in a mesh bag and rinsed in the water before being placed in sample bags. Triplicate plant samples will be collected at each site, placed into a bag, and stored in the laboratory.

FIGURE 2: GOOGLE EARTH IMAGE OBTAINED FROM SATELLITE IMAGERY FOR VEGETATION INVENTORY.

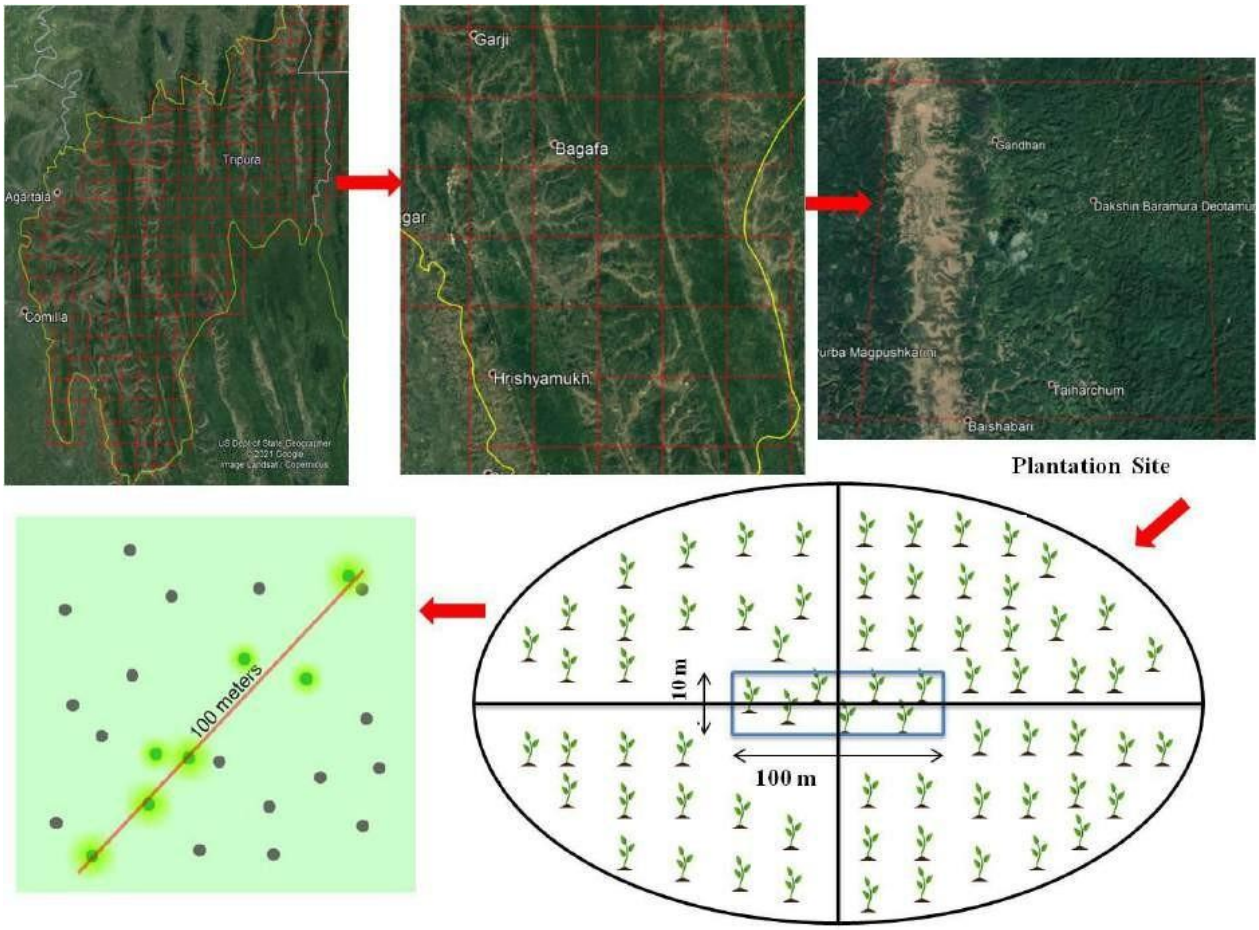
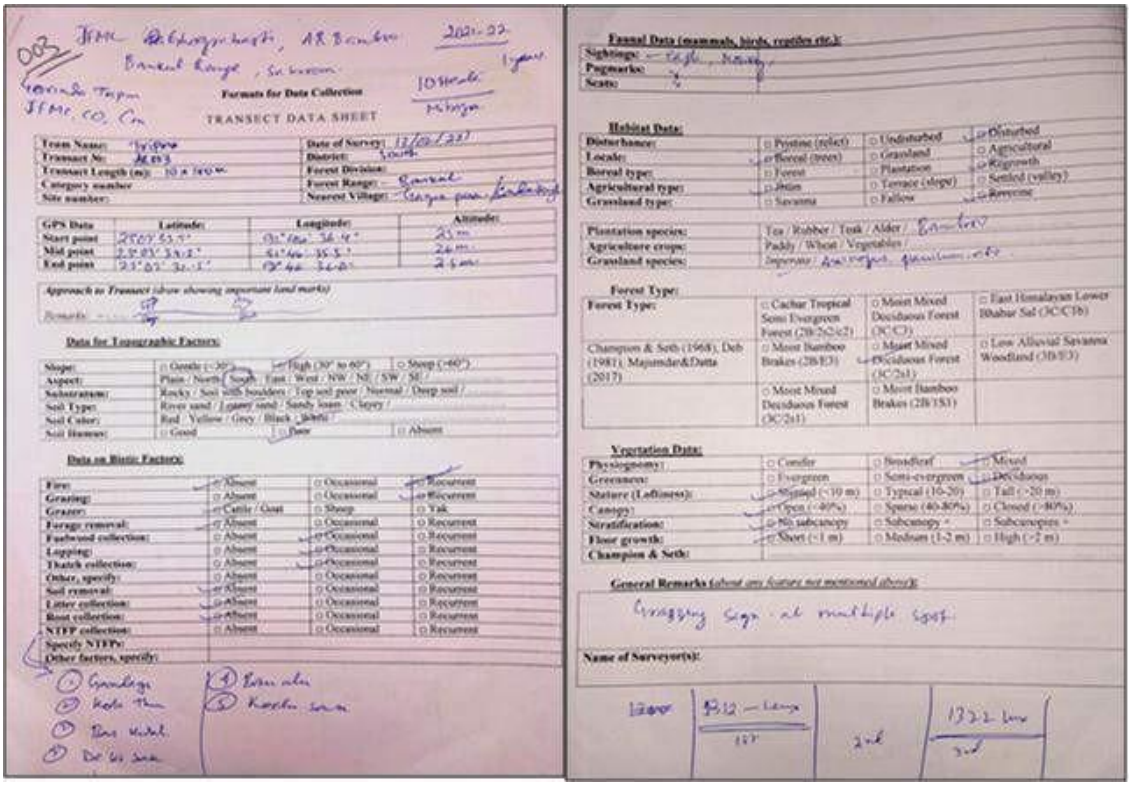


FIGURE 3: APPROACH OF TRANSECT SAMPLING IN PLANTATION SITES.

FIGURE 4: GIRTH (GBH) AND HEIGHT MEASUREMENT OF TREE SPECIES WITHIN TRANSECT.



TRANSECT DATA SHEET

FIGURE 5: SHOWING SAMPLE FORMAT USED DURING DATA COLLECTION

FIGURE 6: (A&D) PLOTTING 10 M TRANSACT BELT (B) MEASURING GBH OF INDIVIDUAL TREE (C) PHOTOGRAPH OF INFLORESCENCE OF ENGELHARDIA SPICATA (E) USING LUX METER.

FIGURE 7: STUDY OF DIVERSITY ON AR001 BAMBOO (SARBAJOY JFMC) A) MAP ALONG WITH GPS COORDINATES. B) SIGNBOARD OF THE STUDY SITE ALONG WITH FORESTER & FFW. C) NATURAL VEGETATION. D) ASSESSING THE BAMBOO PLANTATION.

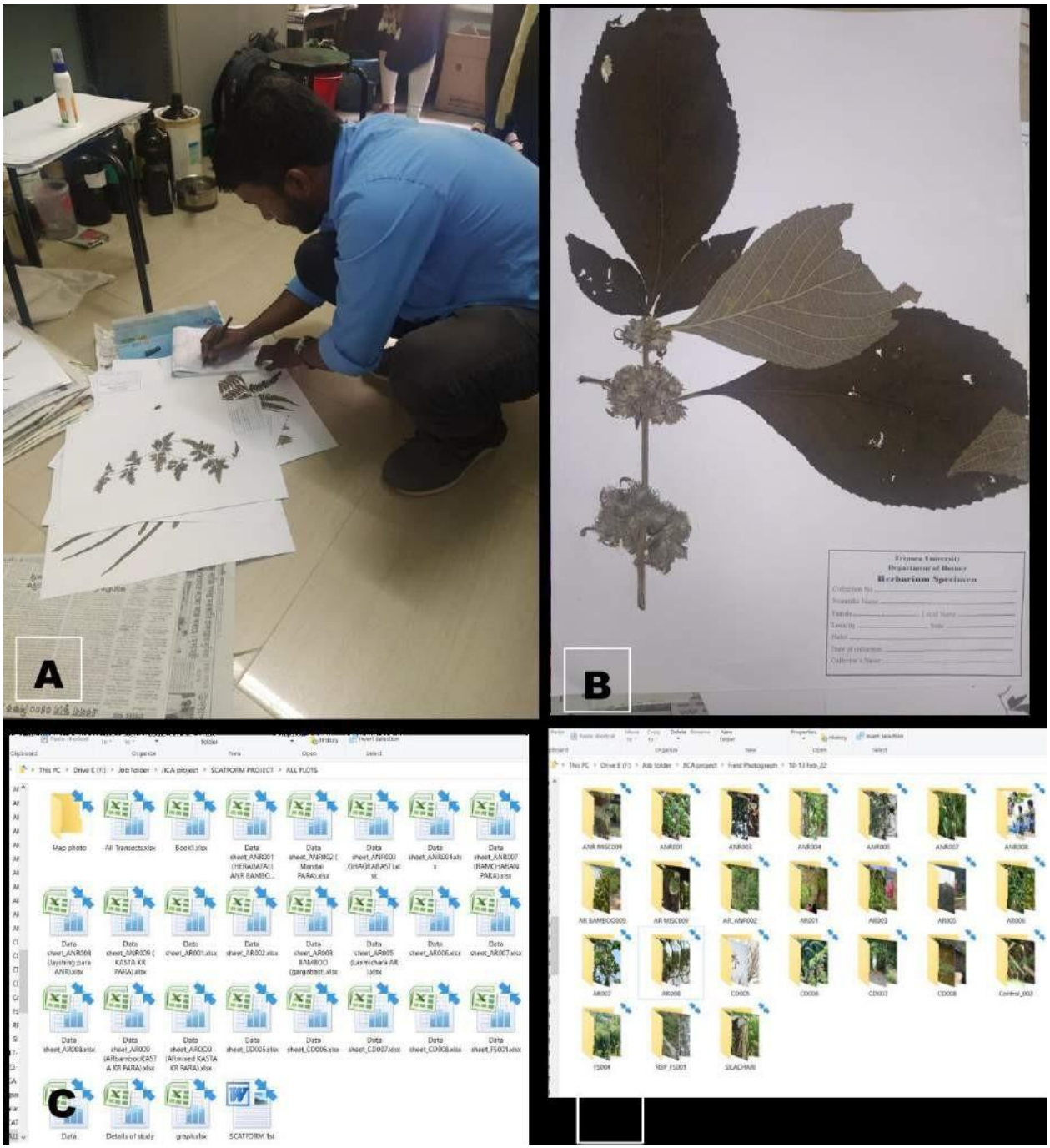


FIGURE 8: (A) PREPARATION OF HERBARIUM (B) A HERBARIUM SHEET OF SPECIES: GOMPHOSTEMMA PARVIFLORUM (C) DATA ARRANGEMENT OF VEGETATION IN EXCEL (DATABASE) (D) PHOTOGRAPHS STORED IN FOLDERS ACCORDING TO THE SITES VISITED

DATA COLLECTION

Following datasheet format was used to record data during field sampling:

T R A N S E C T D A T A S H E E T

Team Name:	**Date of Survey:**
Transact №:	**District:**
Transact Length (m):	**Forest Division:**
Category number	**Forest Range:**
Site number:	**Nearest Village:**

GPS Data	**Latitude:**	**Longitude:**	**Altitude:**
Start point			
Mid point			
End point			

Approach to Transect *(draw showing important land marks)*

Remarks:

Data for Topographic Factors:

Slope:	□ Gentle (<30°)	□ High (30° to 60°)	□ Steep (>60°)
Aspect:	Plain / North / South / East / West / NW / NE / SW / SE / ……		
Substratum:	Rocky / Soil with boulders / Top soil poor / Normal / Deep soil / ……		
Soil Type:	River sand / Loamy sand / Sandy loam / Clayey / …….		

Soil Color:	Red / Yellow / Grey / Black / White / ……		
Soil Humus:	□ Good	□ Poor	□ Absent

Data on Biotic Factors:

Fire:	□ Absent	□ Occasional	□ Recurrent
Grazing:	□ Absent	□ Occasional	□ Recurrent
Grazer:	□ Cattle / Goat	□ Sheep	□ Yak
Forage removal:	□ Absent	□ Occasional	□ Recurrent
Fuelwood collection:	□ Absent	□ Occasional	□ Recurrent
Lopping:	□ Absent	□ Occasional	□ Recurrent
Thatch collection:	□ Absent	□ Occasional	□ Recurrent
Other, specify:	□ Absent	□ Occasional	□ Recurrent
Soil removal:	□ Absent	□ Occasional	□ Recurrent
Litter collection:	□ Absent	□ Occasional	□ Recurrent
Root collection:	□ Absent	□ Occasional	□ Recurrent
NTFP collection:	□ Absent	□ Occasional	□ Recurrent
Specify NTFPs:			
Other factors, specify:			

Faunal Data (mammals, birds, reptiles etc.):

Sightings:	
Pugmarks:	
Scats:	

Habitat Data:

Disturbance:	□ Pristine (relict)	□ Undisturbed	□ Disturbed
Locale:	□ Boreal (trees)	□ Grassland	□ Agricultural
Boreal type:	□ Forest	□ Plantation	□ Regrowth
Agricultural type:	□ Jhum	□ Terrace (slope)	□ Settled (valley)
Grassland type:	□ Savanna	□ Fallow	□ Riverine

Plantation species:	Tea / Rubber / Teak / Alder / ……
Agriculture crops:	Paddy / Wheat / Vegetables / ……
Grassland species:	*Imperata* / …….…….

Forest Type:

Forest Type:	□ Cachar Tropical Semi Evergreen Forest (2B/2s2/c2)	□ Moist Mixed Deciduous Forest (3C/C3)	□ East Himalayan Lower Bhabar Sal (3C/C1b)
Champion & Seth (1968), Deb (1981), Majumdar&Datta (2017)	□ Moist Bamboo Brakes (2B/E3)	□ Moist Mixed Deciduous Forest (3C/2s1)	□ Low Alluvial Savanna Woodland (3B/E3)
	□ Moist Mixed Deciduous Forest (3C/2s1)	□ Moist Bamboo Brakes (2B/1S1)	

Vegetation Data:

Physiognomy:	□ Conifer	□ Broadleaf	□ Mixed
Greenness:	□ Evergreen	□ Semi-evergreen	□ Deciduous

Stature (Loftiness):	□ Stunted (<10 m)	□ Typical (10-20)	□ Tall (>20 m)
Canopy:	□ Open (<40%)	□ Sparse (40-80%)	□ Closed (>80%)
Stratification:	□ No subcanopy	□ Subcanopy +	□ Subcanopies +
Floor growth:	□ Short (<1 m)	□ Medium (1-2 m)	□ High (>2 m)
Champion & Seth:			

General Remarks (*about any feature not mentioned above***):**

Name of Surveyor(s):.

Tree data collection format (10 × 100 m)

Category		**Transect length**			
Site No.		**Direction**			
Transect Id.		**Land mark**			
Sl. No.	**Species**	**Family**	**GBH (cm)**	**Height (m)**	**Remarks**

Shrub/regeneration data collection format (5 × 5 m)

Category		**Transect length**	
Site No.		**Direction**	
Quadrat Id.		**Land mark**	

Sl. No.	Species	Family	GBH (cm)	Height (m)	Remarks

Herb/grass/ data collection format (1 × 1 m)

Category		**Transect length**		
Site No.		**Direction**		
Sub-quadrat Id.		**Land mark**		
Sl. No.	**Species**	**Family**	**No. of individuals**	**Remarks**

Submerged aquatic vegetation data collection (2 m × 2 m)

Category		**Quadrat no.**	
Site No.		**Direction**	
Quadrat Id.		**Land mark**	

Sl. No.	Species	Family	No. of individuals	Remarks

FIGURE 9: TOOLS AND EQUIPMENTS USED FOR THE SURVEY.

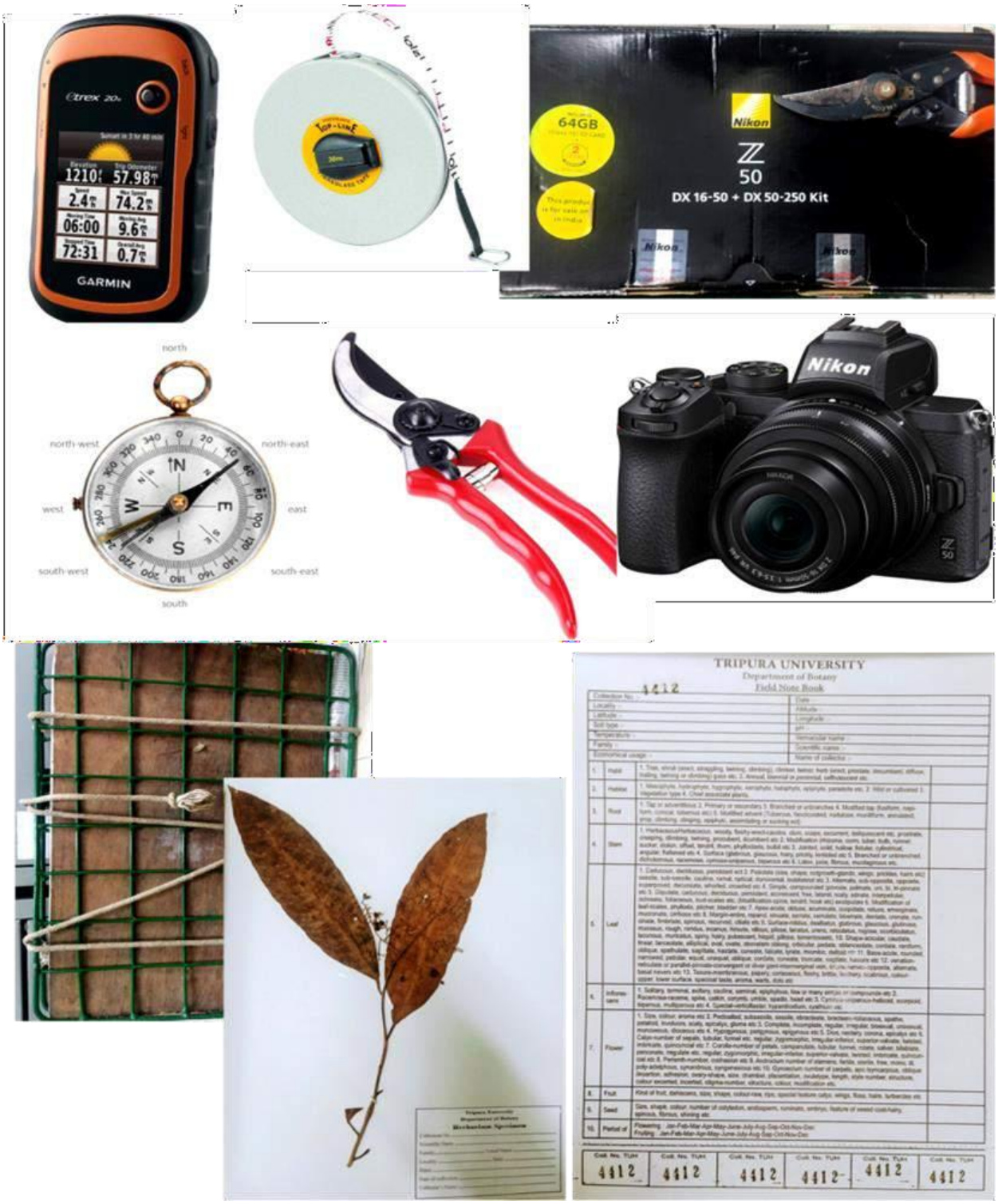


FIGURE 10: TOOLS AND EQUIPMENTS USED FOR THE SURVEY.

SPECIMEN VERIFICATION AND IDENTIFICATION

The occurrences of the selected plant species and specimens were collected from the field for taxonomical study and made into standard mounted herbarium sheets following the procedure of Jain & Rao (1977). As far as possible, specimens with reproductive parts were collected for the morphological studies and preparation of herbarium sheets, and the voucher specimens will be deposited in the herbarium of the Botany Department, Tripura University. Reproductive organs were preserved in FAA solution for further microscopic studies in the laboratory.

The taxonomic identification and geographic distribution ranges of the collected plant species were made using the information provided in regional flora such as Flora of British India by Hooker (1872-1897); Flora of Assam by Kanjilal et al. (1934-1940); Brandis (1906) and Flora of Tripura by Deb (1981, 1983). The nomenclature of plants was updated as per The Plant List project page (The Plant List 2013) (https:// www.theplantlist.org/) and The International Plant Names Index (IPNI 2013). The voucher number of collected species was cited as per the unique herbarium code (*e.g.*, TR0190T31, where TR### represents the belt transect number and T## represents an individual plant species of that transect), which was developed for each individual species following representative belt transects laid randomly throughout TWS. Codes of each unidentified species were used directly for easy data analysis.

DATA ANALYSIS

a) Population structure- All the species will be grouped among ten GBH classes (≥10, > 30, > 60, > 90, > 120, > 150, > 180, > 210, > 240, >270 cm) and height classes (>1, >3, > 6, > 9, > 12,> 15, > 18, > 21, > 24, >27 m) to observe the overall distribution of populations among different girth and height classes. Population grouping of each species will be analyzed by the number of individuals of each species, which was grouped into different population groups viz. Predominant (>50), Dominant (25 to <50), Common (10 to <25), Rare (2 to <10), and Very Rare (<2) (Kadavul & Parthasarathy, 1999; Majumdar et al., 2012c).

Analytical features of the plant community will be quantitatively analyzed from field data for abundance, density, and frequency (Curtis & McIntosh, 1950) with relative frequency, relative density, relative basal area, and Importance Value Index (IVI) following Mueller–Dombois & Ellenberg (1974). Density is an expression of the numerical strength of a species where the total number of individuals of each species in all the quadrats is divided by the total number of quadrats studied.

$$\text{Density} = \frac{\text{Total no. of individuals of a species in all sampling unit}}{\text{Total no. of sampling unit studied}}$$

Frequency will be studied by sampling the study area at several places at random and recorded the name of the species that occurred in each sampling units. It is calculated by the equation-

$$\text{Frequency (\%)} = \frac{\text{No. of sampling unit in which a species occurred}}{\text{Total no. of sampling unit studied}} \times 100$$

b) Abundance: It is the study of the number of individuals of different species in the community per unit area. It is represented by the equation:

$$\text{Abundance} = \frac{\text{Total no. of individuals of a species occured in all sampling unit}}{\text{No. of sampling unit in which the species occurred}}$$

Relative density is the study of numerical strength of a species in relation to the total number of individuals of all the species and can be calculated as:

$$\text{Relative density} = \frac{\text{No. of individual of a particular species}}{\text{Total no. of individuals of all the species}} \times 100$$

c) Relative frequency: It is degree of dispersion of individual species in an area in relation to the number of all the species occurred.

$$\text{Relative frequency} = \frac{\text{Individual frequency of a species}}{\text{Sum of the frequencies of all species}} \times 100$$

Relative dominance is the coverage value of a species with respect to the sum of coverage of the rest of the species in the area.

$$\text{Relative dominance} = \frac{\text{Total basal area of the species}}{\text{Total basal area of all the species}} \times 100$$

d) Importance Value Index (IVI): It is used to determine the overall importance of each species and ecological status of any species based on a single value (**Mishra, 1968**) in the community structure. In calculating this index, the percentage values of the relative frequency, relative density and relative dominance are summed up together and this value is designated as the Importance Value Index or IVI of the species.

$$\text{IVI} = \text{Relative Density (RD)} + \text{Relative Frequency (RF)} + \text{Relative Dominance(RD)}$$

e) Species Diversity Indices: Some important factors which attributes as a key factor when calculating diversity are species richness and evenness. Richness is a measure of the number of different kinds of organisms present in a particular area and evenness compares the similarity of the population size of each of the species considered as relative abundance of the different species that make up the richness of an area.

f) Simpson (1949) index of dominance: It gives the probability of any two individual species taken at random from an infinitely large community of different species. Diversity Indices for each study sites were calculated to record the structural diversity by using the following equations

$$D = \sum_{i=1}^{S} (n_i/N)^2$$

Where, D= Dominance Index, S = total number of species, N = total number of individuals of all the species in a given area, n_i= number of individuals of the *i*th species of the area.

g) Shannon–Weaver (1963) index of diversity: It can be calculated either based on the abundance value of plant species or based on number of individual species which is expressed as

$$H' = -\sum_{i=1}^{S} n_i/N \; ln \; n_i/N$$

Where, H' S = total number of species, N = total number of individuals of all the species in a given area, n_i= number of individuals of the *i*th species of the area.

h) Pielou's equitability or evenness index (e): It can be calculated as e=H′/ln S where H′= Shannon-Wiener Index and S= number of species.

The species richness of the vascular plants was calculated by using the Margalef's index of richness (Magurran, 1988)

$$\text{Species richness} = (S-1)/ \ln N$$

Where, S = Total number of species, N = Total number of individuals.

This can also be calculated according to Whittaker (1977) as $SR = S/\sqrt{N}$, where S is the number of species and N is the total number of individuals of all species.

i) Threat Assessment: Threat assessment and assigning conservation status to the species will be done following IUCN protocol (version 3.1, IUCN 2001; version 3.1, IUCN 2012, Second edition; version 4.0, IUCN 2012; version 11; IUCN 2014). The IUCN Red list categories will be followed for the criteria used for the assessment consisting factors such as population reduction, extent of occurrence, area of occupancy, population size and the probability of extinction in wild.

DISTRICTS AND JFMCS COVERED UNDER THE STUDY

District wise survey outputs:

Overall field surveys were conducted in seven (7) district of Tripura. The study site includes Artificial Regeneration (AR), Aided Natural Regenerations (ANR), Check dam (CD) and Riverbank plantation (RBP). All the site-specific detailed information *viz.*, name of JFMC, Beat and Range Office, plantation and other site area (in hectare), GPS Coordinates and elevation (m), and date of survey are given in **Table 1-7**.

The study sites in all district was about 141 plantation sites. Of which the highest studied site belongs to district Kowhai (19%), followed by North Tripura (16%), South Tripura (16%), Sepahijala (14%), Gomoti Tripura (13%), Unakoti (13%) and West Tripura (10%).

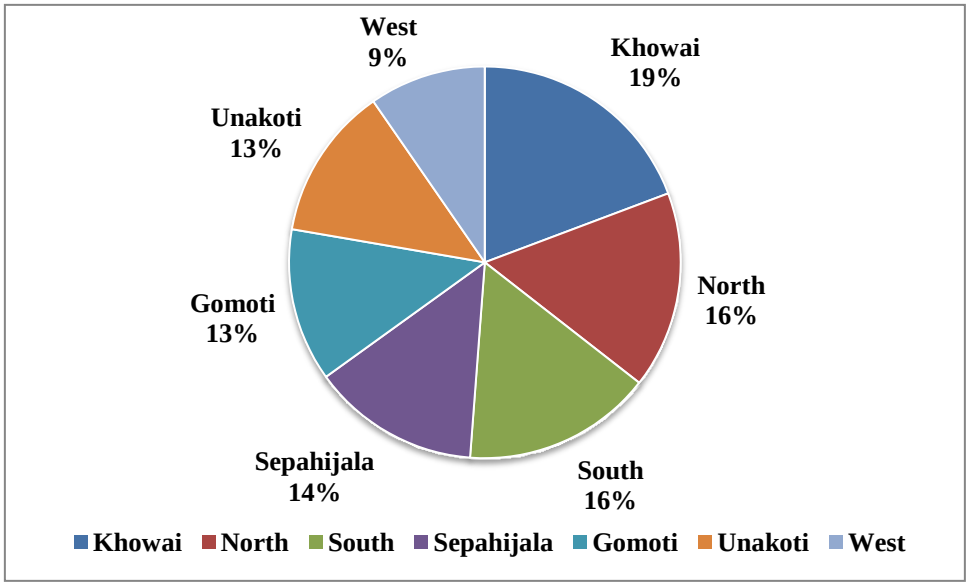


FIGURE 11: SHOWING % OF STUDY SITES DISTRIBUTED IN AN OVERALL DISTRICT OF TRIPURA

Study outputs from Khowai Tripura

In Khowai district surveys were conducted in 26 sites which are categorized into Artificial Regeneration (AR-15 sites), Aided Natural Regenerations(ANR-9 sites) and Check dams (CD-2 sites). During this tenure, 16 JFMC sites (Bhupendra Debbarma, Bidyabil, Bolong Hamkrai, Hadrai, Hawaibari, Jorakaham, Khabaksa, Khatansa bodol, Laxmipur, Madhya Krisnapur, North Gayamoni,

Salkaham, South Gayamoni, Uttar Krishnapur, Yakbaksaand Yaprikwtal bodol) under 7 Beat Offices namely Asharambari, Atharamura, Baramura, Duski, Hazaribari, Mungiakami and Teliamura under 5 Range Offices namely Atharamura, Mungiakami, Padmabil, Teliamura and Tulashikhar. The overall study carried out in the Khowai district comprises AR (58%), ANR (34%) and CD (8%).

Study outputs from North Tripura

In North Tripura surveys were conducted in 23 sites which are categorized into Artificial Regeneration (AR-10 sites), Aided Natural Regenerations (ANR-7 sites) and Check dams (CD-6 sites). During this tenure, 13 JFMC sites (Balidhum, Bireshpara, Debbarma Para (Puspamanipara), Sesimdung (Saitha), Alochaya, Balicherra, Nabajiban, Gobinda Para, Tabouhatai Para, Brikhyaram Para, Juriharam para, Lankadhar para and Birchandra para) under 8 Beat Offices namely Haplong, Panisagar, Indurail, Churaibari, Sanicherra, Kanchancherra, Kanchanpur and North Laljuri under 3 Range Offices namely Panisagar, Dharmanagar and Kanchanpur. The overall study carried out in the North district comprises AR (44%), ANR (30%) and CD (26%)

Study outputs from South Tripura

In South Tripura survey were conducted in 22 sites which categorized into Artificial Regeneration (AR-8), Aided Natural Regenerations (ANR-8), Filter Strips (FS-1), River Bank Plantation (RBP-1) and Check dams (CD-4). The study covers about 9 JFMC site under 6 Beat offices (Betaga, Baishnabpur, Laxmicherra, SK Bari, Sankartilla and Malambari) and 6 Range offices (Satchand, Bankul, Bagafa, Kakulia, Srinagar and Hrishyamukh). The overall study includes AR (38%), ANR (37%), CD (17%) RBP (4%) and FS (4%).

Study outputs from Sepahijala Tripura

In Sepahijala Tripura surveys were conducted in 20 sites of Sepahijala district out of 27 assigned sites which are categorized into Artificial Regeneration (AR-6 sites), Aided Natural Regenerations (ANR-7 sites) and Check dams (CD-7 sites). During this tenure, 11 JFMC sites (Pravapur, Mohanpur, Khumpuibadal, Bangshibari, Guliraibari, Kamalnagar, Rahimpur, Sanghati, Rabithakur, Chandulkami and Harichanhamkrai) under 7 Beat Offices namely Kalkalia, Charilam, Pramodnagar, Kamalnagar, Ashabari, Kathalia and Induria under 5 Range Offices namely Jampuijala, Charilam, Boxanagar, Kathalia and

Melaghar. The overall study carried out in the Sepahijala district comprises AR (30%), ANR (35%) and CD (25%).

Study outputs from Gomoti Tripura

In Gomoti district surveys were conducted in 18 sites which are categorized into Artificial Regeneration (AR-7 sites), Aided Natural Regenerations (ANR-5 sites), River Bank Plantation (RBP-4 sites) and Check dams (CD-6 sites). During this tenure, 13 JFMC sites under 11 Beat Offices namely Bhagwantila, Chapling chera, Dalak, Ekjancherra, Kalajari, Kunaram Para, Mandirgha, Sarbajoy, Sarbong, T.C. Bari, and Y-Ghati under 9 Range Offices namely Amarpur, Ampi, Dalak, Ekjancherra, Karbook, Killa, Mandirghat, T.C. Bari and Tirthamukh. The overall study carried out in the Gomati district comprises AR (39%), ANR (17%), RBP (11%) and CD (33%).

Study outputs from Unakoti Tripura

In Unakoti district surveys were conducted in 17 sites which are categorized into Artificial Regeneration (AR-6 sites), Aided Natural Regenerations (ANR-6 sites) and Check dams (CD-5 sites). During this tenure, 9 JFMC sites namely Judamani Para, Rachi Line, Sebachandra para, Mora Cherra, Mathura para, Kheltang Twisa, Tailenbari, Bru kami and Rongchak Bolong under Demdum, Balanalcherra, Andharcherra, Dhanbilash and Jalai Beat Offices respectively. The survey areas further comes under 5 Range Offices namely Kumarghat, Machmara, Pecharthal, Chandipur and Gournagar. The overall study conducted in the Unakoti district comprises AR (35%), ANR (35%) and CD (30%),

Study outputs from West Tripura

In West Tripura surveys were conducted in 15 sites of West district out of 18 assigned sites which are categorized into Artificial Regeneration (AR-8 sites) and Aided Natural Regenerations (ANR-7 sites). During this tenure, seven (7) JFMC sites (Bamsreetwisa, Burakha kami, Hataikatar, Kathirambari, Purba Belbari, Shibnagar and Tiwari Marang) under 3 Beat Offices namely Burakha, Belbari and Dumrakaridak under 3 Range Offices namely Mandwi, Champaknagar and Subalsing.

TABLE 1: OVERALL STUDY SITES, NAME OF THE JFMC ALONG WITH GPS COORDINATES FOR SOUTH TRIPURA DISTRICT

Transect Sl. No.	Type Code	District	Range	Beat	Name of JFMC	Plantation Area (ha)	Latitude	Longitude	Elevation (m asl)	Date of survey
1	ANR	South	Satchand	Betaga	Herbatali	10	23˚58’50.7”	91˚38’09.7”	25	12-02-22
2	ANR	South	Satchand	Betaga	Mandalipara	8	22˚59'56.89832"	91˚37'54.64745"	58	11-02-22
3	ANR	South	Bankul	Baishnabpur	Gagrabasti	12	23˚04’00.3”	91˚46’03.8”	69	12-02-22
4	ANR	South	Bankul	Baishnabpur	Gagrabasti		23˚04’00.3”	91˚46’03.8”	69	12-02-22
5	ANR	South	Bankul	Baishnabpur	South Baishnabpur	3	23˚02’36.3”	91˚46’00.3”	50	13-02-22
6	ANR	South	Srinagar	Sankartilla	Joysingbari	9	23˚01’36.0”	91˚36’09.8”	108	24-02-22
7	ANR	South	Srinagar	Sankartilla	Kanupara	15	23˚02’05.9”	91˚36’13.8”	129	23-02-22
8	ANR	South	Srinagar	Sankartilla	Kanupara		23˚02’05.9”	91˚36’13.8”	129	23-02-22
9	AR_Misc	South	Kakulia	SK Bari	Kasta kr para	25	23˚14’22.7”	91˚41’30.2”	100	25-02-22
10	AR_Misc	South	Kakulia	SK Bari	Kasta kr para		23˚14’22.7”	91˚41’30.2”	100	25-02-22
11	AR	South	Satchand	Betaga	Herbatali	10	23˚59’07.9”	91˚38’14.4”	35	12-02-22
12	AR	South	Satchand	Betaga	Mandalipara	10	22˚59'56.61659"	91˚37'50.33764"	26	11-02-22
13	AR	South	Bankul	Baishnabpur	Gagrabasti	10	23˚03’35.9”	91˚46’36.4”	25	13-02-22
14	AR	South	Bagafa	Laxmicherra	Laxmicherra	14	23˚17’54.1”	91˚38’58.9”	80	17-02-22
15	AR	South	Bagafa	Laxmicherra	Laxmicherra		23˚17’54.1”	91˚38’58.9”	80	17-02-22
16	AR	South	Hrishyamukh	Malambari	Malambari	10	23˚8’57.3972”	91˚31’34.1796”	-	18-02-22
17	AR	South	Srinagar	Sankartilla	Kanupara	10	23˚02’11.5”	91˚36’02.4”	142	23-02-22
18	AR	South	Srinagar	Sankartilla	Joysingbari	15	23˚01’53.2”	91˚36’08.2”	126	24-02-22
19	AR	South	Srinagar	Sankartilla	Joysingbari		23˚01’53.2”	91˚36’08.2”	126	24-02-22
20	AR_Misc	South	Kakulia	SK Bari	Kasta kr para	5	23˚14’49.3”	91˚40’40.2”	90	25-02-22
21	AR_Bamboo	South	Kakulia	SK Bari	Kasta kr para	5	23˚15’18.2”	91˚40’44.7”	79	25-02-22
22	CD	South	Srinagar	Sankartilla	Joysingbari	NA	23˚02’13.1”	91˚35’28.1”	86	24-02-22
23	CD	South	Srinagar	Sankartilla	Kanupara	NA	23˚01’50.5”	91˚36’19.8”	98	24-02-22
24	CD	South	Bagafa	Laxmicherra	Laxmicherra	NA	23˚17’52.9728”	91˚38’54.0168”	-	17-02-22
25	CD	South	Hrishyamukh	Malambari	Malambari	NA	23˚8’31.5276”	91˚32’54.24”	-	18-02-22
26	RBP	South	Satchand	Betaga	Herbatali	1.25	23˚59’07.7”	91˚38’12.4”	16	12-02-22

TABLE 2: OVERALL STUDY SITES, NAME OF THE JFMC ALONG WITH GPS COORDINATES FOR GOMOTI TRIPURA DISTRICT

Sl. No.	Transect Type	District	Range	Beat	Name of JFMC	Plantation Area (ha)	Latitude	Longitude	Date of survey
1	ANR	Gomoti	Karbook	Bhagwantila	Bolong Naithok	20	23˚16'03.4"	91˚44'39.0"	05-07-2022
2	ANR	Gomoti	Karbook	Bhagwantila	Bolong Naithok		23˚16'03.4"	91˚44'39.0"	05-07-2022
3	ANR	Gomoti	Silachari	Suknachara	Meghabarna	10	23˚11'18.3"	91˚45'57.2"	05-08-2022
4	ANR	Gomoti	Amarpur	Kalajari	Shamal Twisa	10	23˚32'29.6"	91˚44'45.4"	05-01-2022
5	AR	Gomoti	Ampi	Ekjancherra	Atharamura	12.5	23˚40'18.0"	91˚44'01.4"	05-02-2022
6	AR	Gomoti	Ampi	Ekjancherra	Atharamura		23˚40'18.0"	91˚44'01.4"	05-02-2022
7	AR	Gomoti	Karbook	Bhagwantila	Bolong Naithok	3.5	23˚16'02.8"	91˚44'25.8"	05-07-2022
8	AR	Gomoti	Killa	T.C. Bari	Lailak	5	23˚38'58.8"	91˚35'53.2"	06-11-2022
9	AR	Gomoti	Karbook	Bhagwantila	Nabajagaran	5	23˚17'36"	91˚43'58.8"	05-06-2022
10	AR	Gomoti	Amarpur	Dalak	Sarbajoy	5	23˚30'11.0"	91˚43'28.8"	30/4/2022
11	AR	Gomoti	Amarpur	Kalajari	Shamal Twisa	20	23˚30'58.4"	91˚43'50.6"	05-01-2022
12	AR	Gomoti	Amarpur	Kalajari	Shamal Twisa		23˚30'58.4"	91˚43'50.6"	05-01-2022
13	AR	Gomoti	Killa	T.C. Bari	Y-Ghati	10	23˚41'30.7"	91˚34'24.3"	06-12-2022
14	CDI	Gomoti	Ampi	Ekjancherra	Kunaram Para	NA	23˚40'24.3"	91˚42'13.4"	05-02-2022
15	CDI	Gomoti	Killa	T.C. Bari	Lailak	NA	23˚38'59.0"	91˚36'00.8"	06-11-2022
16	CDI	Gomoti	Karbook	Bhagwantila	Nabajagaran	NA	23˚17'36.7"	91˚44'06.0"	05-06-2022
17	CDI	Gomoti	Amarpur	Sarbong	Salka	NA	23˚36'10.6"	91˚41'55.5"	05-01-2022
18	CDI	Gomoti	Killa	T.C. Bari	Y-Ghati	NA	23˚41'33.4"	91˚34'12.4"	06-12-2022
19	CDII	Gomoti	Karbook	Bhagwantila	Patichari	NA	23˚17'01.7"	91˚44'42.5"	05-06-2022
20	RBP	Gomoti	Tirthamukh	Mandirghat	Mandirghat	2	23˚25'20.9"	91˚49'49.1"	05-07-2022
21	RBP	Gomoti	Killa	T.C. Bari	Y-Ghati	2	23˚42'11.2"	91˚34'01.1"	06-12-2022

TABLE 3: OVERALL STUDY SITES, NAME OF THE JFMC ALONG WITH GPS COORDINATES FOR NORTH TRIPURA DISTRICT

Transect Sl. No.	Type Code	District	Range	Beat	Name of JFMC	Plantation Area (ha)	Latitude	Longitude	Elevation (m)	Date of survey
1	ANR_Bamboo	North	Dharmanagar	Churaibari	Alochaya	15	24°25'20"	92°14'56.3"	50	15-07-2022
2	ANR_Bamboo	North	Dharmanagar	Churaibari	Alochaya	_	24°25'20"	92°14'56.3"	50	15-07-2022
3	ANR_Bamboo	North	Dharmanagar	Sanicherra	Balicherra	5	24°22'16.5"	92°14'21.7"	31	15-07-2022
4	ANR_Misc	North	Panisagar	Haplong	Balidum	30	24°19'06.34"	92°04'49.71"	106	20-07-2022
5	ANR_Misc	North	Panisagar	Haplong	Balidum		24°19'06.34"	92°04'49.71"	106	20-07-2022
6	ANR_Misc	North	Panisagar	Haplong	Bireshpara	10	24°20'55.27"	92°06'26.68"	60	20-07-2022
7	ANR_Misc	North	Dharmanagar	Sanicherra	Nabajiban	8	24°23'09.5"	92°15'36.5"	88	15-07-2022
8	ANR_Misc	North	Panisagar	Indurail	Pushpamanipara	5	24°17'21.50"	92°11'37.31"	62	21-07-2022
9	ANR_Misc	North	Panisagar	Indurail	Sesimdung(Saitha)	10	24°16'55.83"	92°13'53.48"	94	21-07-2022
10	AR_Misc	North	Dharmanagar	Churaibari	Alochaya	15	24°41'09.89"	92°24'14.88"	57	15-07-2022
11	AR_Misc	North	Dharmanagar	Churaibari	Alochaya		24°41'09.89"	92°24'14.88"	57	15-07-2022
12	AR_Misc	North	Panisagar	Haplong	Balidum	5	24°19'08.38"	92°04'46.55"	150	20-07-2022
13	AR_Misc	North	Kanchanpur	North Laljuri	Birchandrapara	-	24°18'12.92"	92°19'04.97"	101	17-07-2022
14	AR	North	Panisagar	Haplong	Bireshpara	5	24°21'00.51"	92°06'25.60"	63	20-07-2022
15	AR_Misc	North	Kanchanpur	Kanchancherra	Brikhyaram Para	10	24°02'12"	92°09'13"		16-07-2022
16	AR_Bamboo	North	Kanchanpur	Kanchancherra	Gobinda Para	5				16-07-2022
17	AR_Bamboo	North	Kanchanpur	North Laljuri	Lankadhar Para	5	24°17'15.11"	92°20'05.26"	111	17-07-2022
18	AR_Misc	North	Panisagar	Indurail	Pushpamanipara	5	24°17'10.71"	92°11'14.62"	64	21-07-2022
19	AR_Bamboo	North	Panisagar	Indurail	Sesimdung(Saitha)	15	24°16'55.4"	92°14'00.05"	162	21-07-2022
20	AR_Bamboo	North	Panisagar	Indurail	Sesimdung(Saitha)		24°16'55.4"	92°14'00.05"	162	21-07-2022
21	AR_Misc	North	Kanchanpur	Kanchancherra	Tabouhatai Para	5	24°01'57.7"	92°10'33.1"	89	16-07-2022
22	CDI	North	Dharmanagar	Churaibari	Alochaya	NA	24°41'03.33"	92°24'40.20"	72	15-07-2022
23	CDI	North	Kanchanpur	Kanchanpur	Juriharam Para	NA	24°05'12.55"	92°24'09.45"	114	16-07-2022
24	CDI	North	Kanchanpur	Kanchancherra	Tabouhatai Para	NA	24°02'96.70"	92°17'54.75"	96	16-07-2022
25	CDII	North	Dharmanagar	Churaibari	Alochaya	NA	24°41'54.54"	92°24'26.81"	52	15-07-2022
26	CDII	North	Kanchanpur	Kanchancherra	Gobinda Para	NA	24°01'29.48"	92°16'30.20"	78	16-07-2022
27	CDII	North	Kanchanpur	Kanchanpur	Juriharam Para	NA				16-07-2022

TABLE 4: OVERALL STUDY SITES, NAME OF THE JFMC ALONG WITH GPS COORDINATES FOR UNAKOTI TRIPURA DISTRICT

Transect Sl. No.	Type Code	District	Range	Beat	Name of JFMC	Plantation Area (ha)	Latitude	Longitude	Elevation (m)	Date of survey
1	ANR_Bamboo	Unakoti	Chandipur	Dhanbilash	Judamani Para	15	24°13'37.18"	91°56'36.39"	87	22-07-2022
2	ANR_Bamboo	Unakoti	Chandipur	Dhanbilash	Judamani Para	_	24°13'37.18"	91°56'36.39"	87	22-07-2022
3	ANR_Misc	Unakoti	Kumarghat	Demdum	Kheltang Twisa	15	24°11'43.02"	91°56'45.46"	134	27-07-2022
4	ANR_Misc	Unakoti	Kumarghat	Demdum	Kheltang Twisa	_	24°11'43.02"	91°56'45.46"	134	27-07-2022
5	ANR_Bamboo	Unakoti	Machmara	Balanalcherra	Mathura para	10	24°03'39.91"	92°07'22.89"	131	26-07-2022
6	ANR_Misc	Unakoti	Pecharthal	Andhacherra	Mora Cherra	15	24°14'53.71"	92°05'06.47"	62	25-07-2022
7	ANR_Misc	Unakoti	Pecharthal	Andhacherra	Mora Cherra	_	24°14'53.71"	92°05'06.47"	62	25-07-2022
8	ANR_Misc	Unakoti	Chandipur	Dhanbilash	Rachi Line	10	24°15'04.32"	91°56'52.88"	46	22-07-2022
9	ANR_Misc	Unakoti	Pecharthal	Andhacherra	Sebachandra para	10	24°15'14.40"	92°06'15.17"	65	25-07-2022
10	AR_Misc	Unakoti	Pecharthal	Andhacherra	Bru kami	_	24°14'44.20"	92°05'05.77"	61	25-07-2022
11	AR_Misc	Unakoti	Chandipur	Dhanbilash	Judamani Para	15	24°13'49.32"	91°56'07.75"	134	22-07-2022
12	AR_Misc	Unakoti	Chandipur	Dhanbilash	Judamani Para	_	24°13'49.32"	91°56'07.75"	134	22-07-2022
13	AR_Misc	Unakoti	Kumarghat	Demdum	Kheltang Twisa	8	24°11'44.25"	91°55'22.31"	133	27-07-2022
14	AR_Misc	Unakoti	Machmara	Balanalcherra	Mathura para	_	24°03'39.25"	92°07'28.50"	120	26-07-2022
15	AR_Misc	Unakoti	Pecharthal	Andhacherra	Sebachandra para	5	24°14'56.65"	92°06'10.33"	65	25-07-2022
16	AR_Misc	Unakoti	Gournagar	Jalai	Tailenbari	5	24°15'25.10"	92°03'47.18"	83	23-07-2022
17	CDI	Unakoti	Kumarghat	Demdum	Rongchak Bolong	NA	24°11'95.26"	91°92'00.9"		27-07-2022
18	CDI	Unakoti	Gournagar	Jalai	Tailenbari	NA				23-07-2022
19	CDI	Unakoti	Chandipur	Dhanbilash	Rachi Line	NA	24°14'55.08"	91°56'40.3"	78	22-07-2022
20	CDII	Unakoti	Kumarghat	Demdum	Kheltang Twisa	NA	24°11'16.40"	91°55'48.73"	121	27-07-2022
21	CDII	Unakoti	Pecharthal	Andhacherra	Sebachandra para	NA	24°15'15.09"	92°06'16.01"	55	25-07-2022

TABLE 5: OVERALL STUDY SITES, NAME OF THE JFMC ALONG WITH GPS COORDINATES FOR SEPAHIJALA TRIPURA DISTRICT

Transect Sl. No.	Type Code	District	Range	Beat	Name of JFMC	Plantation Area (ha)	Latitude	Longitude	Elevation (m)	Date of survey
1	ANR_Bamboo	Sepahijala	Charilam	Charilam	Bangshibari	10	23°35'53.75"	91°13'59.87"	68	19-10-2022
2	ANR_Bamboo	Sepahijala	Charilam	Pramodnagar	Guliraibari	5	23°35'30.27"	91°23'35.97"	59	18-10-2022
3	ANR_Bamboo	Sepahijala	Charilam	Pramodnagar	Guliraibari	10	23°35'37.32"	91°23'31.68"	53	18-10-2022
4	ANR_Bamboo	Sepahijala	Melaghar	Induria	Haricharan Hamkrai	10	23°25'51.90"	91°20'59.63"	88	22-10-2022
5	ANR_Bamboo	Sepahijala	Jampuijala	Kalkalia	Khumpuibadal	19	23°41'23.88"	91°22'25.58"	41	20-10-2022
6	ANR_Bamboo	Sepahijala	Jampuijala	Kalkalia	Khumpuibadal		23°41'23.88"	91°22'25.58"	41	20-10-2022
7	ANR_Misc	Sepahijala	Jampuijala	Kalkalia	Mohanpur	10	23°42'40.70"	91°20'20.14"	35	20-10-2022
8	ANR_Misc	Sepahijala	Jampuijala	Kalkalia	Pravapur	10	23°42'42.80"	91°20'18.27"	39	20-10-2022
9	AR_Bamboo	Sepahijala	Melaghar	Induria	Chandulkami	5	23°26'52.57"	91°22'39.44"	63	22-10-2022
10	AR_Bamboo	Sepahijala	Boxanagar	kamalnagar	kamalnagar	20	23°33'08.01"	91°13'33.38"	51	05-11-2022
11	AR_Bamboo	Sepahijala	Boxanagar	kamalnagar	kamalnagar		23°33'08.01"	91°13'33.38"	51	05-11-2022
12	AR_Bamboo	Sepahijala	Jampuijala	Kalkalia	Khumpuibadal	5	23°41'32.99"	91°22'56.83"	22	20-10-2022
13	AR_Misc	Sepahijala	Boxanagar	Ashabari	Rahimpur	10	23°38'30.53"	91°10'43.49"	34	05-11-2022
14	AR_Bamboo	Sepahijala	Boxanagar	Ashabari	Rahimpur	15	23°38'30.26"	91°10'44.49"	22	05-11-2022
15	AR_Bamboo	Sepahijala	Boxanagar	Ashabari	Rahimpur		23°38'30.26"	91°10'44.49"	22	05-11-2022
16	AR_Misc	Sepahijala	Kathalia	Kathalia	Sanghati	3	23°22'27.48"	91°19'25.22"	62	23-10-2022
17	CDII	Sepahijala	Charilam	Charilam	Bangshibari	NA	23°35'47.89"	91°14'05.68"	68	19-10-2022
18	CDII	Sepahijala	Melaghar	Induria	Chandulkami	NA	23°26'52.01"	91°22'39.96"	44	22-10-2022
19	CDII	Sepahijala	Melaghar	Induria	Haricharan Hamkrai	NA	23°25'58.06"	91°20'12.50"	102	22-10-2022
20	CDII	Sepahijala	Boxanagar	kamalnagar	kamalnagar	NA	23°33'11.68"	91°13'21.05"	-	05-11-2022
21	CDII	Sepahijala	Jampuijala	Kalkalia	Khumpuibadal	NA	23°41'40.30"	91°22'56.31"	29	20-10-2022
22	CDII	Sepahijala	Jampuijala	Kalkalia	Mohanpur	NA	23°42'25.22"	91°20'58.55"	32	20-10-2022
23	CDII	Sepahijala	Kathalia	Kathalia	Sanghati	NA	23°380284	91°.325733	-	05-11-2022

TABLE 6: OVERALL STUDY SITES, NAME OF THE JFMC ALONG WITH GPS COORDINATES FOR KHOWAI TRIPURA DISTRICT

Transect Sl. No.	Type Code	District	Range	Beat	Name of JFMC	Plantation Area (ha)	Latitude	Longitude	Elevation (m)	Date of survey
1	ANR Bamboo	Khowai	Padmabil	Hazaribari	Bupendra Debbarma	10	24˚00'11.28"	91˚30'27.47"	142	19-11-2022
2	ANR Misc	Khowai	Mungiakami	Mungiakami	Bolong Hamkrai	10	23˚52'21.16"	91˚41'57.17"	109	17-11-2022
3	ANR Bamboo	Khowai	Teliamura	Baramura	Hadrai	15	23˚49'48.01"	91˚34'11.33"	178	16-11-2022
4	ANR Bamboo	Khowai	Teliamura	Baramura	Hadrai		23˚49'48.01"	91˚34'11.33"	178	16-11-2022
5	ANR Bamboo	Khowai	Teliamura	Baramura	Hawaibari	10	23˚48'13.64"	91˚35'18.52"	74	17-11-2022
6	ANR Misc	Khowai	Teliamura	Duski	Jorakaham	20	23˚52'21.62"	91˚34'59.72"	73	15-11-2022
7	ANR Misc	Khowai	Teliamura	Duski	Jorakaham		23˚52'21.62"	91˚34'59.72"	73	15-11-2022
8	ANR Bamboo	Khowai	Teliamura	Teliamura	Laxmipur	10	23˚51'50.62"	91˚39'45.86"	83	16-11-2022
9	ANR Misc	Khowai	Teliamura	Teliamura	Laxmipur	10	23˚51'39.02"	91˚39'33.73"	77	16-11-2022
10	ANR Bamboo	Khowai	Padmabil	Hazaribari	South Gayamoni	10	23˚59'39.08"	91˚29'58.38"	144	19-11-2022
11	ANR Misc	Khowai	Teliamura	Teliamura	Uttar Krishnapur	10	23˚52'57.34"	91˚39'35.78"	75	16-11-2022
12	AR Misc	Khowai	Padmabil	Hazaribari	Bhupendra Debbarma	10	24˚00'09.41"	91˚30'07.23"	82	19-11-2022
13	AR Misc	Khowai	Tulashikhar	Asharambari	Bidyabil	20	24˚08'27.25"	91˚43'45.60"	96	19-11-2022
14	AR Misc	Khowai	Tulashikhar	Asharambari	Bidyabil	_	24˚08'27.25"	91˚43'45.60"	96	19-11-2022
15	AR Bamboo	Khowai	Teliamura	Baramura	Hadrai	5	23˚49'31.46"	91˚34'08.95"	182	16-11-2022
16	AR Bamboo	Khowai	Teliamura	Baramura	Hawaibari	5	23˚48'13.88"	91˚35'25.77"	64	17-11-2022
17	AR Misc	Khowai	Mungiakami	Mungiakami	Khabaksa	10	23˚53'23.01"	91˚42'00.32"	93	17-11-2022
18	AR Bamboo	Khowai	Atharamura	Atharamura	Khatansa bodol	20	23˚52'38.17"	91˚45'55.76"	283	18-11-2022
19	AR Bamboo	Khowai	Atharamura	Atharamura	Khatansa bodol	_	23˚52'38.17"	91˚45'55.76"	283	18-11-2022
20	AR Misc	Khowai	Teliamura	Teliamura	Madhya Krisnapur	5	23˚52'11.40"	91˚39'20.17"	81	16-11-2022
21	AR Misc	Khowai	Teliamura	Teliamura	Madhya Krisnapur	5	23˚52'03.78"	91˚39'36.98"	65	16-11-2022
22	AR Bamboo	Khowai	Padmabil	Hazaribari	North Gayamoni	15	24˚00'55.14"	91˚30'20.57"	99	19-11-2022
23	AR Bamboo	Khowai	Padmabil	Hazaribari	North Gayamoni	_	24˚00'55.14"	91˚30'20.57"	99	19-11-2022
24	AR Misc	Khowai	Teliamura	Duski	Salkaham	10	23°52'45.26"	91°34'53.45"	89	15-11-2022
25	AR Bamboo	Khowai	Teliamura	Duski	Salkaham	5	23˚52'36.68"	91˚35'05.70"	79	15-11-2022
26	AR Bamboo	Khowai	Padmabil	Hazaribari	South Gayamoni	10	23˚59'54.92"	91˚28'52.08"	135	19-11-2022
27	AR Misc	Khowai	Teliamura	Teliamura	Uttar Krishnapur	10	23˚52'59.85"	91˚39'42.18"	83	16-11-2022

28	AR Bamboo	Khowai	Atharamura	Atharamura	Yakbaksa	10	23˚53'30.74"	91˚46'17.80"	180	18-11-2022
29	AR Bamboo	Khowai	Atharamura	Atharamura	Yaprikwtal bodol	15	23˚53'50.84"	91˚45'41.02"	178	18-11-2022
30	AR Bamboo	Khowai	Atharamura	Atharamura	Yaprikwtal bodol	_	23˚53'50.84"	91˚45'41.02"	178	18-11-2022
31	CD II	Khowai	Teliamura	Baramura	Hadrai	NA	23˚48'55.86"	91˚34'48.36"	100	16-11-2022
32	CD II	Khowai	Teliamura	Baramura	Hawaibari	NA	23˚48'14.03"	91˚35'38.30"	69	17-11-2022

TABLE 7: OVERALL STUDY SITES, NAME OF THE JFMC ALONG WITH GPS COORDINATES FOR WEST TRIPURA DISTRICT

Transect Sl. No.	Type Code	District	Range	Beat	Name of JFMC	Plantation Area (ha)	Latitude	Longitude	Elevation (m)	Date of survey
					Bamsree					
1	ANR(Misc)	West	Champaknagar	Belbari	Twisya	10	23°45'04.74"	91°28'58.22"	65	05-12-2022
2	ANR(Misc)	West	Mandai	Burakha	Burakha para	10	23°53'00.48"	91°26'00.78"	43	03-12-2022
3	ANR(Misc)	West	Subalsing	Dumrakaridak	Hatai Kator	5	23°58'58.17"	91°30'24.78"	137	06-12-2022
4	ANR(Misc)	West	Mandai	Burakha	Kathiram bari	10	23°53'46.98"	91°27'28.77"	78	05-12-2022
5	ANR(Bamboo)	West	Champaknagar	Belbari	Purba Belbari	10	23°45'14.14"	91°29'02.57"	63	05-12-2022
6	ANR(Misc)	West	Mandai	Burakha	Shibnagar	-	23°53'11.50"	91°25'57.21"	52	03-12-2022
7	ANR(Misc)	West	Subalsing	Dumrakaridak	Tiwari Mairang	5	23°57'46.54"	91°29'07.02"	127	06-12-2022
8	AR(Misc)	West	Champaknagar	Belbari	Bamsree Twisya	10	23°45'07.85"	91°29'05.82"	54	05-12-2022
9	AR(Misc)	West	Mandai	Burakha	Burakha para	10	23°52'51.99"	91°26'01.90"	50	03-12-2022
10	AR(Misc)	West	Subalsing	Dumrakaridak	Hatai Kator	5	23°58'35.94"	91°30'20.99"	128	06-12-2022
11	AR(Bamboo)	West	Subalsing	Dumrakaridak	Hatai Kator	15	23°50'28.51"	91°30'23.34"	147	06-12-2022
12	AR(Bamboo)	West	Subalsing	Dumrakaridak	Hatai Kator	_	23°50'28.51"	91°30'23.34"	147	06-12-2022
13	AR(Misc)	West	Mandai	Burakha	Kathiram bari	5	23°53'43.89"	91°27'24.06"	71	05-12-2022
14	AR(Misc)	West	Champaknagar	Belbari	Purba Belbari	10	23°45'08.93"	91°29'06.49"	54	05-12-2022
15	AR(Misc)	West	Champaknagar	Belbari	Purba Belbari	5	23°45'09.06"	91°29'10.06"	73	05-12-2022
16	AR(Misc)	West	Mandai	Burakha	Shibnagar	-	23°52'28.76"	91°24'47.65"	34	03-12-2022

SUMMERY OF DIVERSITY PATTERNS IN DIFFERENT PLANT LAYERS / HABIT WISE:

Several diversity iniex for Tree, Regeneration and Herb species. Indices include *Species Richness, Simpson's Index, Shannon's Index, Pielou's Evenness, Margalef's Index, Fisher's alpha* and *Chao-1*. These indices provide quantitative values to measure species diversity across the study sites. A rich ecosystem with high species diversity has a large value for the diversity index, whereas an ecosystem with little diversity has a low.

SUMMARY OF SPECIES RICHNESS:

1. **TREE layers**

With regard to the tree species, highest *spcies richness* against the district (no.of sites) belongs to N01 (38), SE06 (38), KH05 (37), SH09 (37), SE04 (34), U02 (34), KH04 (32), N05 (32), N11 (32), SH03 (32) and so on (Table 8); whereas highest on plantation areas (AR, ANR, RBP, CD) was observed on ANR004SH (37), AR002U (31), CDII-005SE (31), AR004N (28), AR005SH (27), ANR005SH (24), AR003N (24), AR005N (24), AR010N (24), ANR004SE (23) and so on (Table 9).

2. **REGENERATON (Shrubs/saplings) Layers**

With regard to the tree species, highest spcies richness against the district (no.of sites) belongs to KH05 (43), SE03 (43), SE06 (43), U08 (42), KH01 (39), KH13(39), N01 (39), KH12 (35), N11 (30), U03 (30) and so on (Table 10); whereas highest on plantation areas (AR, ANR, RBP, CD) was observed on AR012KH (35), AR010KH (33), ANR002SE (32), ANR004KH (32), AR005U (32), ANR003SE (29), ANR006KH (29), AR005KH (29), ANR001KH (28), ANR007W (24) and so on (Table 11).

3. **HERB layers**

With regard to the tree species, highest *spcies richness* against the district (no.of sites) belongs to KH05 (46), KH04 (43), U03 (41), N01 (40), SH04 (39), SE01 (38), U08 (36), W06 (32), KH01 (30), KH13 (30) and so on (Table 12); whereas highest on plantation areas (AR, ANR, RBP, CD) was observed on AR003KH (35), CD002SH (31), CDII-002KH (26), CDII-002U (26), ANR004U (25), CDII-001SE (25), CDII-003U (25), RBP001G (25), CDI-001U (23), AR001N (22) and so on (Table 13).

SUMMARY OF SIMPSON'S INDEX:

1. **TREE layers**

With regard to the tree species, highest *Simpson's Index* against the district (no.of sites) belongs to G08 (0.505), G05 (0.429), N09 (0.336), N02 (0.331), N06 (0.313), G07 (0.284), KH03 (0.250), KH15 (0.250), SH01 (0.247) N03 (0.244) and so on (Table 8); whereas highest on plantation areas (AR, ANR, RBP, CD) was observed on AR009SH (1.000), CDII-003N (1.000), RBP001SH (0.657), CDII-001G (0.505), CDII-007SE (0.500), RBP001G (0.429), CDI-001N (0.385), AR001SH (0.381), CD002SH (0.380), ANR001SH (0.365) and so on (Table 9).

2. **REGENERATON (Shrubs/saplings) Layers**

With regard to the tree species, highest *Simpson's Index* against the district (no.of sites) belongs to SH06 (0.244), N04 (0.211), G08 (0.209), G01 (0.207), G10 (0.201), N07 (0.201), G05 (0.195), G02 (0.194), SH07 (0.179), N08 (0.167) and so on (Table 10); whereas highest on plantation areas (AR, ANR, RBP, CD) was observed on CDII-004N (1.000), CDII-003N (0.502), CD003SH (0.500), CDI-004N (0.440), CDI-005G (0.432), CDI-003U (0.333), CDII-004SE (0.333), CDII-007SE (0.333), AR004SH (0.272), AR005SH (0.270) and so on (Table 11).

3. **HERB layers**

With regard to the tree species, highest *Simpson's Index* against the district (no.of sites) belongs to G10 (0.597), SE04 (0.463), N04 (0.368), N06 (0.349), SE08 (0.344), SE02 (0.334), G02 (0.313), G06 (0.259), G08 (0.255), SH01 (0.237) and so on (Table 12); whereas highest on plantation areas (AR, ANR, RBP, CD) was observed on ANR002U (0.622), CDI-003N (0.620), AR005G (0.597), ANR004SE (0.545), CD003SH (0.531), AR001SE (0.525), ANR002SH (0.406), AR003N (0.368), ANR001G (0.355), AR007G (0.349) and so on (Table 13).

SUMMARY OF SHANNON'S INDEX:

1. **TREE layers**

With regard to the tree species, highest *Shannon's Index* against the district (no.of sites) belongs to KH05 (3.520), SE04 (3.368), KH12 (3.336), KH04 (3.318), KH13 (3.286), N11 (3.216), N13 (3.184), U02 (3.127), SE01 (3.106), SE06 (3.045) and so on (Table 8); whereas highest on plantation areas (AR, ANR, RBP, CD) was observed on AR002U (3.177), CDII-005SE (3.131), AR010N (3.017), AR005SH (3.001), AR010KH (2.996), AR002KH (2.992), ANR004SH (2.979), ANR004SE (2.957), ANR001SE (2.938), AR004N (2.916) and so on (Table 9).

COMPARISON OF PIELOU'S EVENNESS

1. **TREE layers**

With regard to the tree species, highest *Pielou's Evenness* against the district (no.of sites) belongs to W07 (1.000), KH07 (1.000), KH08 (1.000), KH06 (1.000), KH03 (1.000), KH15 (1.000), G08 (0.995), KH12 (0.969), KH10 (0.967), KH01 (0.959) and so on (Table 8); whereas highest on plantation areas (AR, ANR, RBP, CD) was observed on AR010KH (1.000), AR003KH (1.000), AR012KH (1.000), CDII-002KH (1.000), ANR006KH (1.000), AR004KH (1.000), ANR004KH (1.000), CDII-001KH (1.000), ANR008KH (1.000), ANR001KH (1.000) and so on (Table 9).

2. **REGENERATON (Shrubs/saplings) Layers**

With regard to the tree species, highest *Pielou's Evenness* against the district (no.of sites) belongs to KH03 (1.000), KH15 (1.000), KH07 (1.000), W07 (0.986), KH10 (0.983), KH12 (0.973), W01 (0.956), KH01 (0.955), W02 (0.953), N10 (0.950) and so on (Table 10); whereas highest on plantation areas (AR, ANR, RBP, CD) was observed on CDII-004N (1.000), CD003SH (1.000), CDI-003U (1.000), CDII-004SE (1.000), CDII-007SE (1.000), CD002SH (1.000), CDII-001KH (1.000), AR011KH (1.000), CDII-002SE (1.000), CDII-002KH (1.000) and so on (Table 11).

3. **HERB layers**

With regard to the tree species, highest *Pielou's Evenness* against the district (no.of sites) belongs to SE08 (0.984), W07 (0.961), KH06 (0.957), W03 (0.925), KH03 (0.892), W06 (0.890), KH07 (0.875), SH06 (0.873), SE01 (0.857), KH04 (0.856) and so on (Table 12); whereas highest on plantation areas (AR, ANR, RBP, CD) was observed on CDII-003SE (1.000), ANR007SE (0.984), AR001SE (0.975), CD003SH (0.969), ANR006KH (0.961), ANR007W (0.961), ANR005KH (0.957), AR004SE (0.938), ANR003G (0.931), ANR006W (0.925) and so on (Table 13).

SUMMARY OF MARGALEF'S INDEX:

1. **TREE layers**

With regard to the tree species, highest *Margalef's Index* against the district (no.of sites) belongs to KH05 (9.156), SE04 (8.235), KH12 (8.079), KH04 (7.965), KH13 (7.722), SE06 (7.455), SH09 (7.042), SE01 (6.873), N01 (6.518), SH07 (6.284) and so on (Table 8); whereas highest on plantation areas (AR, ANR, RBP, CD) was observed on CDII-005SE (7.792), ANR004SH (7.042), AR010KH (6.342), ANR001SE (6.059), AR002U (6.028), ANR004SE (5.924), AR003KH (5.882), AR012KH (5.882), CDII-002KH (5.882), AR005SH (5.868) and so on (Table 9).

2. **REGENERATON (Shrubs/saplings) Layers**

With regard to the tree species, highest *Margalef's Index* against the district (no.of sites) belongs to KH05 (10.34), KH01 (9.925), SE06 (9.886), KH13 (9.764), U08 (9.587), KH12 (9.347), SE03 (8.728), KH07 (8.315), N01 (8.1), KH09 (7.814) and so on (Table 10); whereas highest on plantation areas (AR, ANR, RBP, CD) was observed on AR012KH (9.563), AR010KH (9.152), ANR004KH (8.945), AR005U (8.651), AR005KH (8.315), ANR001KH (8.103), ANR006KH (7.814), ANR002SE (7.482), ANR007W (7.145), ANR003SE (6.839) and so on (Table 11).

3. HERB layers

With regard to the tree species, highest *Margalef's Index* against the district (no.of sites) belongs to KH05 (9.537), KH04 (8.918), SE01 (8.373), W06 (7.701), SH04 (7.349), KH01 (6.973), U03 (6.845), KH13 (6.803), N01 (6.747), KH12 (6.200) and so on (Table 12); whereas highest on plantation areas (AR, ANR, RBP, CD) was observed on AR003KH (7.900), CD002SH (6.588),CDII-001SE (6.381), CDII-002KH (6.106), ANR004KH (5.625), AR012KH (5.539), AR010KH (5.498), AR008W (5.344), ANR006W (5.255), CDII-002U (5.240) and so on (Table 13).

SUMMARY OF FISHER'S ALPHA INDEX:

1. TREE layers

With regard to the tree species, highest *Fisher's alpha* against the district (no.of sites) belongs to KH12 (149.700), KH13 (87.480), KH01 (66.350), KH05 (60.570), KH09 (50.850), KH10 (43.450), KH04 (40.040), SE04 (37.970), SE01 (36.290), KH02 (24.860) and so on (Table 8); whereas highest on plantation areas (AR, ANR, RBP, CD) was observed on CDII-005SE (39.660), ANR007KH (34.610), ANR001SE (31.080), AR002KH (24.860), ANR004SE (21.640), AR009KH (17.710), AR001SE (15.450), ANR004SH (14.770), AR005SH (13.780), AR002U (12.090) and so on (Table 9).

2. REGENERATON (Shrubs/saplings) Layers

With regard to the tree species, highest *Fisher's alpha* against the district (no.of sites) belongs to W07 (295.90), KH12 (215.70), KH10 (206.60), KH01 (121.30), SH09 (96.48), KH13 (88.56), KH05 (75.26), W01 (73.59), W06 (70.58), KH09 (69.39) and so on (Table 10); whereas highest on plantation areas (AR, ANR, RBP, CD) was observed on ANR007W (295.90), AR007KH (206.60), AR005U (138.50), ANR004SH (96.48), ANR006W (75.95), ANR006KH (69.39), ANR001SE (69.23), AR002KH (50.85), AR009KH (45.12), AR003U (43.62) and so on (Table 11).

3. HERB layers

With regard to the tree species, highest *Fisher's alpha* against the district (no.of sites) belongs to W06 (31.03), KH05 (29.18), SE01 (27.11), W07 (26.78), KH04 (25.76), KH01 (22.01), KH12 (21.04), KH15 (20.26), KH13 (19.59), KH09 (16.26) and so on (Table 12); whereas highest on

plantation areas (AR, ANR, RBP, CD) was observed on ANR006W (41.59), ANR006KH (26.78), ANR007W (26.78), AR003KH (25.96), CDII-001SE (24.96), ANR004KH (22.17), ANR002W (20.76), AR014KH (20.26), AR012KH (20.14), AR008W (19.39) and so on (Table 13).

1. **TREE layers**

With regard to the tree species, highest *Chao-1 Richness* against the district (no.of sites) belongs to KH04 (116), KH12 (110), W07 (105), SE07 (77), KH05 (73), KH13 (70), SE06 (69), N06 (64), SE01(60), SE04 (55) and so on (Table 8); whereas highest on plantation areas (AR, ANR, RBP, CD) was observed on AR010KH (210), CDII-005SE (207), AR003KH (171), AR012KH (171), CDII-002KH (171), ANR006KH (153), AR004KH (153), ANR004KH (136), CDII-001KH (136), ANR008KH (120) and so on (Table 9).

2. **REGENERATON (Shrubs/saplings) Layers**

With regard to the tree species, highest *Chao-1 Richness* against the district (no.of sites) belongs to KH07 (435), KH15 (253), SH09 (172), KH12 (159), W07 (151), KH03 (120), KH10 (106), KH01 (101), N02 (82), KH05 (79) and so on (Table 10); whereas highest on plantation areas (AR, ANR, RBP, CD) was observed on AR012KH (630), AR010KH (561), ANR004KH (528), AR005KH (435), ANR001KH (406), AR003W (253), AR014KH (253), ANR003W (231), ANR009KH (231), ANR002W (210) and so on (Table 11).

3. **HERB layers**

With regard to the tree species, highest *Chao-1 Richness* against the district (no.of sites) belongs to KH05 (69), KH15 (57), KH04 (49), SE01 (48), U03 (47), N01 (46), KH01 (43), SE06 (43), KH13 (41), SH04 (41) and so on (Table 12); whereas highest on plantation areas (AR, ANR, RBP, CD) was observed on ANR002W (81), AR003KH (58), AR014KH (57), ANR005W (53), CDII-002KH (52), ANR006W (47), AR012KH (47), ANR001W (47), CDII-001SE (46), ANR004KH (41) and so on (Table 13).

AIDED NATURAL REGENERATION (ANR)

AIDED NATURAL REGENERATION (ANR):

Aided Natural Regeneration (ANR) is a forest restoration approach that focuses on facilitating the natural recovery of degraded or deforested areas by enhancing the growth and establishment of native vegetation without extensive human intervention. ANR is particularly effective in areas where there is a potential seed source from nearby forests or remnant vegetation.

Aided Natural Regeneration (ANR) plantations hold significant importance in ecosystem restoration, biodiversity conservation, and sustainable land management. Here are some of the key reasons why ANR plantations are significant:

Ecosystem Restoration: ANR facilitates the natural recovery of degraded or deforested areas without extensive human intervention. By assisting native vegetation to regenerate on its own, ANR promotes the restoration of ecosystem structure and function.

Biodiversity Conservation: ANR allows for the reestablishment of native plant species, which is crucial for enhancing biodiversity. The natural regeneration process often leads to the establishment of a diverse range of species, contributing to habitat creation and supporting various wildlife.

Minimal Environmental Impact: ANR minimizes disturbance to the environment compared to more intensive restoration methods. It reduces the need for large-scale soil disturbance, planting, and other interventions, which can have negative impacts on soil health and local ecosystems.

Cost-Effectiveness: ANR can be more cost-effective than artificial regeneration methods, as it relies on natural processes rather than extensive planting efforts. It can be particularly advantageous in areas with limited resources for restoration activities.

Resilience and Adaptability: ANR often leads to the development of ecosystems that are well-adapted to local conditions, as the natural regeneration process selects species that are suited to the environment. This can result in more resilient and self-sustaining ecosystems.

Carbon Sequestration: ANR contributes to carbon sequestration by allowing trees to grow and capture carbon dioxide from the atmosphere. As trees mature, they store carbon in their biomass and contribute to mitigating climate change.

Habitat Creation: ANR creates habitats for a variety of species as vegetation regrows naturally. This supports local wildlife populations and enhances ecological connectivity.

Cultural and Indigenous Values: ANR can align with traditional ecological knowledge and practices of indigenous communities. It respects their connection to the land and allows them to play a role in restoration efforts.

Education and Community Engagement: ANR provides opportunities for communities to engage in restoration activities, fostering a sense of ownership and stewardship. It can also be used as a tool for education and raising awareness about the importance of natural regeneration.

Long-Term Sustainability: ANR plantations tend to have a more natural and diverse structure, resembling local ecosystems. This contributes to the long-term sustainability of the restored area, supporting ecosystem services and functions.

Overall, ANR plantations offer a holistic approach to ecosystem restoration that aligns with natural processes and balances environmental, social, and economic considerations. Effective monitoring and adaptive management are crucial to ensure the success of ANR efforts and to address any challenges that may arise during the regeneration process.

Plant diversity and structure are important components of ANR, as they contribute to the overall success of ecosystem recovery and provide various ecological benefits. Here's how plant diversity and structure are relevant in the context of Aided Natural Regeneration:

Aided Natural Regeneration (ANR) is a valuable approach to restore degraded landscapes and promote biodiversity in various regions, including Tripura. Tripura is a state in northeastern India known for its rich biodiversity and diverse ecosystems. ANR can play a significant role in rehabilitating degraded lands, enhancing ecosystem services, and supporting local communities. Here are some considerations for implementing ANR plantations in Tripura:

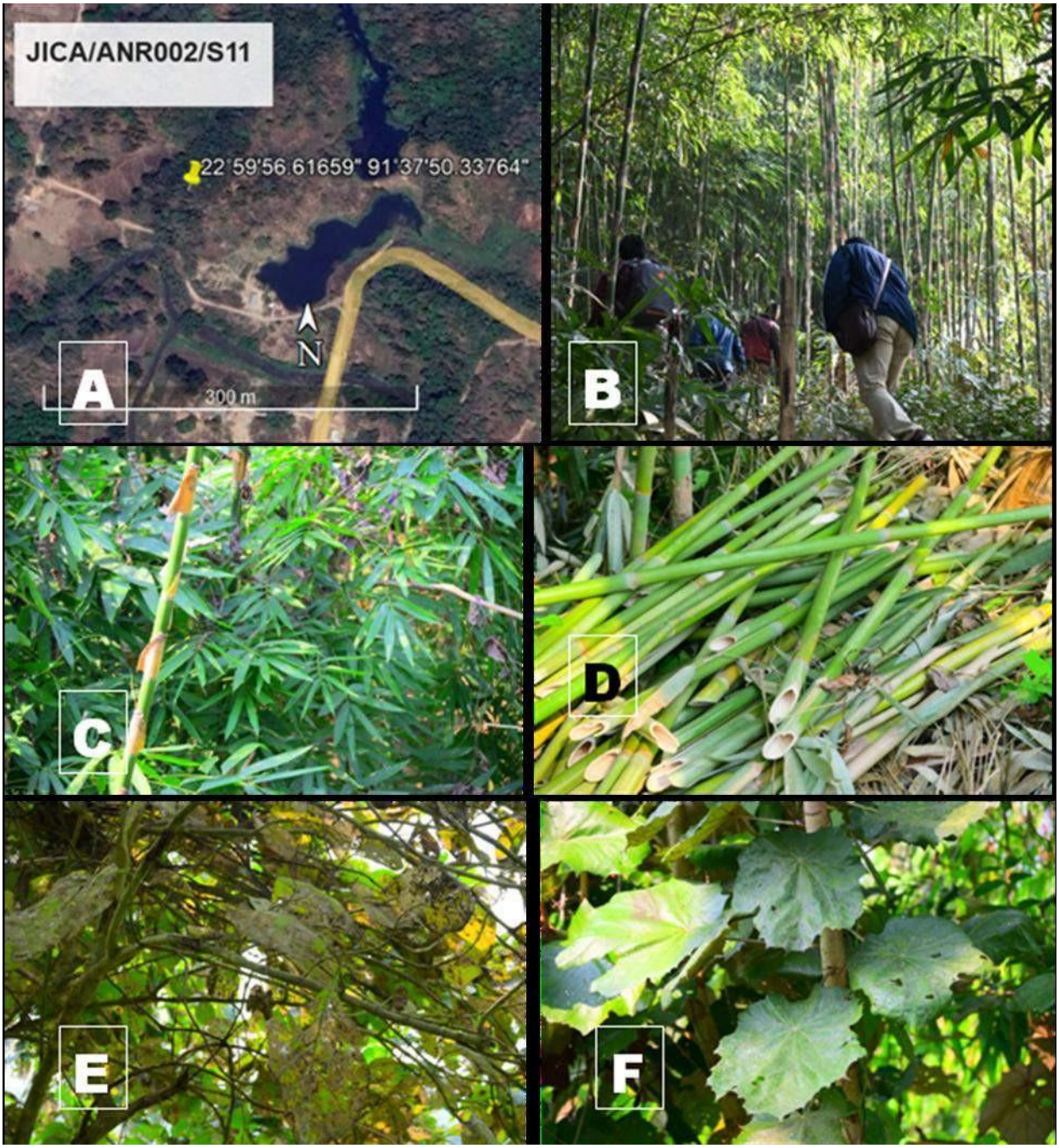


FIGURE 12: STUDY OF DIVERSITY ON ANR BAMBOO PLANTATION SITES (MANDALI PARA JFMC)- A) MAP ALONG WITH GPS COORDINATES (B) PLANTATION SITE OF ANR BAMBOO (C) ASSOCIATED BAMBOO FOREST: MELOCANNA BACCIFERA (D) BAMBOO COLLECTION FOR LIVELIHOODS (E&F) ASSOCIATED TREE SPECIES: TECTONA GRANDIS & PTEROSPERMUM ACERIFOLIUM.

FIGURE 13: STUDY OF DIVERSITY ON ANR BAMBOO PLANTATION SITES (GAGRABASTI JFMC)- A) MAP ALONG WITH GPS COORDINATES (B) PLANTATION SITE OF ANR BAMBOO (C) SAMPLING 5×5 PLOT SIZE (D) DENDROCALAMUS LONGISPATHUS (E&F) ASSOCIATED HERB SPECIES & TREE SAPLING: LYGODIUM FLEXUOSUM & SYZYGIUM CUMINI.

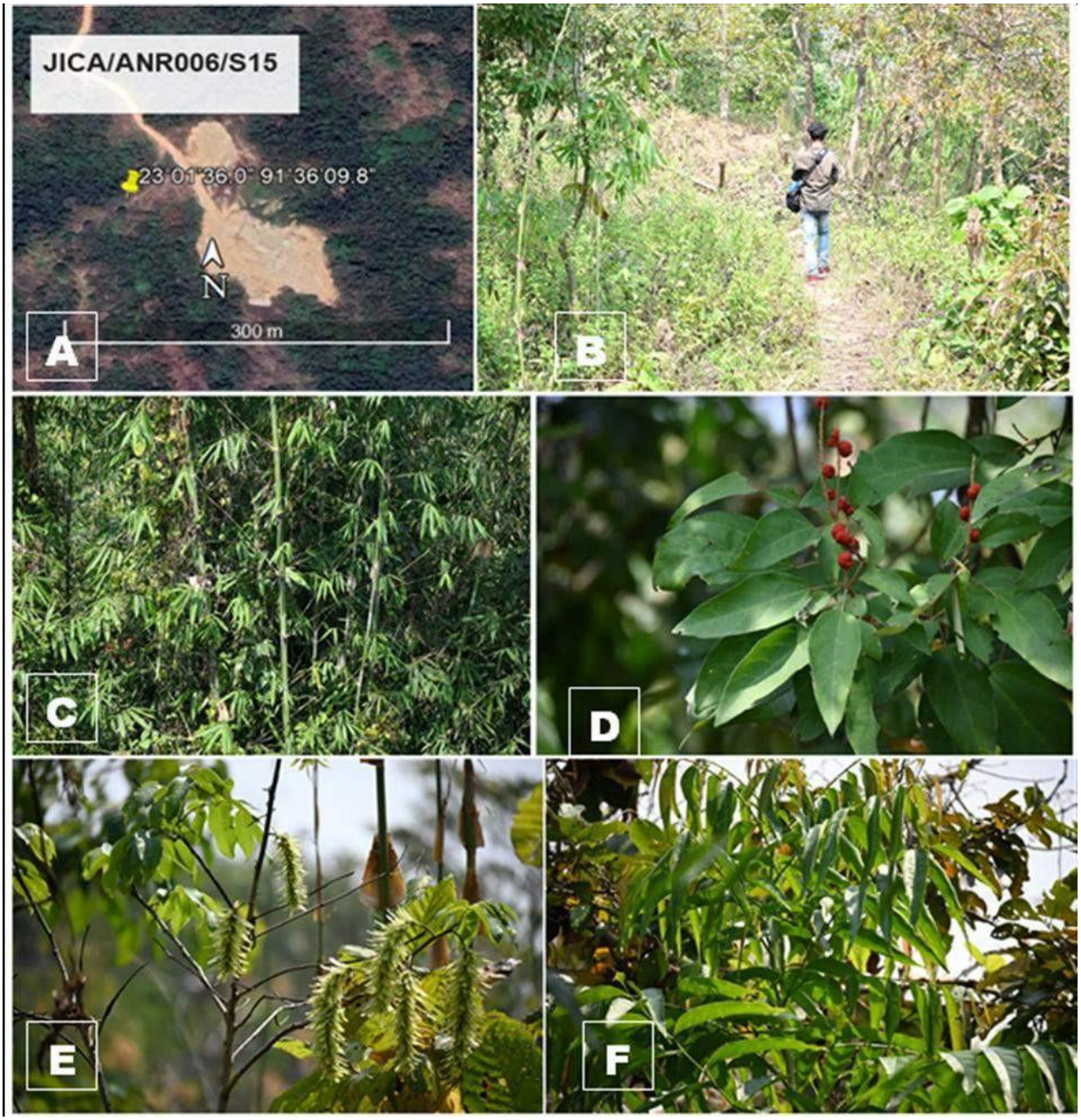


FIGURE 14: STUDY OF DIVERSITY ON ANR BAMBOO PLANTATION SITES (JOYSINGH BARI JFMC)- A) MAP ALONG WITH GPS COORDINATES (B) TOWARDS PLANTATION SITE OF ANR BAMBOO (C) ASSOCIATED FOREST BAMBOO: BAMBUSA TULDA (D) MALLOTUS PHILLIPENSIS (E) ENGELHARDIA SPICATA (F) GLOCHIDION MULTILOCULARE.

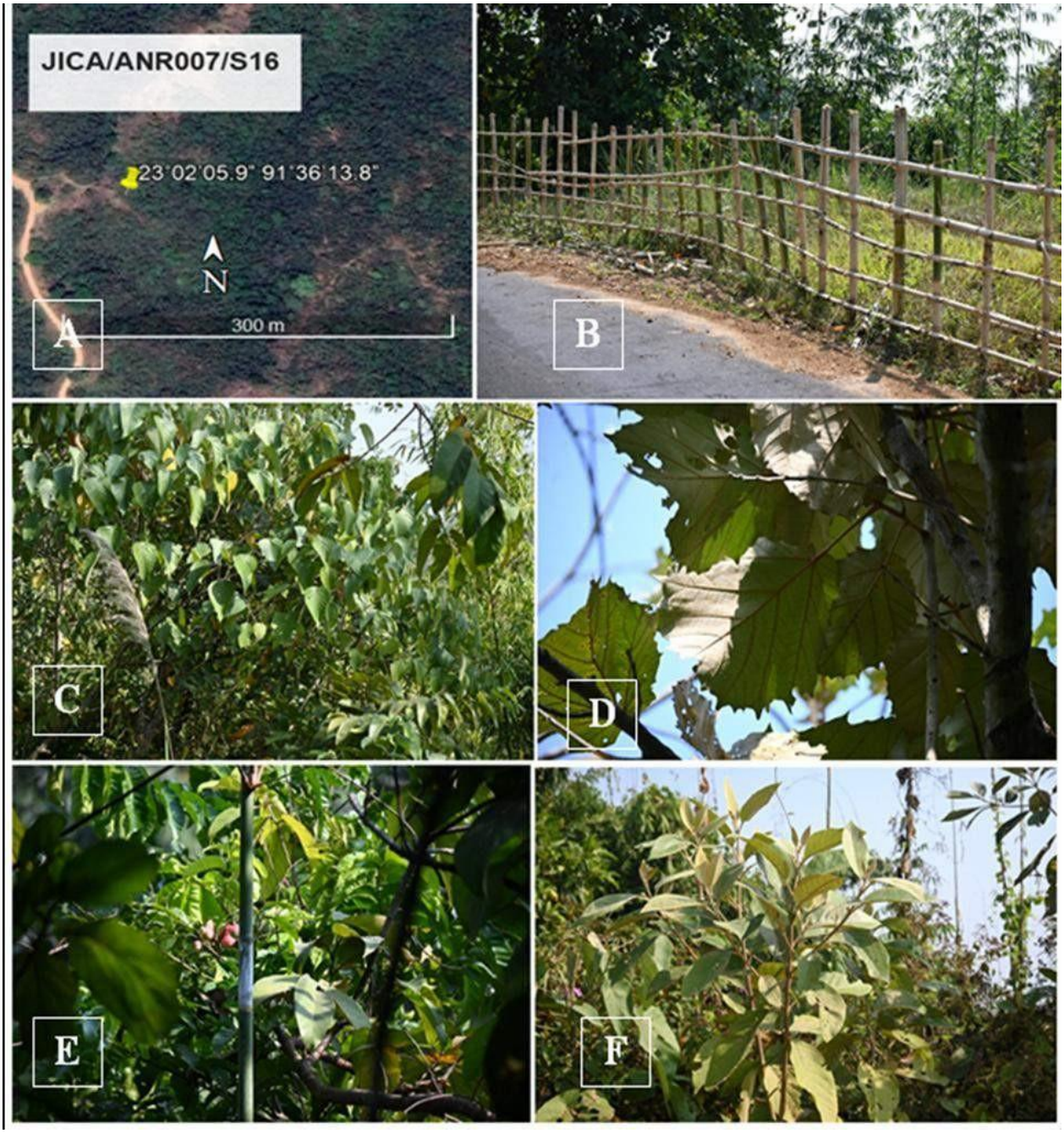


FIGURE 15: STUDY OF DIVERSITY ON ANR BAMBOO PLANTATION SITES (JOYSINGH BARI JFMC)- A) MAP ALONG WITH GPS COORDINATES (B) PLANTATION SITE OF ANR BAMBOO WITH PROPER FENCING (C-F) ASSOCIATED FOREST: MACARANGA PELTATA, PTEROCARPUS ACERIFOLIUM, APHANAMIXIS POLYSTACHYA AND CALLICARPA ARBOREA.

FIGURE 15: STUDY OF DIVERSITY ON ANR MISC PLANTATION SITES- A) MAP ALONG WITH GPS COORDINATES (B) SIGN BOARD OF THE STUDY SITE (C) PLANTATION SITE OF ANR MISC (D) SAPLING OF ELAEOCARPUS FLORIBUNDUS (E) SAPLING OF MIMUSOPS ELENGI (F) SAPLING OF DILLENIA INDICA.

FIGURE 16: STUDY OF DIVERSITY ON ANR002 BAMBOO (SHAMAL TWISA JFMC): (A) MAP ALONG WITH GPS COORDINATES. B) PLANTATION AREA (C) INTERROGATION WITH BEAT OFFICER AND FFW (D) VILLAGE OF BRU-SETTLEMENT CLOSE TO ANR PLANTATION (F) BACCAUREA RAMIFLORA NTFPS SOLD IN THE MARKET NEARBY THE STUDY SITE (ANR).

FIGURE 17: STUDY OF DIVERSITY ON ANR008 BAMBOO (BOLONG NAITHOK JFMC): (A) MAP ALONG WITH GPS COORDINATES. B) SIGNBOARD OF THE STUDY SITE (C) PLANTATION AREA (D) FIGS OF FICUS SEMICORDATA (E) ENGELHARDIA SPICATA (F) NTFPS COLLECTION (INFLORESCENCE OF MUSA SP, BAMBOO SHOOT ETC.)

FIGURE 18: STUDY OF DIVERSITY ON ANR0010 BAMBOO (MEGHABARNA JFMC): (A) MAP ALONG WITH GPS COORDINATES. B) INTERROGATION WITH BEAT OFFICER AND JFMC PRESIDENT (C) PLANTATION AREA (D) SAPLING OF BAMBUSA TULDA (E) ADJACENT FOREST (F) NTFPS COLLECTION (INFLORESCENCE OF MUSA SP, BAMBOO SHOOT ETC.)

FIGURE 19: STUDY OF DIVERSITY ON ANR001 (BAMBOO) (ALOCHAYA JFMC) A) MAP ALONG WITH GPS COORDINATES. B) BAMBOO SAPLING (PLANTATION). C) MEASURING THE GBH OF SAPLING. D) ASSESSING THE BAMBOO PLANTATION IN PRESENCE OF BEAT OFFICER. E) HELMINTHOSTACHYS ZEYLANICA. F) POLYSTACHYA SP. G) AERIDES ODORATUM.

FIGURE 20: STUDY OF DIVERSITY ON ANR002 MISC. (NABAJIBAN JFMC) (A) MAP ALONG WITH GPS COORDINATES (B) ASSESSING THE VEGETATION AROUND CHECKDAM IN PRESENCE OF BEAT OFFICER & FF (C) SAPLING OF BAMBUSA TULDA (D) PARKIA JAVANICA (E) SAPLING OF BAMBUSA TULDA.

FIGURE 21: STUDY OF DIVERSITY ON ANR010 MISC. (BALIDUM JFMC) (A) MAP ALONG WITH GPS COORDINATES (B) ASSESSING THE VEGETATION IN PRESENCE OF FF (C & E) SAPLING OF TERMINALIA ARJUNA (D) SAPLING OF PHYLLANTHUS EMBLICA (F) HIBISCUS SURRATNENSIS (G) MAESA INDICA (I) SAPLING OF PARKIA JAVANICA

TREE DIVERSITY IN AIDED NATURAL REGENERATION (ANR):

Tree Species Richness: ANR aims to restore not just a few dominant species but a diverse array of native plant species. Higher species richness promotes ecosystem resilience and stability, as different species can play unique roles in nutrient cycling, soil stabilization, and providing habitat for various organisms. The presence of genetically diverse plant populations is crucial for adapting to changing environmental conditions and resisting diseases. ANR helps maintain or restore genetic diversity by allowing natural regeneration from diverse seed sources. In the SCATFORM ANR Plantation sites in Tripura number of species ranges from 4-25 with the 58 surveyed plots. Whereas average number of species was 13.43. Total 142 Number of species was recorded in all ANR Sites.

Species Dominance Index: A dominance index value that ranges between 0.027 and 0.421 in an Aided Natural Regeneration (ANR) plantation suggests a scenario with low to moderate dominance by certain species, indicating a relatively diverse ecosystem. The dominance index measures the relative abundance of different species within a community. Here's how to interpret the dominance index values within this range:

Closer to 0.027: If the dominance index value is closer to 0.027 within the specified range, it indicates a higher level of species diversity and even distribution of individuals across various plant species. This suggests that no species is particularly dominant, and the ecosystem is characterized by a more balanced and resilient composition.

Closer to 0.421: If the dominance index value is closer to 0.421 within the range, it suggests a moderate level of dominance by certain species, but the dominance is still relatively low. This indicates that while some species might be more abundant than others, the ecosystem is maintaining a reasonable balance among different species.

In either case, having a dominance index value within the specified range is generally indicative of a positive outcome in terms of species diversity and balance within the ANR plantation. It suggests that the ANR efforts are contributing to the establishment of a diverse and functional ecosystem where no single species is overwhelmingly dominant. This can lead to enhanced ecological resilience, habitat complexity, and overall ecosystem health.

The Shannon Diversity Index: It is a widely used measure of species diversity that takes into account both species richness (the number of different species) and evenness (the relative abundance of each species). The index value ranges from 0 to approximately ln(S), where S is the total number of species in the sample. Higher Shannon Diversity Index values indicate higher diversity and a more balanced distribution of species. Here's how to interpret Shannon Diversity Index values within the specified range of 1.01 to 2.87 in an Aided Natural Regeneration (ANR) plantation:

Closer to 2.87: If the Shannon Diversity Index value is closer to 2.87 within the specified range, it suggests a higher level of species diversity and evenness. This means that the ANR plantation has a greater number of species, and the distribution of individuals among those species is relatively balanced. This is indicative of a healthier and more resilient ecosystem with a variety of species contributing to its composition.

Closer to 1.01: If the Shannon Diversity Index value is closer to 1.01 within the range, it indicates relatively lower diversity compared to values closer to 2.87. However, it's important to note that values above 1 still suggest a certain level of diversity, and the ecosystem might be dominated by a few species to some extent. In either case, having a Shannon Diversity Index value within the specified range indicates a positive outcome for the ANR plantation. It suggests that the ANR efforts have contributed to establishing a more diverse and balanced plant community, which can result in enhanced ecological functions, ecosystem resilience, and habitat quality. Keep in mind that the interpretation of the Shannon Diversity Index should be considered alongside other ecological and contextual information for a comprehensive understanding of the ecosystem's health and dynamics.

The Evenness Index: Also known as Pielou's Evenness Index, measures how evenly the individuals are distributed among different species in a community. The index value ranges from 0 to 1, with higher values indicating a more even distribution of individuals among species. Here's how to interpret Evenness Index values within the specified range of 0.26 to 0.89 in an Aided Natural Regeneration (ANR) plantation:

Closer to 0.89: If the Evenness Index value is closer to 0.89 within the specified range, it indicates a higher level of evenness in the distribution of individuals among species. This suggests that the ANR plantation has a relatively balanced representation of species, where no species is dominant, and each contributes to the community in a more equitable manner.

Closer to 0.26: If the Evenness Index value is closer to 0.26 within the range, it suggests a lower evenness in the distribution of individuals among species. This could indicate that certain species are more dominant, while others are less represented in the ANR plantation.

In either case, having an Evenness Index value within the specified range indicates the extent to which the plant community in the ANR plantation is distributed evenly among species. A higher value suggests a healthier and more balanced ecosystem, where no single species is overwhelmingly dominant. This is often indicative of a more resilient and functional ecosystem that can provide a variety of ecological benefits, including habitat diversity, nutrient cycling, and ecosystem stability. Keep in mind that the Evenness Index should be interpreted in conjunction with other ecological factors and considerations for a comprehensive understanding of the ecosystem's structure and dynamics.

FIGURE 22: TREE SPECIES RICHNESS PATTERN IN ANR PLANTATION SITES OF TRIPURA

Left side represent the no. of taxa while the right side represent their respective sites (ANR plots) linking by curved color lines to each others.

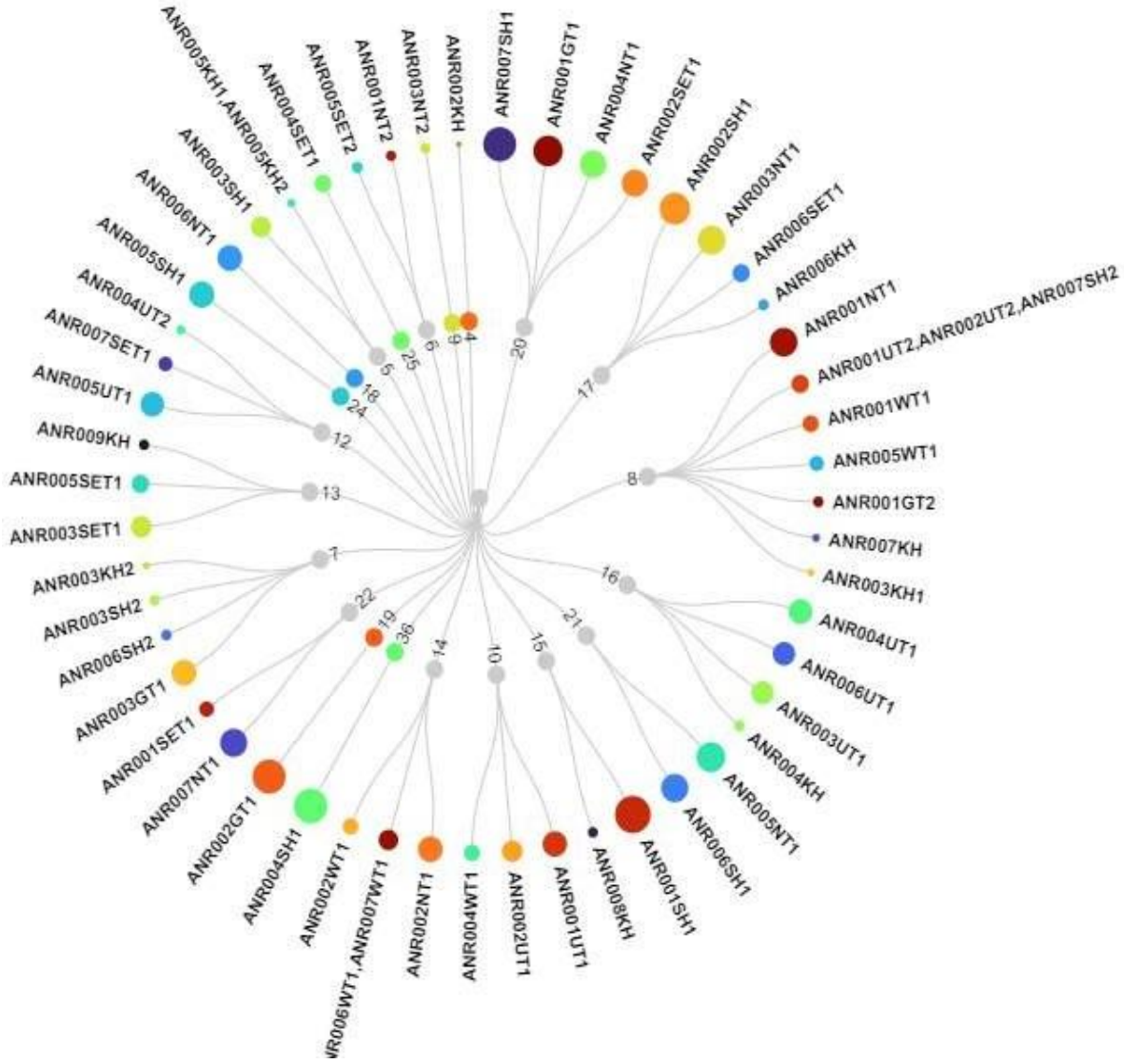


FIGURE 23: RELATIONSHIP BETWEEN TREE SPECIES INDIVIDUALS AND SPECIES RICHNESS PATTERN IN ANR PLANTATION SITES OF TRIPURA

The outer circle of the color code (with ***tree*** individual size) and adjoining the inner circle of the color code represent tree species richness.

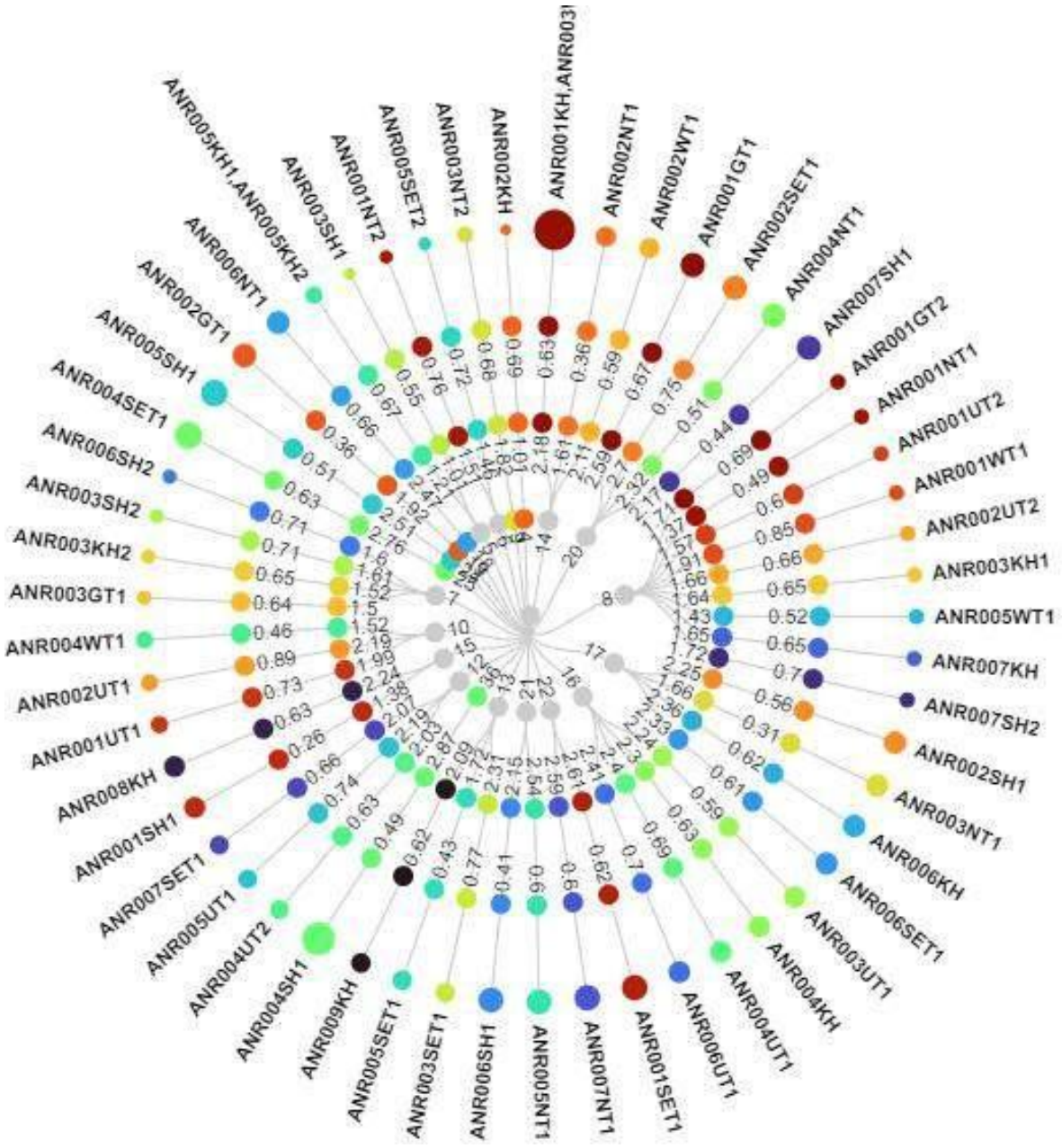


FIGURE 24: TREE SPECIES DOMINANCE AND DIVERSITY PATTERN IN ANR PLANTATION SITES OF TRIPURA

The outer circle of the color code (with ***tree*** individual size) and adjoining the inner circle of the color code represent Shannon index, Evenness, and richness of tree species.

TREE STRUCTURE IN AIDED NATURAL REGENERATION (ANR):

In an Aided Natural Regeneration (ANR) plantation, the vertical and horizontal structure refers to the arrangement of plants both in terms of height (vertical) and spatial distribution (horizontal) within the plantation. The density of trees and the basal area are crucial factors that influence the structure of the plantation and play a significant role in shaping its ecological dynamics. Here's how the vertical and horizontal structure can be described based on the specified density and basal area ranges. The density of trees and the diversity of species contribute to a multi-layered structure that offers habitat diversity and various ecological niches. In your specified range of tree density 40 to 1870 trees per ha. In ANR plantations, a diverse and even distribution of trees can contribute to a healthier ecosystem. The basal area, which is the total area occupied by the tree trunks at breast height, reflects the spatial arrangement and density of trees. In our specified basal area range between 0.69 to 128.15 square meters per ha.

TABLE 8: VERTICAL AND SPATIAL DISTRIBUTION (HORIZONTAL) OF TREES IN IN ANR PLANTATIONS.

ANR PLANTATION	IND	DEN/Ha	BA	BA/m2	BA/ha	AVE GBH	AVE HT
ANR002SH1	137	1370	64079.27	12.81585	128.1585	56	8.121898
ANR001GT1	128	1280	61251.05	12.25021	122.5021	63.08984	8.207031
ANR002GT1	159	1590	59601.1	11.92022	119.2022	52.2956	6.955975
ANR001NT1	112	1120	41161.21	8.232243	82.32243	61.72054	10.65179
ANR002NT1	89	890	34823.57	6.964714	69.64714	62.08989	17.41798
ANR004SH1	166	1660	33374.55	6.67491	66.7491	40.93193	7.454819
ANR007SH1	159	1590	31380.46	6.276093	62.76093	37.68522	9.105031
ANR002SET1	100	1000	25802.16	5.160433	51.60433	47.074	7.31
ANR007NT1	107	1070	20725.17	4.145034	41.45034	38.32645	24.61682
ANR005SH1	94	940	20314.99	4.062999	40.62999	36.78723	6.845745
ANR003NT1	114	1140	20214.28	4.042856	40.42856	38.41088	16.71491
ANR003UT1	73	730	19789.07	3.957813	39.57813	46.61315	31.57534
ANR004NT1	103	1030	19351.51	3.870302	38.70302	40.01553	28.17476
ANR005NT1	122	1220	19269.89	3.853977	38.53977	35.39344	15.06967
ANR002UT1	62	620	18630.95	3.726189	37.26189	53.66532	21.8871
ANR006NT1	90	900	18120.93	3.624187	36.24187	43.195	23.23889
ANR006UT1	74	740	17829.18	3.565837	35.65837	43.65203	27.87838
ANR001UT1	87	870	17727.09	3.545418	35.45418	39.77874	7.441264
ANR004SET1	43	430	16984.78	3.396957	33.96957	64.62791	8.94186
ANR003SET1	64	640	15923.55	3.184711	31.84711	48.27969	7.507813
ANR005UT1	82	820	14267.19	2.853437	28.53437	39.59354	27.44512
ANR005SET1	45	450	13819.59	2.763918	27.63918	55.2	8.666667
ANR003GT1	92	920	13807.28	2.761456	27.61456	31.50543	7.844565
ANR006SH1	109	1090	13569.1	2.71382	27.1382	29.91743	8.440367
ANR003SH1	60	600	12008.64	2.401728	24.01728	38.90833	5.46
ANR004UT1	84	840	10577.64	2.115528	21.15528	32.825	27.17857

ANR006SET1	44	440	9762.773	1.952555	19.52555	46.13636	7.572727
ANR001SH1	187	1870	9657.759	1.931552	19.31552	17.11176	6.882353
ANR001SET1	32	320	8706.18	1.741236	17.41236	50.96469	8.446875
ANR007SH2	15	150	6350.531	1.270106	12.70106	59.56667	8.013333
ANR001KH	14	140	5943.656	1.188731	11.88731	61.25	10.07143
ANR006KH	17	170	5861.864	1.172373	11.72373	58.70588	10.05882
ANR001GT2	16	160	5646.932	1.129386	11.29386	51.125	9.84375
ANR004WT1	37	370	5322.628	1.064526	10.64526	39.07108	6.874324
ANR008KH	15	150	4974.852	0.99497	9.949705	56.46667	8.733333
ANR001WT1	38	380	4497.257	0.899451	8.994514	35.08263	4.846579
ANR003NT2	15	150	4439.563	0.887913	8.879125	50.03333	17.23333
ANR006WT1	14	140	3868.426	0.773685	7.736852	54.01429	13.57857
ANR004KH	16	160	3856.304	0.771261	7.712608	51.40625	9
ANR005SET2	18	180	3702.443	0.740489	7.404886	43.94444	6.416667
ANR007SET1	29	290	3694.091	0.738818	7.388182	35.58621	7.293103
ANR002WT1	36	360	3323.515	0.664703	6.64703	29.36944	5.533333
ANR007WT1	14	140	3197.657	0.639531	6.395314	48.30786	8.8
ANR005WT1	31	310	3104.515	0.620903	6.209029	27.39194	6.422581
ANR001NT2	15	150	3043.24	0.608648	6.086481	40.65333	18.9
ANR009KH	15	150	2973.25	0.59465	5.9465	45.73333	7.7
ANR001UT2	15	150	2964.261	0.592852	5.928523	38.6	7.833333
ANR002UT2	15	150	2622.333	0.524467	5.244666	39.24533	38.43333
ANR003WT1	14	140	2551.942	0.510388	5.103883	40.19857	6.825
ANR003SH2	15	150	2424.749	0.48495	4.849498	36.23533	7.504
ANR004UT2	12	120	2261.013	0.452203	4.522027	37.86667	46.41667
ANR005KH1	5	50	2166.102	0.43322	4.332205	60.6	10.2
ANR005KH2	5	50	2027.932	0.405586	4.055864	58	9.6
ANR003KH1	8	80	2004.943	0.400989	4.009886	52.875	8.0625
ANR006SH2	16	160	1785.08	0.357016	3.570159	30.6875	6.875
ANR007KH	9	90	1634.898	0.32698	3.269795	45.66667	8.666667
ANR003KH2	7	70	1153.727	0.230745	2.307455	44	7
ANR002KH	4	40	345.3068	0.069061	0.690614	32.75	7.5

Data arranged based on ascendning order of BA/Ha for the studied sample sites

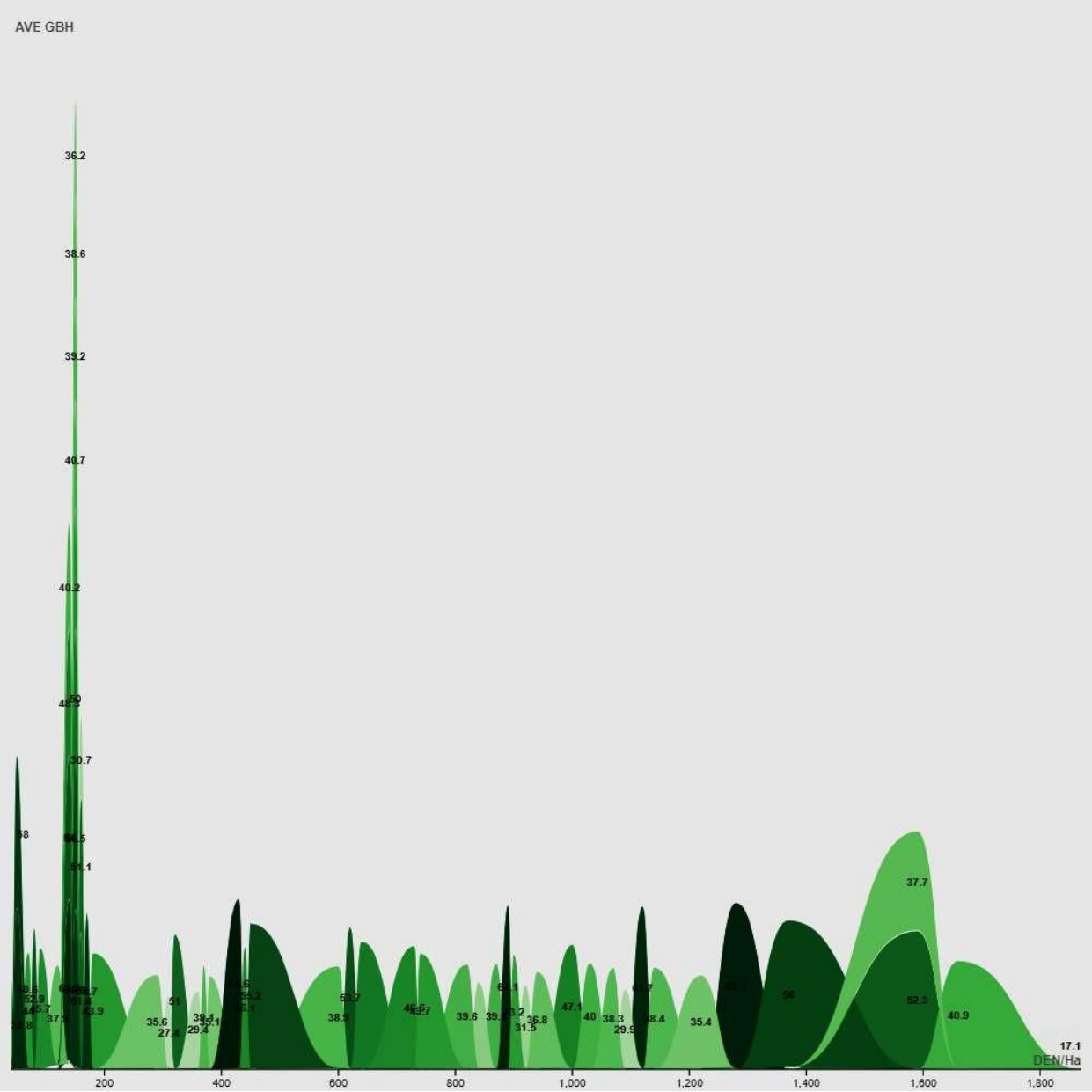


FIGURE 25: DISTRIBUTION OF TREE DENSITY ALONG GIRTH CLASSES (GBH) CM IN ANR PLANTATION SITES

The X-axis represent the average GBH of the tree species and the Y-axis represents density/Ha.

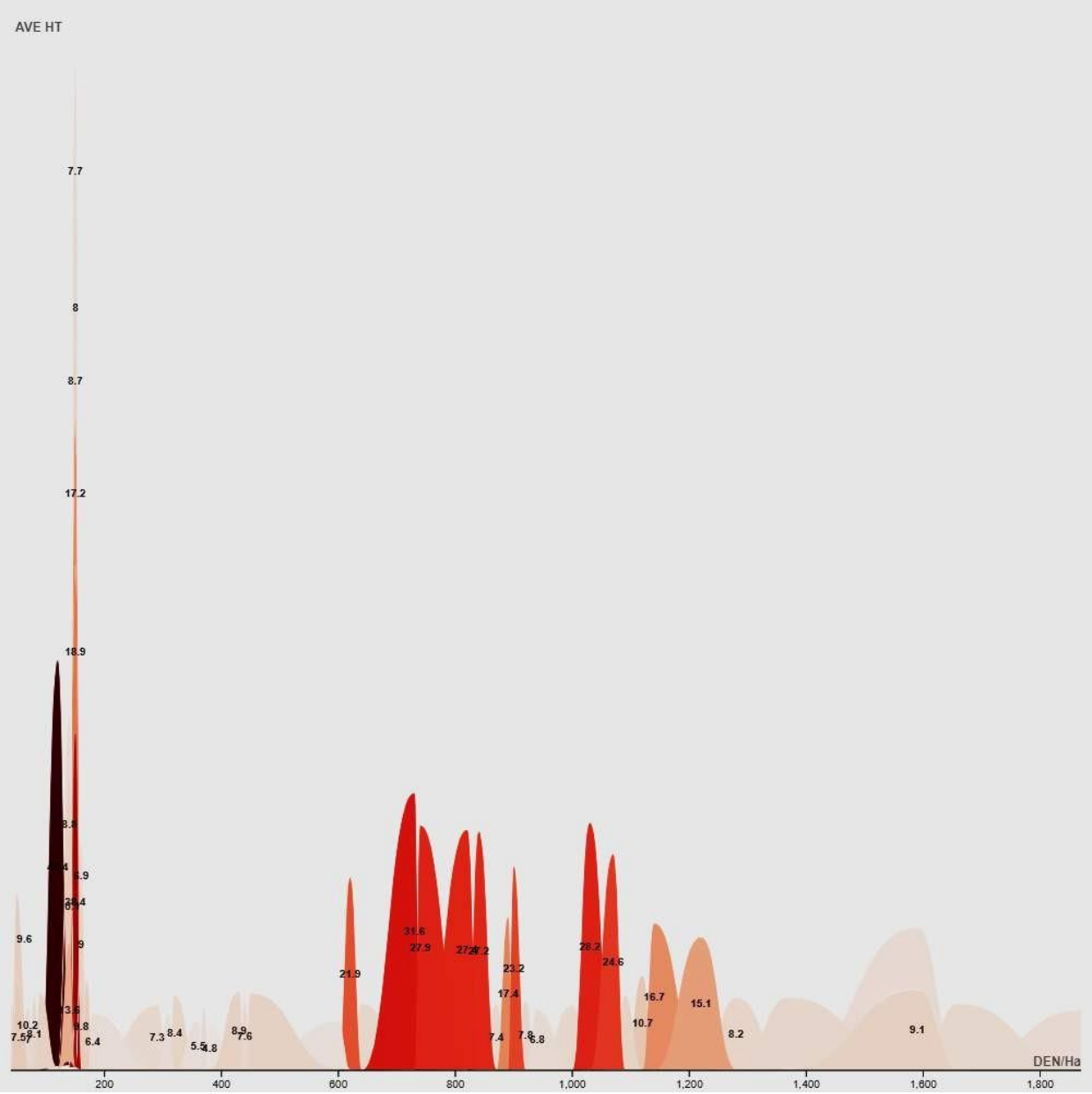


FIGURE 26: DISTRIBUTION OF TREE DENSITY ALONG HEIGHT CLASSES (H) M IN ANR PLANTATION SITES

The X-axis represents the average height of the tree species and the Y-axis represents density/Ha.

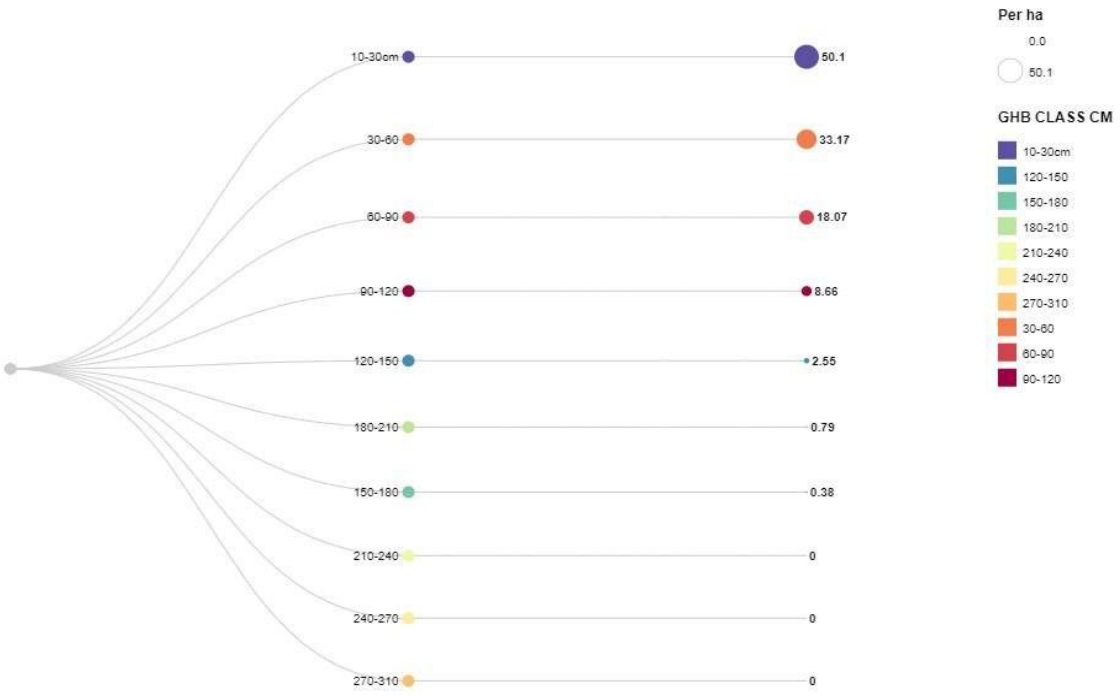


FIGURE 27: STATUS OF TREE GIRTH CLASSES (GBH) CM IN ANR PLANTATION SITES

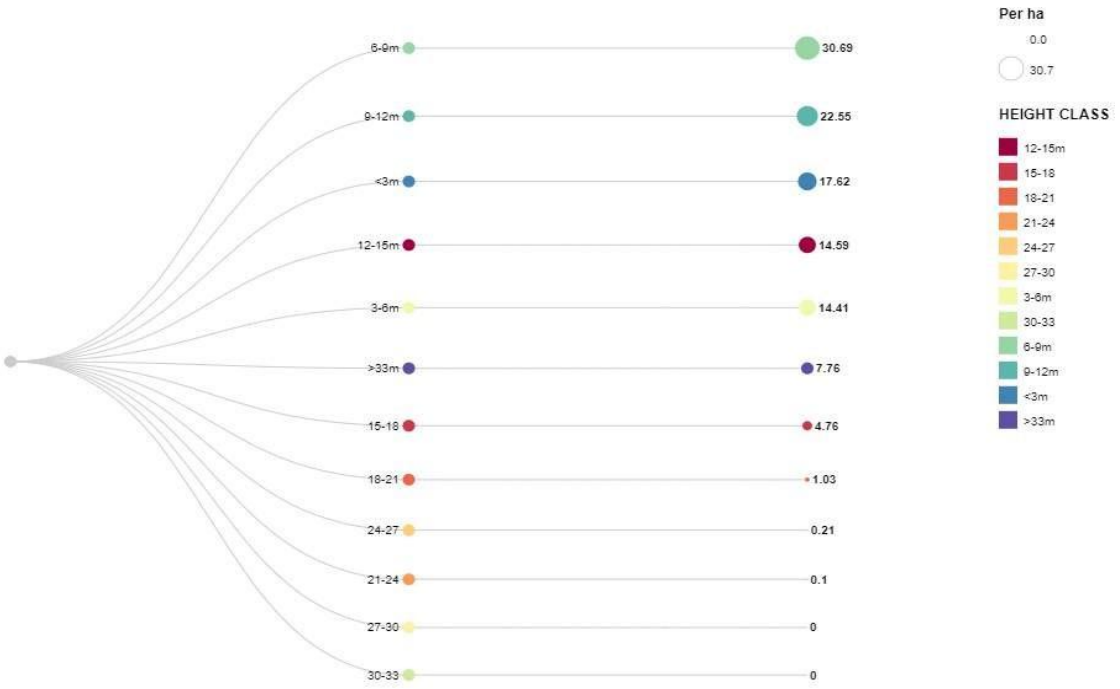


FIGURE 28: STATUS OF TREE HEIGHT CLASSES (H) M IN ANR PLANTATION SITES

The color code represents the girth and height of tree species; the size of the object represents density per Ha.

TABLE 9: TREE DIVERSITY PATTERNS IN ANR PLANTATION

ANRs	Taxa_S	Individuals	Dominance_D	Shannon_H	Evenness_e^H/S	Brillouin	Menhinick	Margalef	Equitability_J	Fisher_alpha	Berger-Parker	Chao-1
ANR001GT1	20	128	0.08	2.59	0.67	2.43	1.77	3.92	0.86	6.65	0.20	23
ANR001GT2	8	16	0.11	1.71	0.69	1.45	2.00	2.53	0.82	6.37	0.25	11
ANR001KH	14	14	0.00	2.18	0.63	1.80	3.74	4.93	0.82	0.00	0.07	105
ANR001NT1	8	112	0.38	1.37	0.49	1.29	0.76	1.48	0.66	1.97	0.60	8
ANR001NT2	6	15	0.14	1.51	0.76	1.29	1.55	1.85	0.84	3.71	0.27	7
ANR001SET1	22	32	0.03	2.61	0.62	2.26	3.89	6.06	0.84	31.08	0.16	46
ANR001SH1	15	187	0.36	1.38	0.26	1.31	1.10	2.68	0.51	3.84	0.53	24.33
ANR001UT1	10	87	0.16	1.99	0.73	1.86	1.07	2.02	0.86	2.92	0.32	10
ANR001UT2	8	15	0.16	1.57	0.60	1.33	2.07	2.59	0.76	6.97	0.40	11.33
ANR001WT1	8	38	0.12	1.91	0.85	1.73	1.30	1.92	0.92	3.09	0.18	8
ANR002GT1	19	159	0.20	1.92	0.36	1.81	1.51	3.55	0.65	5.63	0.29	20.43
ANR002KH	4	4	0.00	1.01	0.69	0.79	2.00	2.16	0.73	0.00	0.25	10
ANR002NT1	14	89	0.32	1.61	0.36	1.49	1.48	2.90	0.61	4.67	0.55	19
ANR002SET1	20	100	0.06	2.70	0.75	2.50	2.00	4.13	0.90	7.52	0.14	20.2
ANR002SH1	17	137	0.13	2.25	0.56	2.12	1.45	3.25	0.79	5.11	0.28	19
ANR002UT1	10	62	0.09	2.19	0.89	2.01	1.27	2.18	0.95	3.37	0.16	10
ANR002UT2	8	15	0.12	1.66	0.66	1.40	2.07	2.59	0.80	6.97	0.33	9.5
ANR002WT1	14	36	0.11	2.11	0.59	1.87	2.33	3.63	0.80	8.42	0.22	23.33
ANR003GT1	7	92	0.24	1.50	0.64	1.42	0.73	1.33	0.77	1.76	0.36	7
ANR003KH1	8	8	0.00	1.64	0.65	1.33	2.83	3.37	0.79	0.00	0.13	36
ANR003KH2	7	7	0.00	1.52	0.65	1.22	2.65	3.08	0.78	0.00	0.14	28
ANR003NT1	17	114	0.32	1.66	0.31	1.55	1.59	3.38	0.59	5.53	0.54	22.25
ANR003NT2	9	15	0.08	1.82	0.68	1.53	2.32	2.95	0.83	9.50	0.20	12.33
ANR003SET1	13	64	0.09	2.31	0.77	2.11	1.63	2.89	0.90	4.93	0.16	13.5
ANR003SH1	5	60	0.42	1.01	0.55	0.94	0.65	0.98	0.62	1.30	0.58	6
ANR003SH2	7	15	0.12	1.61	0.71	1.36	1.81	2.22	0.83	5.11	0.27	8.5
ANR003UT1	16	73	0.13	2.24	0.59	2.05	1.87	3.50	0.81	6.33	0.29	16.14

ANR003WT1	14	14	0.00	2.18	0.63	1.80	3.74	4.93	0.82	0.00	0.07	105
ANR004KH	16	16	0.00	2.30	0.63	1.92	4.00	5.41	0.83	0.00	0.06	136
ANR004NT1	20	103	0.13	2.32	0.51	2.15	1.97	4.10	0.77	7.40	0.28	23
ANR004SET1	25	43	0.04	2.76	0.63	2.42	3.81	6.38	0.86	24.96	0.12	40
ANR004SH1	36	166	0.09	2.87	0.49	2.67	2.79	6.85	0.80	14.15	0.27	39.6
ANR004UT1	16	84	0.09	2.40	0.69	2.22	1.75	3.39	0.87	5.86	0.18	17.5
ANR004UT2	12	12	0.00	2.03	0.63	1.67	3.46	4.43	0.82	0.00	0.08	78
ANR004WT1	10	37	0.29	1.52	0.46	1.36	1.64	2.49	0.66	4.50	0.51	25
ANR005KH1	5	5	0.00	1.21	0.67	0.96	2.24	2.49	0.75	0.00	0.20	15
ANR005KH2	5	5	0.00	1.21	0.67	0.96	2.24	2.49	0.75	0.00	0.20	15
ANR005NT1	21	122	0.09	2.54	0.60	2.37	1.90	4.16	0.83	7.31	0.20	28.5
ANR005SET1	13	45	0.26	1.72	0.43	1.54	1.94	3.15	0.67	6.13	0.49	20
ANR005SET2	6	18	0.18	1.46	0.72	1.27	1.41	1.73	0.82	3.15	0.33	6.5
ANR005SH1	24	94	0.11	2.51	0.51	2.31	2.48	5.06	0.79	10.41	0.28	28
ANR005UT1	12	82	0.12	2.19	0.74	2.03	1.33	2.50	0.88	3.87	0.24	12
ANR005WT1	8	31	0.26	1.43	0.52	1.28	1.44	2.04	0.69	3.49	0.42	18
ANR006KH	17	17	0.00	2.36	0.62	1.97	4.12	5.65	0.83	0.00	0.06	153
ANR006NT1	18	90	0.09	2.47	0.66	2.28	1.90	3.78	0.86	6.77	0.19	18
ANR006SET1	17	44	0.08	2.33	0.61	2.08	2.56	4.23	0.82	10.16	0.18	29
ANR006SH1	21	109	0.19	2.15	0.41	1.99	2.01	4.26	0.70	7.74	0.39	28.2
ANR006SH2	7	16	0.13	1.60	0.71	1.36	1.75	2.16	0.82	4.75	0.25	8.5
ANR006UT1	16	74	0.09	2.41	0.70	2.21	1.86	3.49	0.87	6.28	0.20	16
ANR006WT1	14	14	0.00	2.18	0.63	1.80	3.74	4.93	0.82	0.00	0.07	105
ANR007KH	8	9	0.03	1.65	0.65	1.35	2.67	3.19	0.80	34.61	0.22	18.5
ANR007NT1	22	107	0.08	2.59	0.60	2.40	2.13	4.49	0.84	8.39	0.19	27.25
ANR007SET1	12	29	0.09	2.07	0.66	1.82	2.23	3.27	0.83	7.67	0.21	19.5
ANR007SH1	20	159	0.15	2.17	0.44	2.05	1.59	3.75	0.72	6.05	0.25	22.14
ANR007SH2	8	15	0.10	1.72	0.70	1.46	2.07	2.59	0.83	6.97	0.20	11
ANR007WT1	14	14	0.00	2.18	0.63	1.80	3.74	4.93	0.82	0.00	0.07	105
ANR008KH	15	15	0.00	2.24	0.63	1.86	3.87	5.17	0.83	0.00	0.07	120
ANR009KH	13	15	0.03	2.09	0.62	1.74	3.36	4.43	0.81	46.48	0.20	79

Estimating Relative Frequency (RFR), Relative Density (RDEN), Relative Basal Area (RBA), and Important Value Index (IVI): These are important steps in assessing the structure, composition, and ecological significance of plant species within an Aided Natural Regeneration (ANR) plantation. These indices provide valuable insights into the success of ANR efforts and the overall health of the regenerated ecosystem. In summary, estimating these indices is crucial for understanding the ecological dynamics, biodiversity, and overall success of ANR plantations, enabling informed decision-making and adaptive management practices.

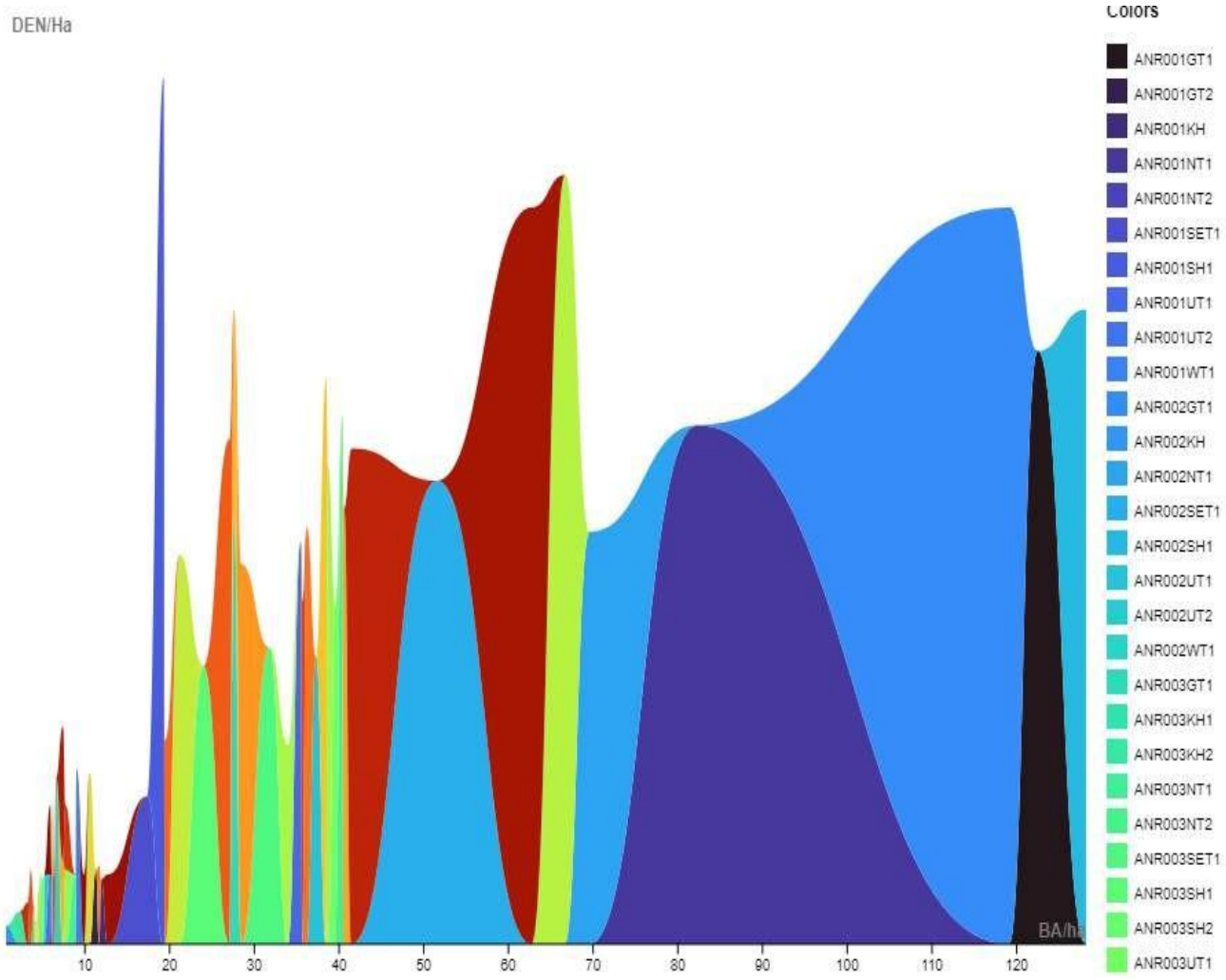


FIGURE 29: STATUS OF TREE DENSITY AND BASAL AREA IN ANR PLANTATION SITES

The X-axis represents density/Ha of the tree species and the Y-axis represents Basal area/Ha for each plantation plots.

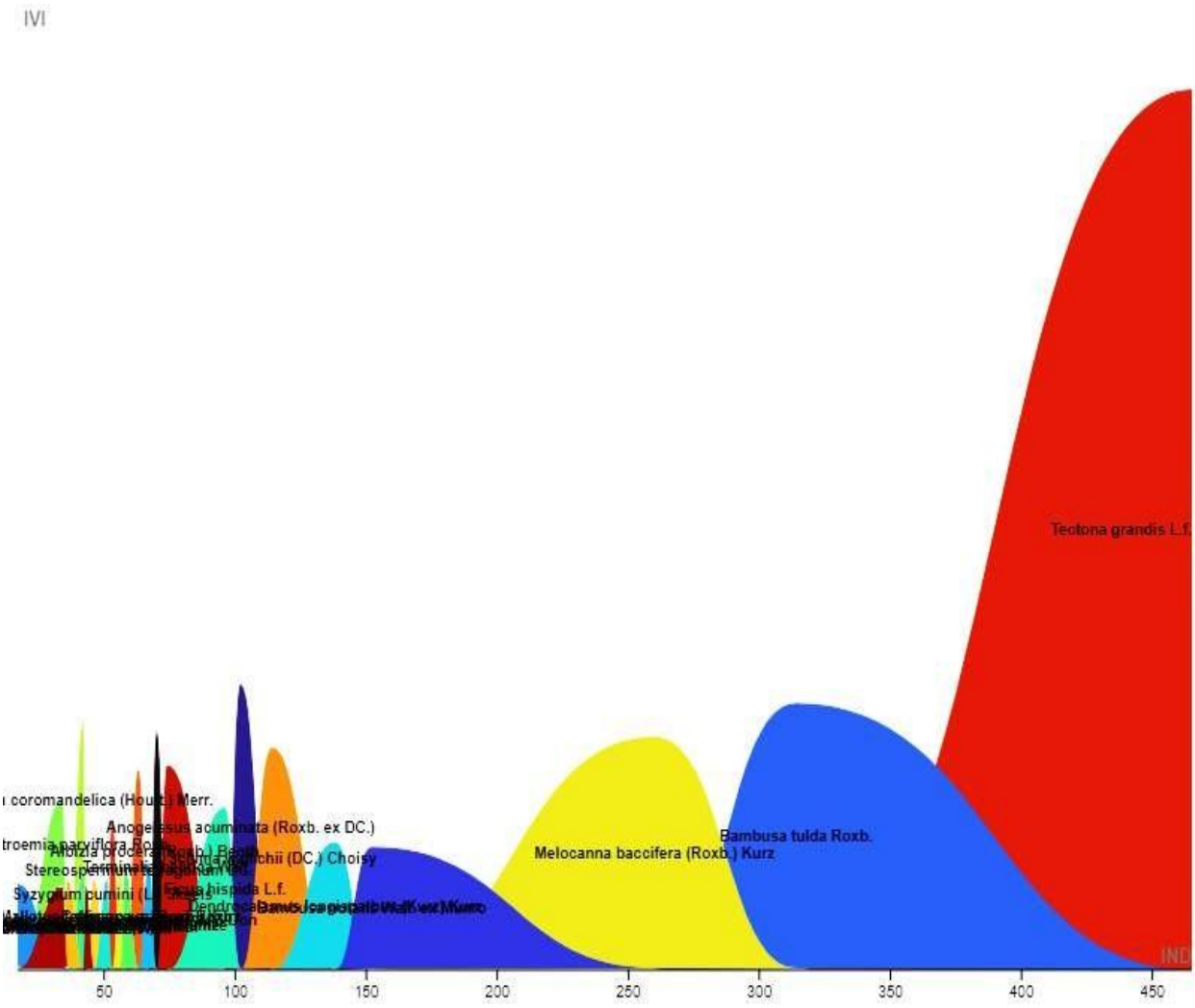


FIGURE 30: CONTRIBUTION OF TOP 25 DOMINANT TREE SPECIES IVI IN ANR PLANTATION SITES

The X-axis represents highest IVI for a tree species and the Y-axis represents no.of individual species.

TABLE 10: RELATIVE FREQUENCY (RFR), RELATIVE DENSITY (RDEN) , RELATIVE BASAL AREA (RBA) AND IMPORTANT VALUE INDEX (IVI) OF TREES IN ANR PLANTATIONS

Sl No.	Species	RFR	RDEN	RBA	IVI
1	Tectona grandis L.f.	3.583	14.1	23.62	41.301
2	Anogeissus acuminata (Roxb. ex DC.) Wall. ex Guill.	3.149	3.093	7.064	13.306
3	Bambusa tulda Roxb.	2.389	9.521	0.522	12.431
4	Albizia procera (Roxb.) Benth.	2.063	2.122	6.896	11.081
5	Melocanna baccifera (Roxb.) Kurz	2.497	7.884	0.466	10.847
6	Schima wallichii (DC.) Choisy	2.063	3.457	4.828	10.347
7	Terminalia belirica Wall.	3.257	2.244	4.006	9.507
8	Stereospermum tetragonum DC.	2.172	1.91	5.207	9.288
9	Ficus hispida L.f.	2.823	2.911	1.793	7.527
10	Syzygium cumini (L.) Skeels	2.28	1.607	3.163	7.05
11	Lannea coromandelica (Houtt.) Merr.	1.52	1.274	4.215	7.008
12	Dendrocalamus longispathus (Kurz) Kurz	1.52	4.184	0.202	5.906
13	Bambusa nutans Wall. ex Munro	0.869	4.609	0.217	5.694
14	Mallotus tetracoccus (Roxb.) Kurz	1.194	1.698	2.092	4.985
15	Callicarpa arborea Roxb.	1.52	2.032	1.349	4.9
16	Holarrhena pubescens Wall. & G.Don	1.954	1.759	0.898	4.612
17	Ficus semicordata Buch.Ham. ex Sm.	1.629	1.274	1.505	4.407
18	Mitragyna rotundifolia (Roxb.) Kuntze	1.737	1.395	0.988	4.12
19	Elaeocarpus floribundus Blume	1.412	1.546	1.153	4.111
20	Lagerstroemia parviflora Roxb.	2.28	1.031	0.73	4.041
21	Pterospermum acerifolium (L.) Willd.	1.194	1.092	1.722	4.008
22	Bombax ceiba L.	0.869	0.515	2.481	3.865
23	Vitex peduncularis Wall.	1.52	1.304	0.997	3.821
24	Toona ciliata M.Roem.	1.194	1.031	1.568	3.793
25	Sterculia villosa Roxb.	1.412	1.031	1.269	3.711
26	Litsea glutinosa (Lour.) C.B.Rob.	1.737	0.94	0.993	3.67
27	Derris robusta (Roxb. ex DC.) Benth.	1.412	1.122	1.05	3.583
28	Oroxylum indicum (L.) Benth. ex Kurz	1.954	0.728	0.31	2.992
29	Microcos paniculata L.	1.086	0.97	0.617	2.673
30	Artocarpus chama Buch.Ham.	0.76	0.637	1.263	2.66
31	Senna siamea (Lam.) H.S.Irwin & Barneby	0.869	0.637	0.891	2.397
32	Macaranga peltata (Roxb.) Müll.Arg.	0.76	0.758	0.868	2.386
33	Litsea monopetala (Roxb.) Pers.	0.977	0.637	0.535	2.149
34	Parkia javanica (Lam.) Merr.	0.977	0.849	0.087	1.913
35	Dipterocarpus turbinatus C.F.Gaertn.	0.543	0.303	1.015	1.861
36	Careya arborea Roxb.	0.869	0.455	0.477	1.8
37	Artocarpus heterophyllus Lam.	0.869	0.515	0.361	1.745
38	Bambusa balcooa Roxb.	0.543	1.061	0.14	1.744
39	Mallotus philippensis (Lam.) Müll.Arg	1.086	0.455	0.189	1.73
40	Shorea robusta C.F.Gaertn.	0.76	0.364	0.523	1.647

41	Aquilaria malaccensis Lam.	0.869	0.637	0.041	1.546
42	Tamarindus indica L.	0.869	0.546	0.13	1.545
43	Albizia chinensis (Osbeck) Merr.	0.434	0.273	0.799	1.507
44	Chaetocarpus castanicarpus (Roxb.) Thwaites	0.543	0.425	0.487	1.454
45	Dillenia indica L.	0.869	0.455	0.12	1.444
46	Artocarpus lacucha Buch.Ham.	0.543	0.303	0.583	1.429
47	Terminalia phillyreifolia (Van Heurck & Müll.Arg.) Gere	0.326	0.273	0.804	1.402
48	Bridelia tomentosa Blume	0.76	0.394	0.211	1.365
49	Swietenia mahagoni (L.) Jacq.	0.76	0.485	0.103	1.348
50	Hymenodictyon orixense (Roxb.) Mabb.	0.543	0.334	0.436	1.313
51	Phyllanthus emblica L.	0.869	0.364	0.054	1.286
52	Streblus asper Lour.	0.543	0.425	0.309	1.277
53	Terminalia arjuna (Roxb. ex DC.) Wight & Arn.	0.543	0.576	0.083	1.202
54	Gmelina arborea Roxb.	0.651	0.303	0.233	1.188
55	Garuga pinnata Roxb.	0.76	0.243	0.177	1.18
56	Pterospermum lanceifolium Roxb.	0.543	0.182	0.339	1.063
57	Acacia auriculiformis A.Cunn. ex Benth.	0.651	0.303	0.104	1.059
58	Erythrina arborescens Roxb.	0.543	0.121	0.392	1.056
59	Ceiba pentandra (L.) Gaertn.	0.543	0.182	0.328	1.052
60	Aegle marmelos (L.) Corrêa	0.76	0.243	0.022	1.025
61	Firmiana colorata (Roxb.) R.Br.	0.543	0.273	0.201	1.016
62	Bauhinia acuminata L.	0.76	0.182	0.057	0.999
63	Ficus auriculata Lour.	0.434	0.273	0.16	0.867
64	Balakata baccata (Roxb.) Esser	0.543	0.121	0.187	0.851
65	Mangifera indica L.	0.326	0.152	0.359	0.836
66	Peltophorum pterocarpum (DC.) Backer ex K.Heyne	0.326	0.334	0.162	0.821
67	Thyrsostachys oliveri Gamble	0.326	0.455	0.022	0.802
68	Cassia fistula L.	0.543	0.121	0.135	0.799
69	Engelhardia spicata Lesch. ex Bl.	0.326	0.061	0.373	0.76
70	Lepisanthes rubiginosa (Roxb.) Leenh.	0.434	0.091	0.217	0.742
71	Alstonia scholaris (L.) R. Br.	0.434	0.121	0.127	0.683
72	Caryota urens L.	0.434	0.121	0.105	0.661
73	Terminalia chebula Retz.	0.326	0.212	0.12	0.658
74	Suregada multiflora (A.Juss.) Baill.	0.434	0.121	0.1	0.655
75	Ficus racemosa L.	0.326	0.091	0.23	0.647
76	Ziziphus xylopyrus (Retz.) Willd.	0.434	0.091	0.088	0.614
77	Areca catechu L.	0.217	0.303	0.091	0.612
78	Aphanamixis polystachya (Wall.) R.Parker	0.434	0.091	0.076	0.602
79	Syzygium jambos (L.) Alston	0.326	0.212	0.058	0.596
80	Mimusops elengi Bojer	0.326	0.243	0.02	0.588
81	Garcinia cowa Roxb.	0.434	0.091	0.058	0.583
82	Glochidion zeylanicum (Gaertn.) A.Juss.	0.434	0.091	0.053	0.578
83	Alangium chinense (Lour.) Harms	0.217	0.212	0.142	0.572
84	Castanopsis indica (Roxb. ex Lindl.) A.DC.	0.326	0.121	0.121	0.568
85	Dillenia pentagyna Roxb.	0.434	0.091	0.03	0.555
86	Bridelia retusa (L.) A.Juss.	0.434	0.091	0.029	0.554

87	Maesa indica (Roxb.) Sweet	0.217	0.182	0.146	0.545
88	Carica papaya L.	0.217	0.243	0.073	0.533
89	Glochidion multiloculare (Roxb. ex Willd.) Voigt	0.326	0.121	0.074	0.521
90	Syzygium nervosum DC.	0.326	0.121	0.063	0.51
91	Trema orientalis (L.) Blume	0.326	0.091	0.082	0.498
92	Melia azadirachta L.	0.217	0.091	0.186	0.494
93	Spondias pinnata (L.f.) Kurz	0.326	0.091	0.064	0.481
94	Aporosa octandra (Buch.Ham. ex D.Don) Vickery	0.217	0.182	0.064	0.463
95	Mallotus nudiflorus (L.) Kulju & Welzen	0.217	0.091	0.151	0.46
96	Gardenia resinifera Roth	0.326	0.091	0.042	0.459
97	Macaranga denticulata (Blume) Müll.Arg.	0.326	0.061	0.067	0.454
98	Saraca asoca (Roxb.) Willd.	0.326	0.091	0.036	0.453
99	Spatholobus parviflorus (DC.) Kuntze	0.326	0.091	0.031	0.447
100	Ficus nervosa Roth	0.326	0.061	0.057	0.443
101	Neolitsea zeylanica (Nees & T. Nees) Merr.	0.217	0.091	0.132	0.44
102	Azadirachta indica A.Juss.	0.326	0.091	0.014	0.431
103	Hevea brasiliensis (Willd. ex A.Juss.) Müll.Arg.	0.217	0.091	0.111	0.42
104	Bambusa vulgaris Nees	0.217	0.152	0.023	0.392
105	Phyllodium pulchellum (L.) Desv.	0.217	0.061	0.087	0.365
106	Dalbergia sissoo Roxb. ex DC.	0.217	0.091	0.042	0.35
107	Albizia julibrissin Durazz.	0.217	0.03	0.092	0.339
108	Bischofia javanica Blume	0.217	0.03	0.092	0.339
109	Markhamia stipulata (Wall.) Seem.	0.217	0.061	0.062	0.339
110	Tetrameles nudiflora R.Br.	0.217	0.03	0.083	0.33
111	Borassus flabellifer L.	0.217	0.03	0.074	0.321
112	Grewia acuminata Juss.	0.217	0.061	0.043	0.321
113	Butea monosperma (Lam.) Kuntze	0.217	0.061	0.033	0.311
114	Delonix regia (Bojer ex Hook.) Raf.	0.217	0.061	0.032	0.31
115	Ziziphus rugosa Lam.	0.217	0.061	0.031	0.309
116	Zanthoxylum rhetsa (Roxb.) DC.	0.217	0.03	0.057	0.305
117	Ziziphus jujuba Mill.	0.217	0.03	0.057	0.305
118	Ziziphus oenopolia (L.) Mill.	0.217	0.03	0.057	0.305
119	Carallia brachiata (Lour.) Merr.	0.217	0.061	0.024	0.302
120	Elaeocarpus robustus Roxb.	0.217	0.03	0.037	0.284
121	Knema angustifolia (Roxb.) Warb.	0.217	0.03	0.037	0.284
122	Eurya acuminata DC.	0.217	0.03	0.034	0.282
123	Adenanthera pavonina L.	0.217	0.061	0.002	0.28
124	Bambusa polymorpha Munro	0.217	0.061	0.001	0.279
125	Macropanax undulatus (Wall. ex G.Don) Seem.	0.217	0.03	0.031	0.278
126	Erythrina variegata L.	0.217	0.03	0.028	0.275
127	Horsfieldia amygdalina (Wall.) Warb.	0.217	0.03	0.025	0.273
128	Calliandra umbrosa (wall.) Benth.	0.217	0.03	0.023	0.271
129	Grewia serratula Baill.	0.217	0.03	0.02	0.267
130	Actinodaphne obovata (Nees) Blume	0.217	0.03	0.019	0.266
131	Allophylus serratus (Hiern) Kurz	0.217	0.03	0.018	0.265
132	Garcinia xanthochymus Hook.f.	0.217	0.03	0.018	0.265

133	Protium serratum Engl.	0.217	0.03	0.018	0.265
134	Albizia lebbeck (L.) Benth.	0.217	0.03	0.016	0.264
135	Pongamia pinnata (L.) Pierre	0.217	0.03	0.01	0.258
136	Bauhinia variegata L.	0.217	0.03	0.006	0.254
137	Bridelia micrantha (Hochst.) Baill.	0.217	0.03	0.006	0.254
138	Caesalpinia bonduc (L.) Roxb.	0.217	0.03	0.006	0.254
139	Callicarpa longifolia Lam.	0.217	0.03	0.006	0.254
140	Canthium dicoccum (Gaertn.) Merr.	0.217	0.03	0.004	0.252
141	Mallotus roxburghianus Müll.Arg.	0.217	0.03	0.003	0.251
142	Duabanga grandiflora (Roxb. ex DC.) Walp.	0.217	0.03	0.002	0.249

Data arranged based on ascending order of IVI values for each studied species

REGENERATION STATUS IN ANR:

Plant diversity status in ANR regeneration plots:

The status of plant regeneration pattern in an Aided Natural Regeneration (ANR) plantation refers to the current state and trends of plant regrowth and establishment within the restored area. ANR involves allowing natural processes to drive vegetation recovery, with minimal human intervention. Regular monitoring and assessment of these factors will provide insights into the trajectory of the ANR plantation's development. It helps determine if the ANR efforts are successfully restoring a diverse and functional ecosystem, and whether any adaptive management actions are required to enhance the regeneration process.

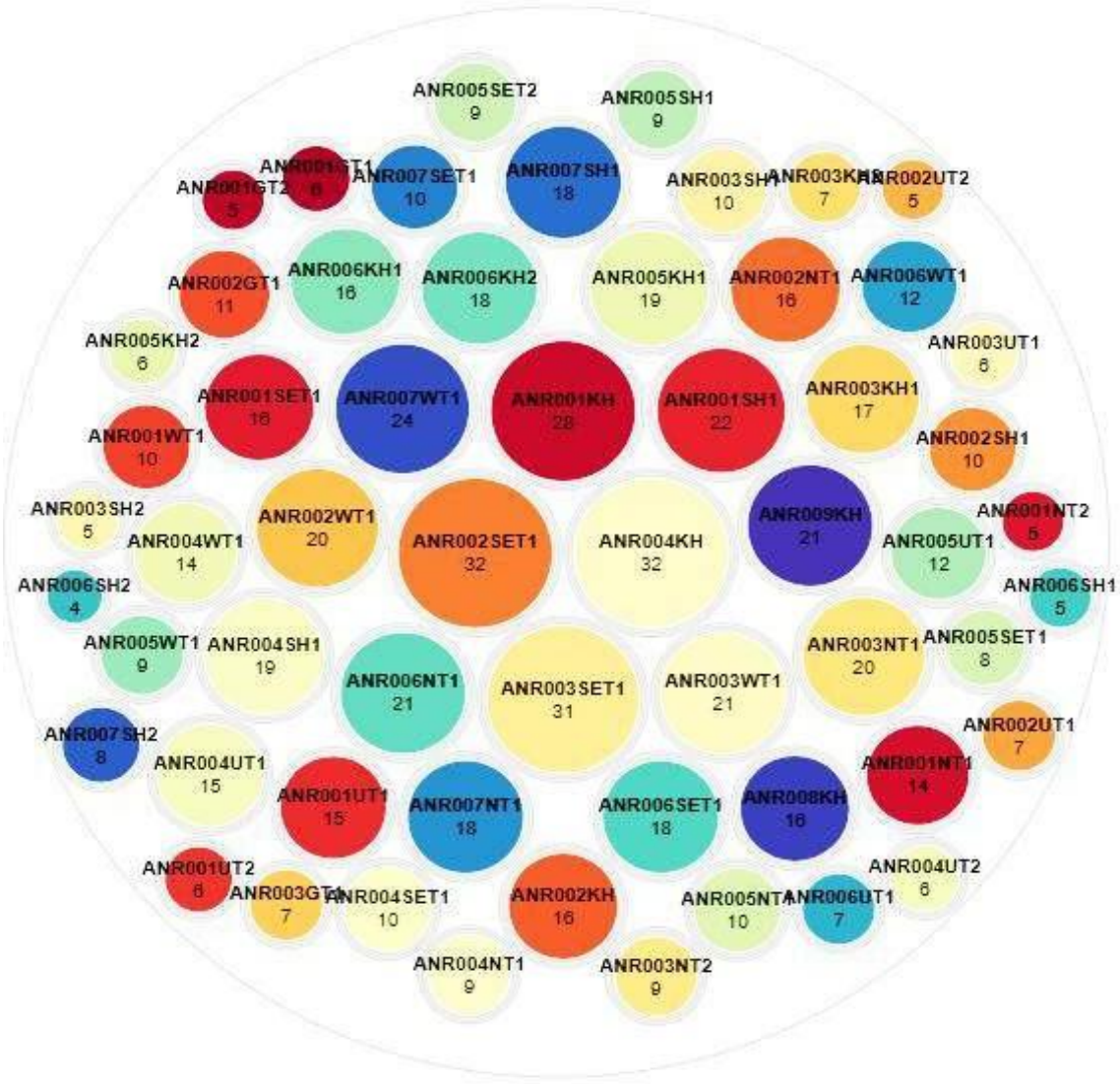


FIGURE 31: STATUS OF SPECIES RICHNESS IN ANR REGENERATION PLOTS

Circle graph showing the species richness of regeneration across the ANR plantation sites (Larger size denotes high richness.

Species Richness: A plant species diversity ranging between 4 and 32 species in a regeneration plot of an Aided Natural Regeneration (ANR) plantation indicates the number of different plant species that have naturally regenerated and established in that specific area. Plant species diversity is a key indicator of the ecological health and richness of an ecosystem. When plant species diversity range of 4-32 in an ANR regeneration plot is a reflection of the richness and complexity of the plant community in that specific area. A higher diversity generally indicates a more resilient and ecologically valuable ecosystem, but interpretation should account for various factors influencing the specific context of the ANR plantation.

Shannon Diversity Index: A Shannon Diversity Index that ranges between 1.08 and 3.10 in a regeneration plot of an Aided Natural Regeneration (ANR) plantation reflects the level of species diversity present in that specific area. The Shannon Diversity Index takes into account both the number of different species (species richness) and their relative abundance. In summary, a Shannon Diversity Index range of 1.08 - 3.10 in an ANR regeneration plot reflects the diversity and evenness of the plant community in that specific area. A higher diversity generally indicates a more resilient and ecologically valuable ecosystem, but interpretation should consider various factors influencing the ANR plantation's specific context.

Structure of regeneration Plots:

A plant density per hectare that ranges between 60 and 970 in a regeneration plot of an Aided Natural Regeneration (ANR) plantation refers to the number of individual plants of various species that have naturally regenerated and established within that specific area. Plant density is a key indicator of the abundance of vegetation and the ecological success of the regeneration process. Here's how to interpret the range of 60-970 plants per hectare: Closer to 60: A plant density of around 60 plants per hectare suggests a lower density of regenerating plants. This might indicate early stages of regeneration or a site with certain limiting factors that influence the establishment of vegetation. Closer to 970: A plant density of around 970 plants per hectare indicates a higher density of regenerating plants. This suggests more successful regeneration efforts, possibly with a mix of pioneer, early-successional, and potentially mid-successional species. A Basal Area per hectare that ranges between 0.07 and 1.20 in a regeneration plot of an Aided Natural Regeneration (ANR) plantation refers to the total cross-sectional area of tree trunks at breast height (usually 1.3 meters above the ground) within that specific area. Basal area is a key indicator of the amount of space occupied by tree trunks, which provides insights into tree density and canopy cover. Here's how to interpret the range of 0.07-1.20 square meters per hectare: Closer to 0.07: A basal area of around 0.07 square meters per hectare indicates a lower density of tree trunks and potentially a more open canopy. This might reflect early stages of regeneration or a site with certain limiting factors that influence tree growth. Closer to 1.20: A basal area of around 1.20 square meters per hectare suggests a higher density of tree trunks and a denser canopy. This suggests more successful tree regeneration efforts, with a greater number of trees occupying the space.

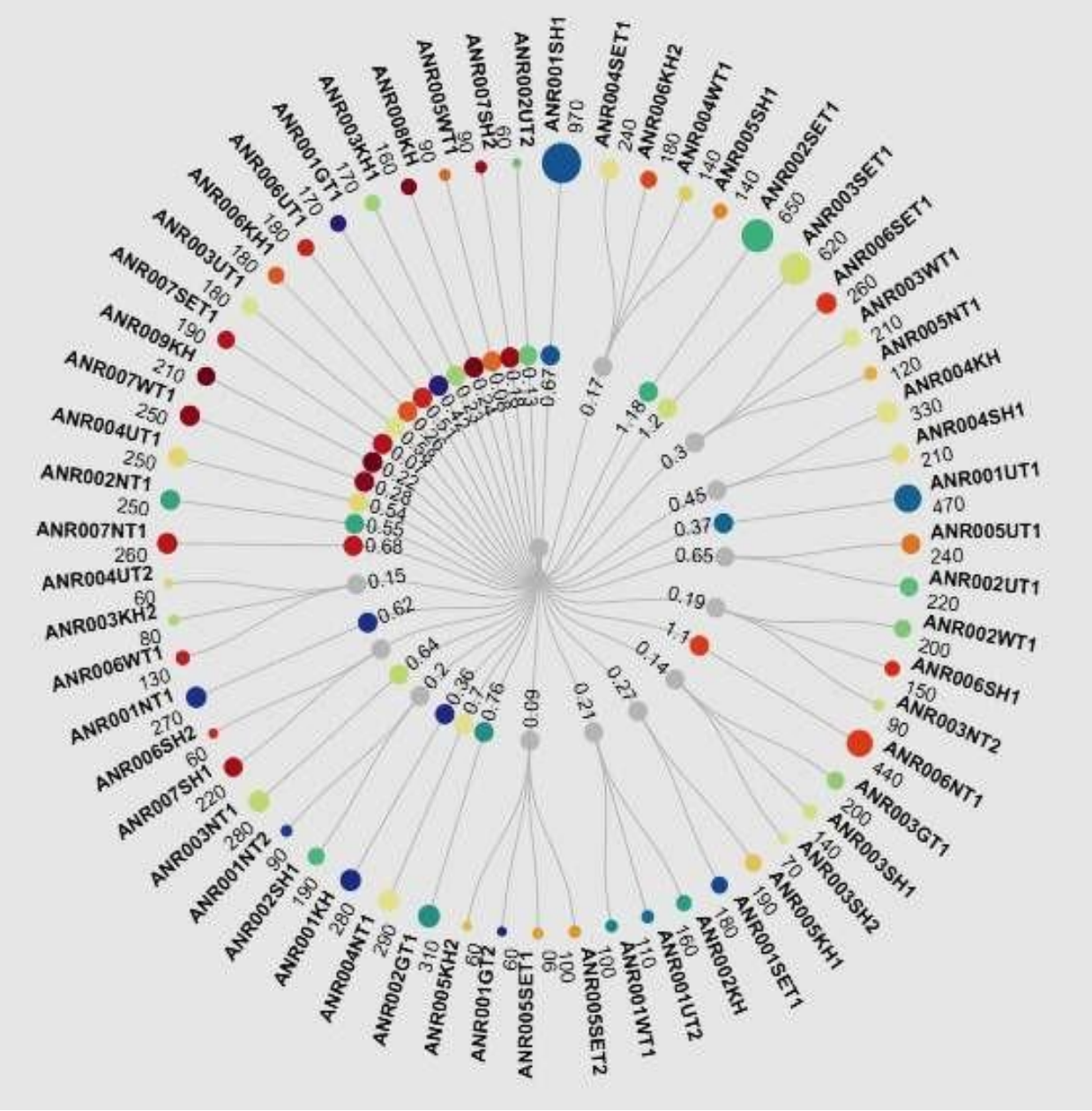


FIGURE 32: STATUS OF SPECIES DENSITY AND BASAL AREA IN ANR REGENERATION PLOTS

The outer circle of the color code showing no.of individual species and adjoining the inner circle of the color code represent Shannon index of the regeneration species.

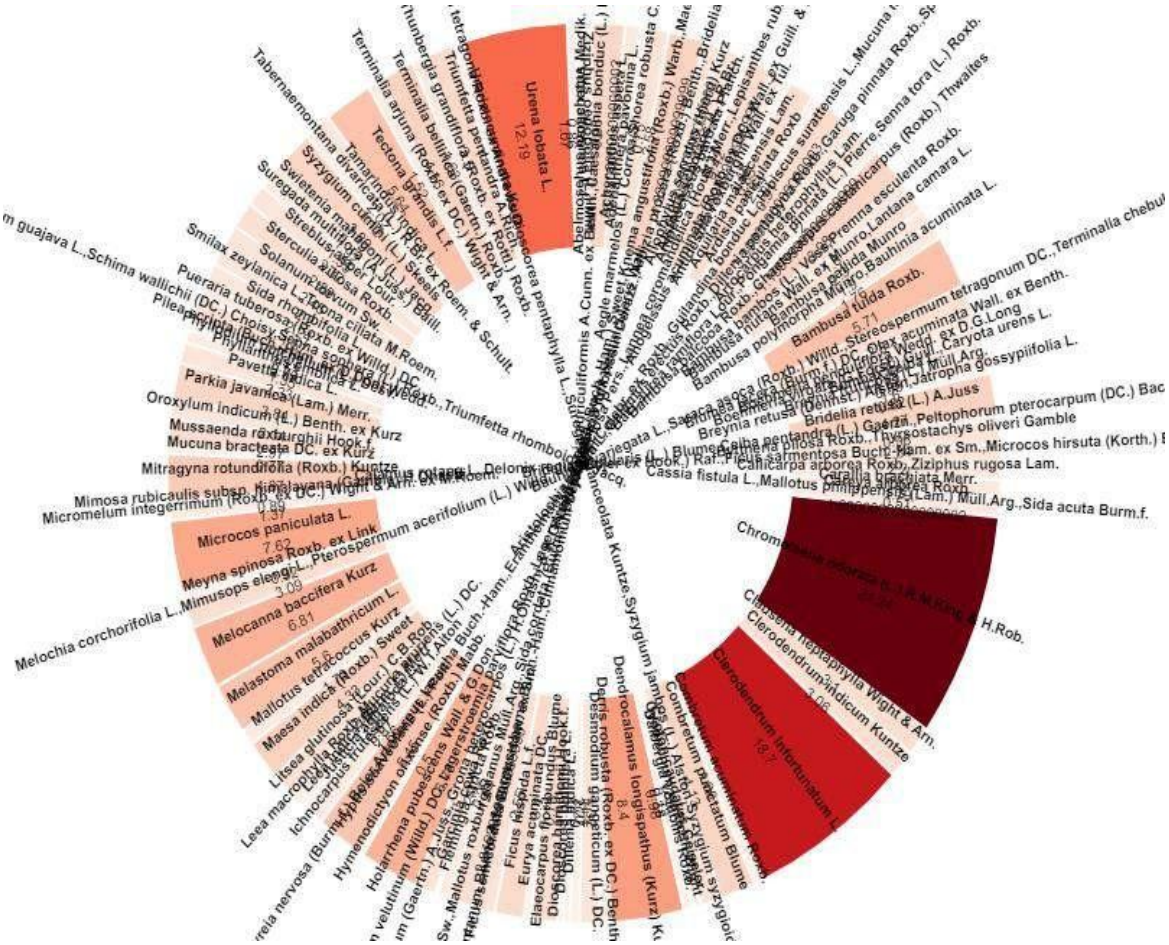


FIGURE 33: IVI OF TOP DOMINANT SPECIES IN ANR REGENERATION PLOTS

The graph with darker color code and size denotes higher IVI values

STATUS OF SPECIES IN ANR REGENERATION PLOTS:

It seems like you've provided a table with data related to various plant species and their characteristics within a regeneration plot of an Aided Natural Regeneration (ANR) plantation. Each row represents a different plant species, and the columns provide information about various aspects of the species' presence and characteristics. Here's a breakdown of the columns and what they represent:

Species: The name of the plant species.

OCC: Occurrence, which likely indicates the number of times the species was observed.

IND: Individual count, indicating the number of individual plants of that species.

FR: Frequency, representing the percentage of plots where the species was observed.

RFR: Relative Frequency, calculated by dividing the frequency by the total number of plots.

DEN/Ha: Density per hectare, indicating the number of individuals of that species per hectare.

RDEN: Relative Density, calculated by dividing the density per hectare by the total density of all species.

BA: Basal Area, the cross-sectional area of tree trunks at breast height.

BAM2: Basal Area per square meter, calculated by dividing basal area by the square meter.

BA/Ha: Basal Area per hectare, indicating the total basal area for the species per hectare.

RBA: Relative Basal Area, calculated by dividing the basal area per hectare by the total basal area of all species.

IVI: Important Value Index, combining measures like relative frequency, relative density, and relative basal area to assess the species' overall importance within the ecosystem.

AVE GBH: Average Girth at Breast Height, providing the average circumference of the trunk at breast height.

AVE HT: Average Height, indicating the average height of the plants.

TABLE 11: STATUS OF PLANT DIVERSITY IN REGENERATION PLOTS OF ANR PLANTATION

Sl. No.	ANR PLANTATION	Taxa_S	Individuals	Dominance_D	Shannon_H	Evenness_e^H/S	Menhinick	Fisher_alpha	Chao-1
1	ANR001GT1	6	17	0.20	1.45	0.71	1.46	3.31	6
2	ANR001GT2	5	6	0.07	1.23	0.68	2.04	14.12	8
3	ANR001KH	28	28	0.00	2.85	0.62	5.29	0.00	406
4	ANR001NT1	14	27	0.11	2.08	0.57	2.69	11.71	23
5	ANR001NT2	5	9	0.14	1.30	0.73	1.67	4.63	5.333
6	ANR001SET1	16	18	0.02	2.29	0.62	3.77	69.23	121
7	ANR001SH1	22	97	0.08	2.53	0.57	2.23	8.87	31
8	ANR001UT1	15	47	0.08	2.33	0.68	2.19	7.61	16.2
9	ANR001UT2	6	11	0.09	1.54	0.78	1.81	5.40	6
10	ANR001WT1	10	10	0.00	1.85	0.64	3.16	0.00	55
11	ANR002GT1	11	31	0.11	1.98	0.66	1.98	6.09	16
12	ANR002KH	16	16	0.00	2.30	0.63	4.00	0.00	136
13	ANR002NT1	16	25	0.05	2.30	0.62	3.20	19.17	82
14	ANR002SET1	32	65	0.02	3.10	0.70	3.97	24.96	37.5
15	ANR002SH1	10	19	0.08	1.95	0.70	2.29	8.54	11.2
16	ANR002UT1	7	22	0.10	1.80	0.87	1.49	3.54	7
17	ANR002UT2	5	6	0.07	1.23	0.68	2.04	14.12	8
18	ANR002WT1	20	20	0.00	2.52	0.62	4.47	0.00	210
19	ANR003GT1	7	20	0.14	1.66	0.75	1.57	3.83	7.5
20	ANR003KH1	17	17	0.00	2.36	0.62	4.12	0.00	153
21	ANR003KH2	7	8	0.04	1.53	0.66	2.48	26.78	14.5
22	ANR003NT1	20	28	0.04	2.46	0.58	3.78	31.30	88
23	ANR003NT2	9	9	0.00	1.75	0.64	3.00	0.00	45
24	ANR003SET1	31	62	0.03	3.04	0.68	3.94	24.67	41.11
25	ANR003SH1	10	14	0.11	1.74	0.57	2.67	15.65	46
26	ANR003SH2	5	7	0.14	1.19	0.66	1.89	7.82	11
27	ANR003UT1	6	18	0.12	1.63	0.85	1.41	3.15	6

28	ANR003WT1	21	21	0.00	2.57	0.62	4.58	0.00	231
29	ANR004KH	32	33	0.00	2.99	0.62	5.57	522.60	264.5
30	ANR004NT1	9	29	0.11	1.92	0.76	1.67	4.47	9.333
31	ANR004SET1	10	24	0.08	2.05	0.77	2.04	6.44	10
32	ANR004SH1	19	21	0.01	2.46	0.62	4.15	96.48	172
33	ANR004UT1	15	25	0.06	2.25	0.63	3.00	15.83	30
34	ANR004UT2	6	6	0.00	1.38	0.66	2.45	0.00	21
35	ANR004WT1	14	14	0.00	2.18	0.63	3.74	0.00	105
36	ANR005KH1	19	19	0.00	2.47	0.62	4.36	0.00	190
37	ANR005KH2	6	6	0.00	1.38	0.66	2.45	0.00	21
38	ANR005NT1	10	12	0.03	1.88	0.65	2.89	28.23	19.33
39	ANR005SET1	8	9	0.03	1.65	0.65	2.67	34.61	18.5
40	ANR005SET2	9	10	0.02	1.76	0.65	2.85	43.45	23
41	ANR005SH1	9	14	0.09	1.76	0.65	2.41	10.88	14
42	ANR005UT1	12	24	0.07	2.13	0.70	2.45	9.55	14.5
43	ANR005WT1	9	9	0.00	1.75	0.64	3.00	0.00	45
44	ANR006KH1	16	18	0.01	2.32	0.64	3.77	69.23	46.33
45	ANR006KH2	18	18	0.00	2.42	0.62	4.24	0.00	171
46	ANR006NT1	21	44	0.06	2.56	0.62	3.17	15.75	43
47	ANR006SET1	18	26	0.02	2.51	0.68	3.53	25.89	23
48	ANR006SH1	5	15	0.19	1.36	0.78	1.29	2.63	5
49	ANR006SH2	4	6	0.13	1.08	0.74	1.63	5.25	4.333
50	ANR006UT1	7	18	0.10	1.74	0.82	1.65	4.21	7
51	ANR006WT1	12	13	0.01	2.04	0.64	3.33	75.95	39.5
52	ANR007NT1	18	26	0.03	2.46	0.65	3.53	25.89	31.2
53	ANR007SET1	10	19	0.09	1.90	0.67	2.29	8.54	25
54	ANR007SH1	18	22	0.02	2.43	0.63	3.84	46.30	53
55	ANR007SH2	8	9	0.03	1.65	0.65	2.67	34.61	18.5
56	ANR007WT1	24	25	0.00	2.70	0.62	4.80	295.90	150.5
57	ANR008KH	16	16	0.00	2.30	0.63	4.00	0.00	136
58	ANR009KH	21	21	0.00	2.57	0.62	4.58	0.00	231

TABLE 12: STATUS OF PLANT IN ANR REGENERATION PLOTS

Sl. No.	Species	RFR	RDEN	RBA	IVI
1	Chromolaena odorata (L.) R.M.King & H.Rob.	4.45	9.85	9.95	24.24
2	Clerodendrum infortunatum L.	3.62	6.75	8.32	18.7
3	Urena lobata L.	3.21	4.72	4.27	12.19
4	Dendrocalamus longispathus (Kurz) Kurz	1.86	3.01	3.53	8.4
5	Microcos paniculata L.	1.97	2.28	3.37	7.62
6	Melocanna baccifera Kurz	1.55	2.28	2.98	6.81
7	Holarrhena pubescens Wall. & G.Don	2.48	2.52	1.78	6.78
8	Bambusa tulda Roxb.	1.45	2.52	1.74	5.71
9	Tectona grandis L.f.	1.35	2.12	2.18	5.64
10	Melastoma malabathricum L.	1.14	1.71	2.75	5.6
11	Hyptis suaveolens (L.) Poit.	1.55	1.55	2.35	5.45
12	Mitragyna rotundifolia (Roxb.) Kuntze	1.76	1.55	1.56	4.87
13	Maesa indica (Roxb.) Sweet	1.04	1.95	1.34	4.33
14	Bridelia retusa (L.) A.Juss	1.14	1.3	1.83	4.27
15	Terminalia bellirica (Gaertn.) Roxb.	1.66	1.79	0.71	4.16
16	Combretum punctatum Blume	1.04	1.3	1.79	4.13
17	Syzygium cumini (L.) Skeels	1.76	1.38	0.75	3.89
18	Parkia javanica (Lam.) Merr.	1.66	1.22	0.97	3.84
19	Triumfetta pentandra A.Rich.	1.24	1.38	0.87	3.5
20	Ficus hispida L.f.	1.24	1.3	0.86	3.4
21	Clausena heptaphylla Wight & Arn.	1.14	1.14	0.82	3.1
22	Elaeocarpus floribundus Blume	1.14	0.81	1.13	3.08
23	Clerodendrum indicum Kuntze	0.62	1.3	1.13	3.06
24	Mussaenda roxburghii Hook.f.	0.72	0.81	1.43	2.97
25	Aquilaria malaccensis Lam.	1.04	0.81	1.09	2.94
26	Sterculia villosa Roxb.	0.72	0.81	1.35	2.89
27	Litsea glutinosa (Lour.) C.B.Rob.	1.14	0.9	0.66	2.69
28	Ficus semicordata Buch.-Ham. ex Sm.	0.62	0.73	1.19	2.55
29	Solanum torvum Sw.	0.72	0.57	1.16	2.45
30	Streblus asper Lour.	1.14	0.98	0.26	2.37
31	Pavetta indica L.	0.93	1.06	0.34	2.33
32	Desmodium gangeticum (L.) DC.	0.93	0.81	0.53	2.27
33	Sida rhombifolia L.	0.93	0.9	0.42	2.24
34	Allophylus serratus (Hiern) Kurz	0.72	1.06	0.45	2.23
35	Oroxylum indicum (L.) Benth. ex Kurz	0.72	0.57	0.85	2.14
36	Tamarindus indica L.	0.72	0.49	0.81	2.02
37	Artocarpus heterophyllus Lam.	0.72	0.49	0.79	2
38	Bambusa balcooa Roxb.	0.52	0.73	0.74	1.99
39	Chaetocarpus castanicarpus (Roxb.) Thwaites	0.52	0.73	0.74	1.99
40	Swietenia mahagoni (L.) Jacq.	0.62	0.41	0.89	1.92
41	Bambusa pallida Munro	0.21	1.3	0.39	1.9
42	Carallia brachiata Merr.	0.52	0.65	0.62	1.79

43	Achyranthes aspera L.	0.52	0.49	0.74	1.75
44	Mallotus tetracoccus Kurz	0.52	0.65	0.56	1.73
45	Ichnocarpus frutescens (L.) W.T.Aiton	0.93	0.65	0.08	1.66
46	Thunbergia grandiflora (Roxb. ex Rottl.) Roxb.	0.83	0.65	0.15	1.63
47	Breynia fruticosa (L.) Müll.Arg.	0.41	0.41	0.77	1.6
48	Pueraria tuberosa (Roxb. ex Willd.) DC.	0.72	0.57	0.27	1.57
49	Suregada multiflora (A.Juss.) Baill.	0.52	0.33	0.71	1.55
50	Terminalia arjuna (Roxb. ex DC.) Wight & Arn.	0.72	0.49	0.3	1.52
51	Anogeissus acuminata (Roxb. ex DC.) Wall. ex Guill. & Perr.	0.41	0.41	0.66	1.48
52	Flemingia stricta Roxb.	0.62	0.41	0.41	1.44
53	Micromelum integerrimum (Roxb. ex DC.) Wight & Arn. ex M.Ro	0.52	0.33	0.53	1.37
54	Boehmeria penduliflora Wedd. ex D.G.Long	0.41	0.33	0.62	1.36
55	Phyllanthus emblica L.	0.52	0.49	0.35	1.35
56	Derris robusta (Roxb. ex DC.) Benth.	0.52	0.33	0.48	1.32
57	Aegle marmelos (L.) Corrêa	0.52	0.33	0.45	1.29
58	Shorea robusta C.F.Gaertn.	0.62	0.57	0.1	1.29
59	Acacia auriculiformis A.Cunn. ex Benth.	0.41	0.33	0.52	1.26
60	Caesalpinia bonduc (L.) Roxb.	0.52	0.33	0.41	1.26
61	Dracaena spicata Roxb.	0.31	0.33	0.62	1.26
62	Glochidion zeylanicum (Gaertn.) A.Juss.	0.41	0.33	0.47	1.21
63	Grona heterocarpos (L.) H.Ohashi & K.Ohashi	0.41	0.41	0.39	1.21
64	Byttneria pilosa Roxb.	0.62	0.41	0.14	1.17
65	Thyrsostachys oliveri Gamble	0.41	0.57	0.19	1.17
66	Bambusa nutans Wall. ex Munro	0.31	0.41	0.43	1.15
67	Lantana camara L.	0.41	0.33	0.41	1.15
68	Dillenia indica L.	0.62	0.41	0.11	1.14
69	Tabernaemontana divaricata (L.) R.Br. ex Roem. & Schult.	0.41	0.24	0.46	1.12
70	Smilax zeylanica L.	0.62	0.41	0.07	1.1
71	Toona ciliata M.Roem.	0.52	0.33	0.26	1.1
72	Vitex altissima L.f.	0.41	0.41	0.25	1.07
73	Combretum acuminatum Roxb.	0.31	0.41	0.34	1.06
74	Melochia corchorifolia L.	0.41	0.24	0.37	1.03
75	Mimusops elengi L.	0.41	0.24	0.37	1.03
76	Pterospermum acerifolium (L.) Willd.	0.31	0.33	0.39	1.03
77	Uraria acuminata Kurz	0.41	0.24	0.34	1
78	Dalbergia volubilis Roxb.	0.31	0.33	0.35	0.98
79	Abelmoschus moschatus Medik.	0.31	0.24	0.4	0.96
80	Meyna spinosa Roxb. ex Link	0.21	0.24	0.46	0.92
81	Ardisia paniculata Roxb	0.41	0.24	0.26	0.91
82	Bambusa bambos (L.) Voss	0.41	0.24	0.25	0.9
83	Premna esculenta Roxb.	0.41	0.24	0.24	0.9
84	Mimosa rubicaulis subsp. himalayana (Gamble) H.Ohashi	0.31	0.24	0.33	0.89
85	Bambusa polymorpha Munro	0.41	0.41	0.06	0.88
86	Bauhinia acuminata L.	0.31	0.24	0.32	0.88
87	Justicia adhatoda L.	0.21	0.24	0.42	0.87
88	Ziziphus oenopolia (L.) Mill.	0.31	0.24	0.31	0.86

89	Antidesma roxburghii Wall. ex Tul.	0.31	0.24	0.3	0.85
90	Callicarpa arborea Roxb.	0.31	0.16	0.33	0.81
91	Ziziphus rugosa Lam.	0.41	0.24	0.15	0.81
92	Dioscorea bulbifera L.	0.41	0.33	0.06	0.8
93	Blumea lacera (Burm.f.) DC.	0.31	0.16	0.31	0.79
94	Olax acuminata Wall. ex Benth.	0.21	0.24	0.34	0.79
95	Eurya acuminata DC.	0.31	0.24	0.22	0.78
96	Mucuna bracteata DC. ex Kurz	0.41	0.24	0.12	0.77
97	Adenanthera pavonina L.	0.31	0.16	0.28	0.75
98	Alstonia scholaris (L.) R.Br.	0.31	0.16	0.27	0.74
99	Phyllodium pulchellum (L.) Desv.	0.31	0.16	0.26	0.73
100	Croton caudatus Geiseler	0.31	0.16	0.24	0.72
101	Dioscorea hamiltonii Hook.f.	0.41	0.24	0.05	0.71
102	Bauhinia variegata L.	0.31	0.16	0.23	0.7
103	Saraca asoca (Roxb.) Willd.	0.31	0.16	0.23	0.7
104	Stereospermum tetragonum DC.	0.31	0.16	0.23	0.7
105	Terminalia chebula Retz.	0.41	0.24	0.04	0.7
106	Leea macrophylla Roxb.	0.21	0.16	0.3	0.67
107	Mucuna pruriens (L.) DC.	0.31	0.24	0.12	0.67
108	Boehmeria virgata (G.Forst.) Guill.	0.31	0.16	0.19	0.66
109	Caryota urens L.	0.31	0.16	0.19	0.66
110	Albizia julibrissin Durazz.	0.31	0.16	0.17	0.65
111	Albizia procera (Roxb.) Benth.	0.31	0.16	0.17	0.65
112	Bridelia montana (Roxb.) Willd.	0.31	0.16	0.17	0.65
113	Psidium guajava L.	0.31	0.16	0.16	0.63
114	Schima wallichii (DC.) Choisy	0.31	0.16	0.15	0.63
115	Senna sophera (L.) Roxb.	0.31	0.16	0.16	0.63
116	Triumfetta rhomboidea Jacq.	0.31	0.16	0.16	0.63
117	Leea indica (Burm. f.) Merr	0.31	0.16	0.14	0.61
118	Firmiana colorata (Roxb.) R.Br.	0.31	0.16	0.1	0.57
119	Lygodium flexuosum (L.) Sw.	0.31	0.16	0.1	0.57
120	Mallotus roxburghianus Müll.Arg.	0.31	0.16	0.1	0.57
121	Sida cordata (Burm.f.) Borss.Waalk.	0.31	0.16	0.1	0.57
122	Vitex peduncularis Wall.	0.31	0.16	0.1	0.57
123	Cassia fistula L.	0.21	0.16	0.19	0.56
124	Mallotus philippensis (Lam.) Müll.Arg.	0.31	0.16	0.09	0.56
125	Sida acuta Burm.f.	0.31	0.16	0.09	0.56
126	Pilea scripta (Buch.-Ham. ex D.Don) Wedd.	0.21	0.16	0.16	0.53
127	Careya arborea Roxb.	0.31	0.16	0.04	0.51
128	Hymenodictyon orixense (Roxb.) Mabb.	0.31	0.16	0.03	0.5
129	Alangium chinense (Lour.) Harms	0.21	0.08	0.18	0.47
130	Antidesma montanum Blume	0.21	0.08	0.18	0.47
131	Artocarpus chama Buch.-Ham.	0.21	0.08	0.18	0.47
132	Cinnamomum bejolghota (Buch.-Ham.) Sweet	0.21	0.08	0.18	0.47
133	Knema angustifolia (Roxb.) Warb.	0.21	0.08	0.18	0.47
134	Maesa ramentacea (Roxb.) A.DC.	0.21	0.16	0.1	0.47

135	Oreocnide integrifolia (Gaudich.) Miq.	0.21	0.08	0.18	0.47
136	Ziziphus funiculosa Buch.-Ham. ex Wall.	0.21	0.16	0.1	0.47
137	Ziziphus xylopyrus (Retz.) Willd.	0.21	0.16	0.1	0.47
138	Calamus rotang L.	0.21	0.08	0.15	0.44
139	Delonix regia (Bojer ex Hook.) Raf.	0.21	0.08	0.15	0.44
140	Ficus sarmentosa Buch.-Ham. ex Sm.	0.21	0.08	0.15	0.44
141	Microcos hirsuta (Korth.) Burret	0.21	0.08	0.15	0.44
142	Tadehagi triquetrum (L.) H.Ohashi	0.21	0.08	0.15	0.44
143	Ampelocissus barbata Planch.	0.21	0.08	0.13	0.42
144	Breynia retusa (Dennst.) Alston	0.21	0.08	0.12	0.41
145	Jatropha gossypiifolia L.	0.21	0.08	0.12	0.41
146	Aristolochia indica L.	0.21	0.16	0.03	0.4
147	Calamus erectus Roxb.	0.21	0.08	0.11	0.4
148	Dillenia pentagyna Roxb.	0.21	0.16	0.03	0.4
149	Garuga pinnata Roxb.	0.21	0.08	0.11	0.4
150	Spondias pinnata (L.f.) Kurz	0.21	0.08	0.11	0.4
151	Cynanchum wallichii Wight	0.21	0.08	0.09	0.38
152	Baccaurea ramiflora Lour.	0.21	0.08	0.08	0.37
153	Pongamia pinnata (L.) Pierre	0.21	0.08	0.08	0.37
154	Senna tora (L.) Roxb.	0.21	0.08	0.08	0.37
155	Bombax ceiba L.	0.21	0.08	0.06	0.35
156	Annona reticulata L.	0.21	0.08	0.05	0.34
157	Desmodium velutinum (Willd.) DC.	0.21	0.08	0.05	0.34
158	Lagerstroemia parviflora Roxb.	0.21	0.08	0.05	0.34
159	Lagerstroemia speciosa Pers.	0.21	0.08	0.05	0.34
160	Lannea coromandelica (Houtt.) Merr.	0.21	0.08	0.05	0.34
161	Lepisanthes rubiginosa (Roxb.) Leenh.	0.21	0.08	0.05	0.34
162	Macaranga denticulata Müll.Arg.	0.21	0.08	0.05	0.34
163	Macaranga peltata (Roxb.) Müll.Arg.	0.21	0.08	0.05	0.34
164	Zanthoxylum rhetsa (Roxb.) DC.	0.21	0.08	0.05	0.34
165	Argyreia cymosa Sweet	0.21	0.08	0.04	0.33
166	Argyreia nervosa (Burm. f.) Bojer	0.21	0.08	0.04	0.33
167	Artocarpus lacucha Buch.-Ham.	0.21	0.08	0.04	0.33
168	Eranthemum strictum Colebr. ex Roxb.,	0.21	0.08	0.04	0.33
169	Guilandina bonduc L.	0.21	0.08	0.04	0.33
170	Hibiscus surattensis L.	0.21	0.08	0.04	0.33
171	Mucuna monosperma DC. ex Wight	0.21	0.08	0.04	0.33
172	Mucuna monosperma Wight	0.21	0.08	0.04	0.33
173	Rauvolfia serpentina Benth. ex Kurz	0.21	0.08	0.04	0.33
174	Senegalia pennata (L.) Maslin	0.21	0.08	0.04	0.33
175	Bridelia stipularis (L.) Blume	0.21	0.08	0.03	0.32
176	Ceiba pentandra (L.) Gaertn.	0.21	0.08	0.03	0.32
177	Peltophorum pterocarpum (DC.) Backer ex K.Heyne	0.21	0.08	0.03	0.32
178	Crotalaria pallida Aiton	0.21	0.08	0.01	0.3
179	Crotalaria tetragona Roxb. ex Andrews	0.21	0.08	0.01	0.3
180	Dioscorea pentaphylla L.	0.21	0.08	0.02	0.3

181	Suregada lanceolata Kuntze	0.21	0.08	0.01	0.3
182	Syzygium jambos (L.) Alston	0.21	0.08	0.01	0.3
183	Syzygium syzygioides (Miq.) Merr. & L.M.Perry	0.21	0.08	0.02	0.3
184	Terminalia phillyreifolia (Van Heurck & Müll.Arg.) Gere & Boatwr.	0.21	0.08	0.01	0.3
185	Tinospora sinensis (Lour.) Merr.	0.21	0.08	0.01	0.3
186	Garcinia cowa Roxb.	0.21	0.08	0	0.29

Data arranged based on ascending order of IVI values for each studied species

HERBACEOUS DIVERSITY IN PATTERNS IN ANR:

Herbaceous diversity patterns in Aided Natural Regeneration (ANR) plantations within tropical forests can provide valuable insights into the dynamics of understory vegetation, which includes various grasses, herbs, and shrubs. Understanding these patterns is essential for assessing the success of ANR efforts and the overall health of the restored ecosystem. Here are some key points to consider regarding herbaceous diversity patterns:

Species Richness and Evenness: Herbaceous diversity refers to the variety of herbaceous plant species present in the ANR plantation. High species richness (a large number of different species) indicates a more diverse ecosystem. Evenness refers to how evenly these species are distributed. A balanced distribution of species contributes to a more resilient ecosystem.

Vertical and Horizontal Structure: The arrangement of herbaceous plants at different height levels, from ground cover to understory. Different species may occupy distinct vertical layers, contributing to habitat complexity. The spatial distribution of herbaceous species across the ANR area. Clumps, gaps, and patterns of distribution can influence ecosystem dynamics.

Herbaceous diversity can change with the successional stages of the ANR plantation. Early stages might be dominated by pioneer species, while later stages might exhibit a more diverse array of species, including shade-tolerant and climax species. Herbaceous plants play critical roles in the ecosystem, such as nutrient cycling, soil stabilization, and providing food and habitat for insects, birds, and small mammals. The amount of light reaching the forest floor, influenced by the canopy structure, impacts the composition and growth of herbaceous species. Open canopies allow for a more diverse understory. ANR plantations might have edges where the forest meets open areas. These edges can influence herbaceous diversity, potentially supporting species adapted to different light and moisture conditions. Herbaceous plants interact with each other and with other organisms. Some species might suppress others, while some may facilitate growth. Monitoring invasive plant species is important, as they can negatively impact herbaceous diversity by outcompeting native species.

TABLE 13: STATUS OF PLANT DIVERSITY IN HERBACEOUS PLOTS OF ANR PLANTATION

Sl. No.	Species	Taxa_S	Individuals	Dominance_D	Shannon_H	Evenness_e^H/S	Menhinick	Fisher_alpha	Chao-1
1	ANR001GT1	7	56	0.46	1.08	0.42	0.94	2.11	7.333
2	ANR001GT2	5	29	0.20	1.47	0.87	0.93	1.74	5
3	ANR001KH	14	54	0.13	2.13	0.60	1.91	6.13	15.5
4	ANR001NT1	12	68	0.10	2.22	0.77	1.46	4.23	12
5	ANR001NT2	6	27	0.17	1.58	0.81	1.16	2.39	6
6	ANR001SET1	20	89	0.09	2.42	0.56	2.12	8.02	32
7	ANR001SH1	8	49	0.18	1.73	0.70	1.14	2.71	8
8	ANR001UT1	7	95	0.39	1.22	0.48	0.72	1.74	8
9	ANR001UT2	6	29	0.17	1.58	0.81	1.11	2.30	6
10	ANR001WT1	11	28	0.07	2.18	0.80	2.08	6.68	11
11	ANR002GT1	10	81	0.25	1.70	0.55	1.11	3.00	10
12	ANR002KH	6	20	0.21	1.43	0.70	1.34	2.91	7
13	ANR002NT1	14	49	0.11	2.19	0.64	2.00	6.55	14.43
14	ANR002SET1	15	90	0.27	1.84	0.42	1.58	5.14	17
15	ANR002SH1	3	58	0.50	0.76	0.71	0.39	0.67	3
16	ANR002UT1	6	109	0.63	0.76	0.36	0.57	1.37	6
17	ANR002UT2	6	48	0.47	1.03	0.47	0.87	1.81	6.5
18	ANR002WT1	15	54	0.11	2.27	0.65	2.04	6.88	15.14
19	ANR003GT1	6	53	0.30	1.30	0.61	0.82	1.74	6
20	ANR003KH1	5	18	0.22	1.35	0.77	1.18	2.29	5
21	ANR003KH2	5	18	0.22	1.35	0.77	1.18	2.29	5
22	ANR003NT1	22	71	0.11	2.33	0.47	2.61	10.92	44.75
23	ANR003NT2	6	10	0.11	1.45	0.71	1.90	6.33	7
24	ANR003SET1	12	96	0.16	1.93	0.57	1.23	3.62	14
25	ANR003SH1	3	12	0.47	0.74	0.70	0.87	1.28	3
26	ANR003SH2	4	26	0.35	1.06	0.72	0.78	1.32	4
27	ANR003UT1	19	69	0.22	1.95	0.37	2.29	8.66	30
28	ANR003WT1	11	44	0.11	2.10	0.74	1.66	4.71	11

29	ANR004KH	21	85	0.07	2.66	0.68	2.28	8.92	21
30	ANR004NT1	12	70	0.24	1.72	0.47	1.43	4.17	12.17
31	ANR004SET1	4	38	0.42	1.00	0.68	0.65	1.13	4
32	ANR004SH1	12	35	0.12	2.02	0.63	2.03	6.45	13
33	ANR004UT1	22	99	0.07	2.61	0.62	2.21	8.77	24.14
34	ANR004UT2	7	39	0.23	1.51	0.64	1.12	2.49	7.5
35	ANR004WT1	7	27	0.16	1.69	0.77	1.35	3.07	7
36	ANR005KH1	5	12	0.17	1.35	0.77	1.44	3.22	5
37	ANR005KH2	5	24	0.37	1.13	0.62	1.02	1.92	5
38	ANR005NT1	11	42	0.15	1.89	0.60	1.70	4.85	13
39	ANR005SET1	3	9	0.33	0.85	0.78	1.00	1.58	3
40	ANR005SET2	2	16	0.50	0.63	0.94	0.50	0.60	2
41	ANR005SH1	8	57	0.23	1.63	0.64	1.06	2.53	8
42	ANR005UT1	17	82	0.08	2.42	0.66	1.88	6.52	18
43	ANR005WT1	20	72	0.07	2.60	0.67	2.36	9.17	20.1
44	ANR006KH1	8	15	0.10	1.72	0.70	2.07	6.97	11
45	ANR006NT1	12	58	0.25	1.74	0.48	1.58	4.59	12.6
46	ANR006SET1	5	69	0.27	1.35	0.77	0.60	1.24	5
47	ANR006SH1	12	50	0.14	2.02	0.63	1.70	5.01	12.75
48	ANR006SH2	5	29	0.34	1.14	0.62	0.93	1.74	5
49	ANR006UT1	10	85	0.28	1.52	0.46	1.09	2.94	10
50	ANR006WT1	17	37	0.04	2.55	0.75	2.80	12.18	17.3
51	ANR007KH1	10	36	0.10	2.05	0.78	1.67	4.59	10
52	ANR007NT1	16	118	0.13	2.20	0.56	1.47	4.99	16.6
53	ANR007SET1	3	36	0.34	1.03	0.94	0.50	0.78	3
54	ANR007SH1	3	76	0.40	0.98	0.89	0.34	0.62	3
55	ANR007SH2	5	41	0.35	1.15	0.63	0.78	1.49	5
56	ANR007WT1	7	24	0.20	1.57	0.69	1.43	3.32	7
57	ANR008KH	17	97	0.09	2.47	0.69	1.73	5.97	17
58	ANR009KH	8	28	0.14	1.79	0.75	1.51	3.74	8

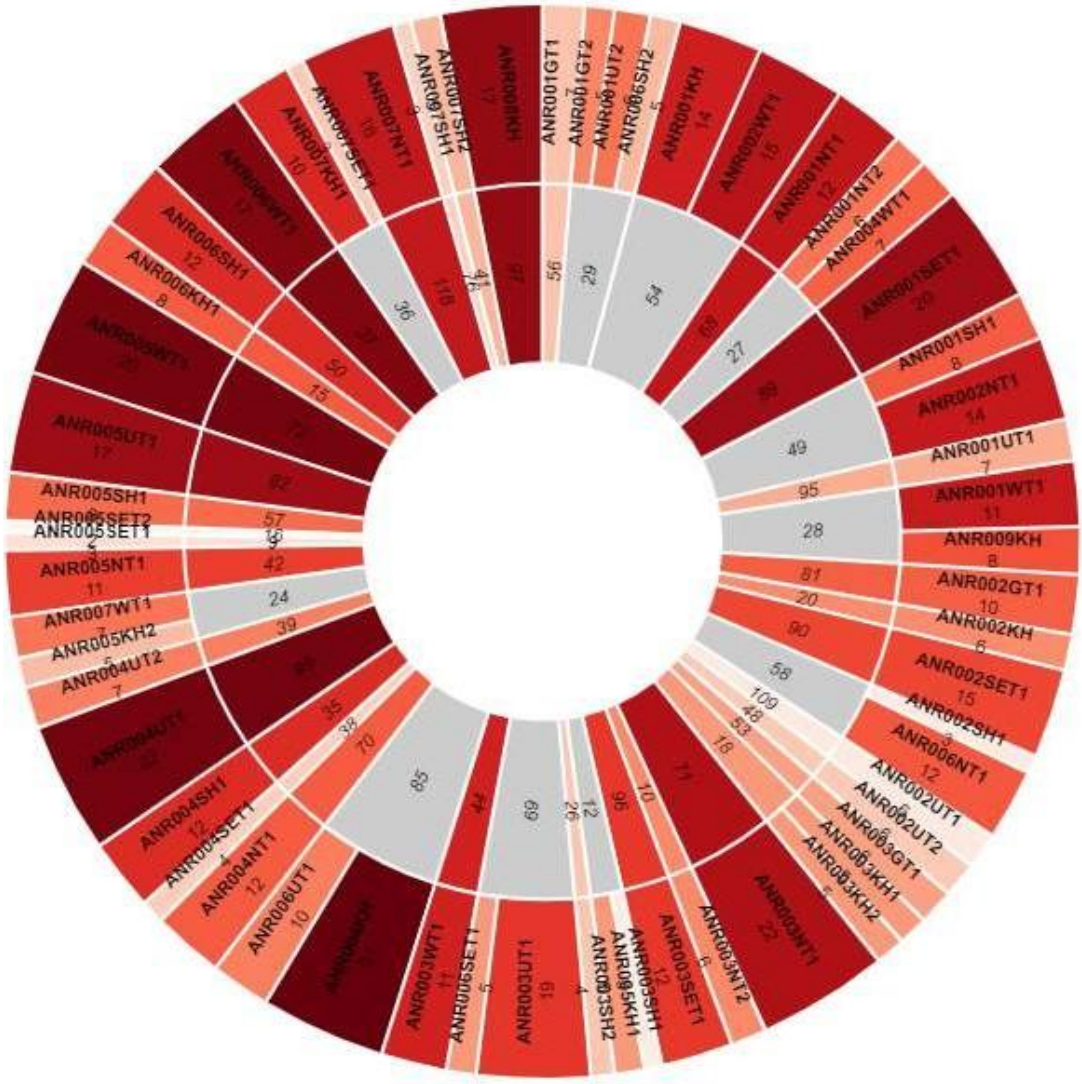


FIGURE 34: HERBACEOUS DIVERSITY IN PATTERNS IN ANR PLANTATION

Herbaceous diversity can respond to natural disturbances, such as fire, as well as restoration efforts. ANR plantations can aid in the recovery of herbaceous species after disturbances. Herbaceous diversity can serve as an indicator of ecosystem health, especially when it reflects a balanced and resilient plant community. Monitoring and understanding these patterns are crucial for adaptive management in ANR plantations. Regular assessments help gauge the progress of regeneration, guide management decisions, and ensure the establishment of a diverse, functioning, and resilient ecosystem within the tropical forest ANR area.

The graph represent the ANR plantation sites for herbaceous species; darker color and larger size denotes higher values.

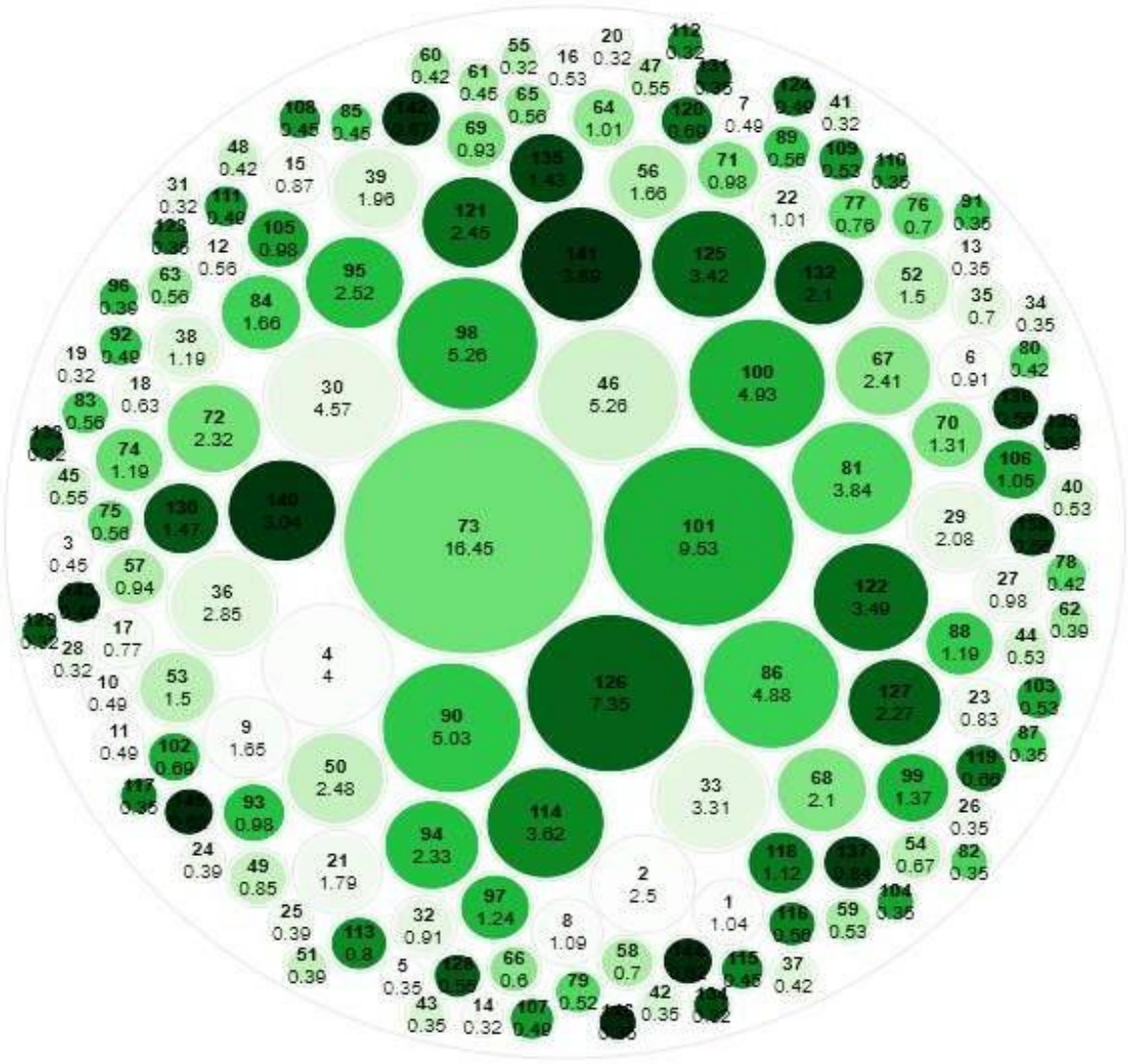


FIGURE 35: RELATIVE IMPORTANCE VALUE (RIV) OF HERBACEOUS PLANTS IN ANR PLANTATION

The Relative Importance Value (RIV) is a metric used to assess the significance or importance of different plant species within a community or ecosystem. It takes into account multiple factors, such as relative frequency, relative density, and relative dominance, to provide a comprehensive understanding of a species' contribution to the overall structure and composition of the plant community. RIV is commonly used to prioritize or rank plant species based on their ecological significance. In the context of herbaceous plants within a plant community or ANR plantation, RIV can provide insights into which herbaceous species are more ecologically important or dominant. By assessing the relative values of frequency, density, and dominance, RIV helps to identify species that play a significant role in the ecosystem.

The graph contain serial no of species (ref. - Table 14) and RIV. The larger circle denotes higher values.

TABLE 14: STATUS OF PLANT IN ANR REGENERATION PLOTS

Sl. No.	Row Labels	RFR	RDEN	RIV
1	Imperata cylindrica (L.) P.Beauv.	5.11	11.33	16.45
2	Panicum notatum Retz.	1.85	7.68	9.53
3	Spermacoce hispida L.	2.27	5.07	7.35
4	Cyrtococcum oxyphyllum Stapf	1.14	4.13	5.26
5	Oplismenus compositus (L.) P.Beauv.	0.99	4.26	5.26
6	Mimosa pudica L.	2.56	2.47	5.03
7	Panicum auritum Presl ex Nees	0.57	4.36	4.93
8	Mikania cordata (Burm.f.) B.L.Rob.	3.13	1.76	4.88
9	Chrysopogon aciculatus Trin.	0.85	3.72	4.57
10	Ageratum conyzoides (L.) L.	1.56	2.44	4
11	Thysanolaena latifolia (Roxb. ex Hornem.) Honda	1.42	2.47	3.89
12	Lygodium flexuosum (L.) Sw.	2.41	1.42	3.84
13	Pueraria tuberosa (Roxb. ex Willd.) DC.	2.13	1.49	3.62
14	Setaria pumila Roem. & Schult.	0.85	2.64	3.49
15	Smilax zeylanica L.	2.27	1.15	3.42
16	Colocasia esculenta (L.) Schott	1.42	1.89	3.31
17	Thunbergia grandiflora (Roxb. ex Rottl.) Roxb.	1.99	1.05	3.04
18	Curculigo latifolia Dryand. ex W.T.Aiton	1.56	1.29	2.85
19	Musa acuminata Colla	1.85	0.68	2.52
20	Acmella paniculata (Wall. ex DC.) R.K.Jansen	0.71	1.79	2.5
21	Dioscorea bulbifera L.	1.7	0.78	2.48
22	Scoparia dulcis L.	0.99	1.45	2.45
23	Hellenia speciosa (J.Koenig) Govaerts	1.7	0.71	2.41
24	Mucuna pruriens (L.) DC.	1.28	1.05	2.33
25	Ichnocarpus frutescens (L.) W.T.Aiton	1.14	1.18	2.32
26	Spermacoce ocymoides Burm.f.	0.85	1.42	2.27
27	Helminthostachys zeylanica (L.) Hook.	0.85	1.25	2.1
28	Synedrella nodiflora (L.) Gaertn.	0.71	1.39	2.1
29	Chromolaena odorata (L.) R.M.King & H.Rob.	0.99	1.08	2.08
30	Cyanthillium cinereum (L.) H.Rob.	0.57	1.39	1.96
31	Byttneria pilosa Roxb.	1.42	0.37	1.79
32	Diplazium esculentum (Retz.) Sw.	0.71	0.95	1.66
33	Merremia umbellata (L.) Hallier f.	0.71	0.95	1.66
34	Ampelocissus barbata Planch.	1.28	0.37	1.65
35	Dioscorea hamiltonii Hook.f.	0.99	0.51	1.5
36	Dioscorea oppositifolia L.	0.99	0.51	1.5
37	Stephania japonica (Thunb.) Miers	0.99	0.47	1.47
38	Thelypteris arida (D.Don) Morton	0.99	0.44	1.43
39	Oplismenus hirtellus (L.) P.Beauv.	0.43	0.95	1.37
40	Homalomena aromatica Schott	0.57	0.74	1.31
41	Oplismenus burmanni (Retz.) P.Beauv.	0.43	0.81	1.24
42	Curcuma zedoaria (Christm.) Roscoe	0.85	0.34	1.19

43	Ipomoea coccinea L.	0.85	0.34	1.19
44	Mikania micrantha (L.) Willd.	0.85	0.34	1.19
45	Saccharum spontaneum L.	0.71	0.41	1.12
46	Amorphophallus bulbifer (Roxb.) Blume	0.85	0.24	1.09
47	Peristylus constrictus Lindl.	0.71	0.34	1.05
48	Achyranthes aspera L.	0.57	0.47	1.04
49	Cajanus scarabaeoides (L.) F.Muell.	0.57	0.44	1.01
50	Globba multiflora Wall. ex Baker	0.71	0.3	1.01
51	Centotheca lappacea Desv.	0.71	0.27	0.98
52	Hypolytrum nemorum (Vahl) Spreng.	0.71	0.27	0.98
53	Mucuna bracteata DC. ex Kurz	0.71	0.27	0.98
54	Pennisetum polystachion (L.) Schult.	0.71	0.27	0.98
55	Elephantopus scaber L.	0.57	0.37	0.94
56	Hemidesmus indicus (L.) R. Br. ex Schult.	0.43	0.51	0.93
57	Alpinia nigra (Gaertn.) B.L.Burtt	0.71	0.2	0.91
58	Cissus repanda Vahl	0.71	0.2	0.91
59	Axonopus compressus (Sw.) P.Beauv.	0.43	0.44	0.87
60	Tinospora cordifolia (Willd.) Miers ex Hook.f. & Thomson	0.57	0.3	0.87
61	Dioscorea alata L.	0.71	0.14	0.85
62	Themeda arundinacea (Roxb.) A.Camus	0.57	0.27	0.84
63	Camonea umbellata (L.) A.R.Simões & Staples	0.43	0.41	0.83
64	Pteris vittata L.	0.43	0.37	0.8
65	Blumea lacera (Burm.f.) DC.	0.57	0.2	0.77
66	Isachne globosa Kuntze	0.43	0.34	0.76
67	Crassocephalum crepidioides (Benth.) S.Moore	0.57	0.14	0.7
68	Eragrostis tenella (L.) P.Beauv. ex Roem. & Schult.	0.43	0.27	0.7
69	Ipomoea triloba L.	0.43	0.27	0.7
70	Paspalum conjugatum P.J.Bergius	0.28	0.41	0.69
71	Scleria terrestris (L.) Fassett	0.28	0.41	0.69
72	Dioscorea pentaphylla L.	0.57	0.1	0.67
73	Scleria lacustris C.Wright	0.43	0.24	0.66
74	Blumea laciniata (Wall. ex Roxb.) DC.	0.43	0.2	0.63
75	Urtica dioica L.	0.28	0.34	0.62
76	Xenostegia tridentata (L.) D.F.Austin & Staples	0.28	0.34	0.62
77	Hedychium coccineum Buch.Ham. ex Sm.	0.43	0.17	0.6
78	Argyreia nervosa (Burm. f.) Bojer	0.43	0.14	0.56
79	Globba bulbifera Roxb.	0.43	0.14	0.56
80	Grona triflora (L.) H.Ohashi & K.Ohashi	0.43	0.14	0.56
81	Ipomoea hederifolia L.	0.43	0.14	0.56
82	Merremia tridentata (L.) Hallier f.	0.43	0.14	0.56
83	Mimosa himalayana Gamble	0.43	0.14	0.56
84	Rungia pectinata Nees	0.43	0.14	0.56
85	Thelypteris hispidula (Decne.) C.F.Reed	0.43	0.14	0.56
86	Themeda caudata (Nees) A.Camus	0.43	0.14	0.56
87	Cyperus iria L.	0.28	0.27	0.55

88	Cyrtococcum patens A.Camus	0.28	0.27	0.55
89	Sphagneticola calendulacea (L.) Pruski	0.28	0.27	0.55
90	Blechnum orientale L.	0.43	0.1	0.53
91	Cyclea barbata Miers	0.43	0.1	0.53
92	Cyperus haspan L.	0.43	0.1	0.53
93	Etlingera linguiformis (Roxb.) R.M.Sm.	0.43	0.1	0.53
94	Passiflora foetida L.	0.43	0.1	0.53
95	Phyllanthus urinaria L.	0.43	0.1	0.53
96	Kyllinga nemoralis (J.R.Forst. & G.Forst.) Dandy ex Hutch.	0.28	0.24	0.52
97	Amomum dealbatum Roxb.	0.43	0.07	0.49
98	Ampelocissus latifolia (Roxb.) Planch.	0.43	0.07	0.49
99	Argyreia capitiformis (Poir.) Ooststr.	0.43	0.07	0.49
100	Molineria latifolia (Dryand. ex W.T.Aiton) Herb. ex Kurz	0.28	0.2	0.49
101	Persicaria chinensis (L.) H.Gross	0.28	0.2	0.49
102	Pityrogramma calomelanos (L.) Link	0.43	0.07	0.49
103	Smilax glabra Roxb.	0.43	0.07	0.49
104	Trichosanthes tricuspidata Lour.	0.43	0.07	0.49
105	Adiantum philippense L.	0.28	0.17	0.45
106	Evolvulus nummularius (L.) L.	0.28	0.17	0.45
107	Microlepia strigosa (Thunb.) C. Presl	0.28	0.17	0.45
108	Phrynium pubinerve Blume	0.28	0.17	0.45
109	Rhynchospora corymbosa (L.) Britton	0.28	0.17	0.45
110	Curculigo orchioides Gaertn.	0.28	0.14	0.42
111	Dicranopteris linearis (Burm.f.) Underw.	0.28	0.14	0.42
112	Euphorbia hirta L.	0.28	0.14	0.42
113	Kyllinga brevifolia Rottb.	0.28	0.14	0.42
114	Leucas aspera (Willd.) Link	0.28	0.14	0.42
115	Canavalia gladiata (Jacq.) DC.	0.28	0.1	0.39
116	Caryota urens L.	0.28	0.1	0.39
117	Dioscorea glabra Roxb.	0.28	0.1	0.39
118	Geodorum densiflorum (Lam.) Schltr.	0.28	0.1	0.39
119	Onychium siliculosum (Desv.) C.Chr.	0.28	0.1	0.39
120	Thladiantha cordifolia Cogn.	0.28	0.1	0.39
121	Alpinia galanga (L.) Willd.	0.28	0.07	0.35
122	Argyreia sp	0.28	0.07	0.35
123	Cayratia japonica Gagnep.	0.28	0.07	0.35
124	Combretum punctatum Blume	0.28	0.07	0.35
125	Cyperus esculentus L.	0.28	0.07	0.35
126	Cyperus exaltatus Retz.	0.28	0.07	0.35
127	Mecardonia procumbens (Mill.) Small	0.28	0.07	0.35
128	Mikania cordifolia (L.f.) Willd.	0.28	0.07	0.35
129	Mimosa rubicaulis subsp. himalayana (Gamble) H.Ohashi	0.28	0.07	0.35
130	Peliosanthes teta Andrews	0.28	0.07	0.35
131	Piper nigrum L.	0.28	0.07	0.35
132	Saccharum arundinaceum Retz.	0.28	0.07	0.35

133	Sida cordata (Burm.f.) Borss.Waalk.	0.28	0.07	0.35
134	Steudnera assamica Hook.f.	0.28	0.07	0.35
135	Zingiber chrysanthum Roscoe	0.28	0.07	0.35
136	Aristolochia tagala Cham.	0.28	0.03	0.32
137	Breynia retusa (Dennst.) Alston	0.28	0.03	0.32
138	Bridelia tomentosa Blume	0.28	0.03	0.32
139	Cheilocostus speciosus (J.Koenig) C.D.Specht	0.28	0.03	0.32
140	Cissampelos pareira L.	0.28	0.03	0.32
141	Cynodon dactylon (L.) Pers.	0.28	0.03	0.32
142	Dioscorea wallichii Hook.f.	0.28	0.03	0.32
143	Polystachya sp.	0.28	0.03	0.32
144	Stemona tuberosa Lour.	0.28	0.03	0.32
145	Tetrastigma bracteolatum (Wall.) Planch.	0.28	0.03	0.32
146	Tetrastigma serrulatum (Roxb.) Planch.	0.28	0.03	0.32

Data arranged based on ascending order of RIV values for each studied species

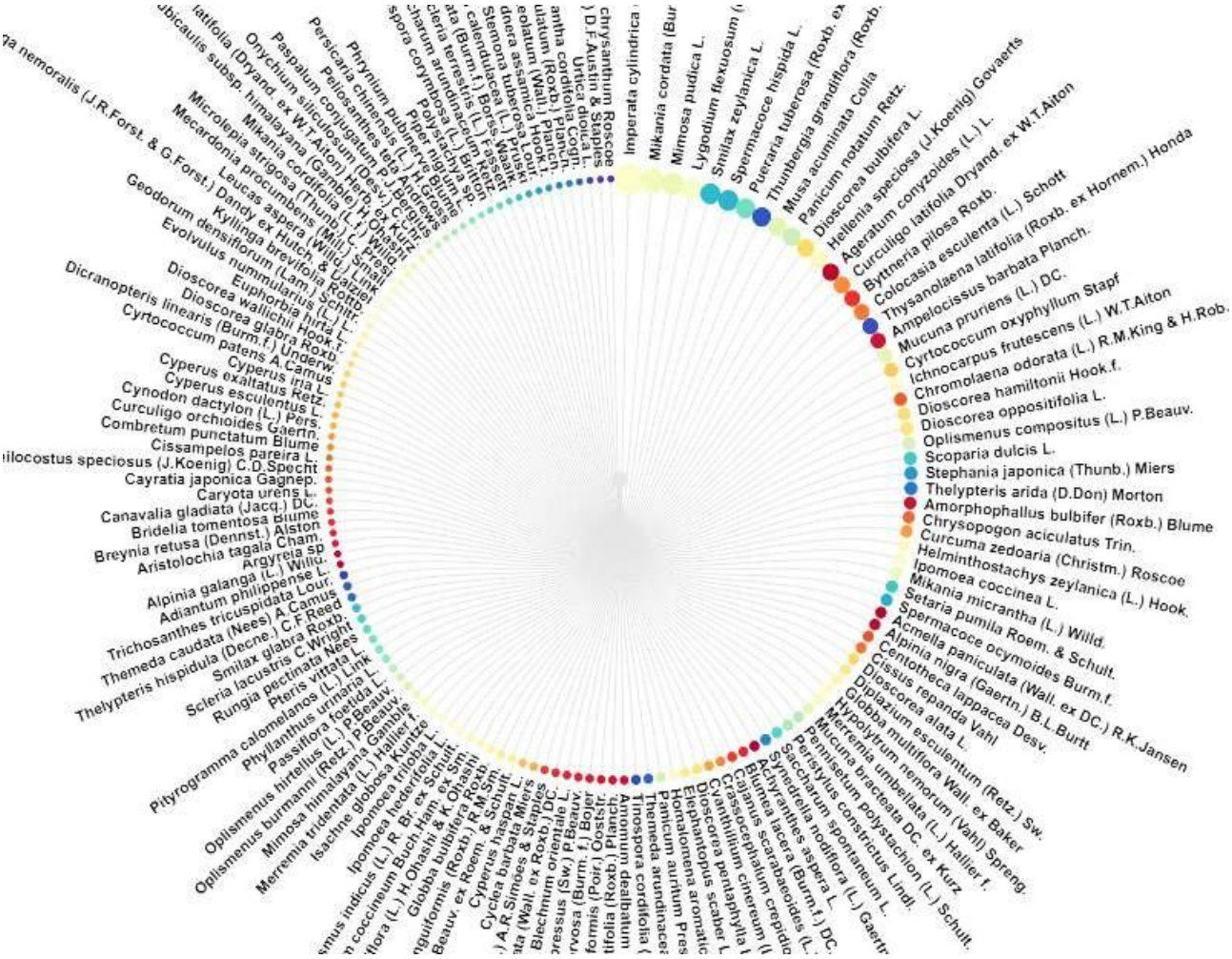


FIGURE 36: COMPOSITION AND DOMINANCE OF HERBACEOUS PLANTS IN ANR PLANTATION

The composition and dominance of herbaceous plants in an Aided Natural Regeneration (ANR) plantation play a crucial role in shaping the ecosystem structure, function, and overall success of the regeneration efforts. Herbaceous plants, including grasses, ferns, forbs, and other non-woody plants, contribute to various ecological processes and provide habitat for numerous organisms. Composition refers to the variety of different herbaceous plant species present in the ANR plantation. Understanding the composition involves identifying the species, quantifying their abundance, and assessing their roles within the ecosystem. The composition and dominance of herbaceous plants provide valuable information about the ANR plantation's progress and its potential to restore a diverse and functional ecosystem. Regular monitoring and assessment can guide management decisions, such as promoting native species, addressing invasive plants, and ensuring a balanced and resilient plant community.

The graph showing species with denotes higher RIV values.

ARTIFICIAL REGENERATION (AR)

ARTIFICIAL REGENERATION (AR):

Artificial Regeneration (AR) involves the intentional planting of tree seedlings or propagules to restore or establish forests in degraded or deforested areas. In contrast to Aided Natural Regeneration (ANR), AR directly involves human intervention in selecting, planting, and managing plant species. Plant diversity and structure are also crucial considerations in the context of Artificial Regeneration plantations.

Artificial Regeneration (AR) plantations have significant importance in various ecological, economic, and social contexts. Here are some of the key reasons why AR plantations are significant:

Ecosystem Restoration: AR plays a crucial role in restoring degraded or deforested areas, helping to reverse ecological degradation and promote the recovery of ecosystems. It aids in rebuilding habitats, enhancing biodiversity, and restoring ecosystem functions.

Biodiversity Conservation: Well-planned AR plantations can contribute to biodiversity conservation by reintroducing native plant species and creating habitats for various wildlife species. By selecting diverse native species, AR plantations can support a range of ecological niches and enhance overall ecosystem resilience.

Climate Change Mitigation: Trees planted in AR efforts sequester carbon dioxide from the atmosphere, contributing to carbon sequestration and mitigating climate change. They provide an essential ecosystem service by acting as carbon sinks.

Soil Stabilization and Erosion Control: AR plantations help prevent soil erosion and improve soil stability, particularly in areas where natural vegetation has been removed. The root systems of trees anchor soil, reducing the risk of landslides and protecting watersheds.

Water Regulation and Quality: Trees in AR plantations contribute to water regulation by influencing local hydrological cycles. They can reduce runoff, increase groundwater recharge, and improve water quality by filtering pollutants.

Timber and Non-Timber Forest Products: AR plantations can provide a sustainable supply of timber and non-timber forest products, supporting local economies and livelihoods. These products range from timber for construction and fuelwood to medicinal plants and fruits.

Habitat Creation and Connectivity: AR plantations can act as stepping stones or corridors between fragmented natural habitats, promoting species movement and genetic exchange. This is especially important for species that require larger ranges for survival.

Research and Education: AR plantations provide opportunities for research on tree growth, species interactions, and ecosystem dynamics. They also serve as outdoor classrooms for

educating people about ecological processes, forest management, and the importance of biodiversity.

Rural Livelihoods: AR plantations can generate employment opportunities in planting, maintenance, and management activities. They can contribute to the livelihoods of local communities, especially in regions with limited economic alternatives.

Aesthetic and Recreational Value: Well-designed AR plantations can enhance the aesthetic quality of landscapes, providing spaces for recreation, eco-tourism, and nature-based activities.

It's important to note that the success of AR plantations depends on careful planning, appropriate species selection, proper site preparation, and effective management. Monitoring and adaptive management are also crucial to ensure the long-term sustainability of AR efforts and to address any potential challenges that may arise.

TREE DIVERSITY IN ARTIFICIAL REGENERATION (AR):

Tree diversity, dominance, and distribution patterns in Artificial Regeneration (AR) plantation reflect the establishment and development of tree species within the designated area over a specific time frame. These patterns provide insights into the success of the AR efforts, ecosystem structure, and potential future trajectory. In AR, the choice of plant species for planting is important. Selecting a diverse range of native species that are adapted to the local ecological conditions can enhance the resilience of the plantation. Using multiple species can also reduce the risk of pest and disease outbreaks that can affect monoculture plantations.

Patterns of tree diversity in an Artificial Regeneration (AR) plantation involve the arrangement, composition, and dynamics of tree species within the planted area. Understanding these patterns provides insights into the success of the regeneration efforts, the health of the ecosystem, and potential ecological trajectories. Here are different patterns of tree diversity that can be observed in AR plantations:

FIGURE 37: STUDY OF DIVERSITY ON AR BAMBOO PLANTATION SITES (HERBATALI JFMC)- A) MAP ALONG WITH GPS COORDINATES (B&C) PLANTATION SITE OF AR BAMBOO (D) BAMBUSA TULDA (E) SAMPLING 10×100 PLOT (F) RECORDING FLORISTIC DATA.

FIGURE 38: STUDY OF DIVERSITY ON AR BAMBOO PLANTATION SITES (MANDALI PARA JFMC)- A) MAP ALONG WITH GPS COORDINATES (B) SIGN BOARD OF THE STUDY SITE (C) PLANTATION SITE OF AR BAMBOO (D) BAMBUSA TULDA (E) DISCUSSION WITH BEAT OFFICER (F) DISCUSSION WITH LOCALS.

FIGURE 39: STUDY OF DIVERSITY ON AR BAMBOO PLANTATION SITES (GHAGRABASTI JFMC)- A) MAP ALONG WITH GPS COORDINATES (B) SIGN BOARD OF THE STUDY SITE (C) PLANTATION SITE OF AR BAMBOO AND SAMPLING PLOT SIZE 5×5 M (D) ASSISTED BY C/O OF BANKUL RANGE AND BSF PERSONALS (E&F) ASSOCIATED TREE SPECIES: MACARANGA PELTATA AND CALLICARPA ARBOREA.

FIGURE 40: AR BAMBOO PLANTATION SITES (LAXMICHARA JFMC)- A) MAP ALONG WITH GPS COORDINATES (B) SIGN BOARD OF THE STUDY SITE (C) PLANTATION SITE OF AR BAMBOO (D) CULTIVATED BAMBUSA TULDA (E) ASSOCIATED BAMBOO FOREST: MELOCANNA BACCIFERA (F) ASSOCIATED HERB & SHRUB (G) ASSOCIATED CHECK DAMS.

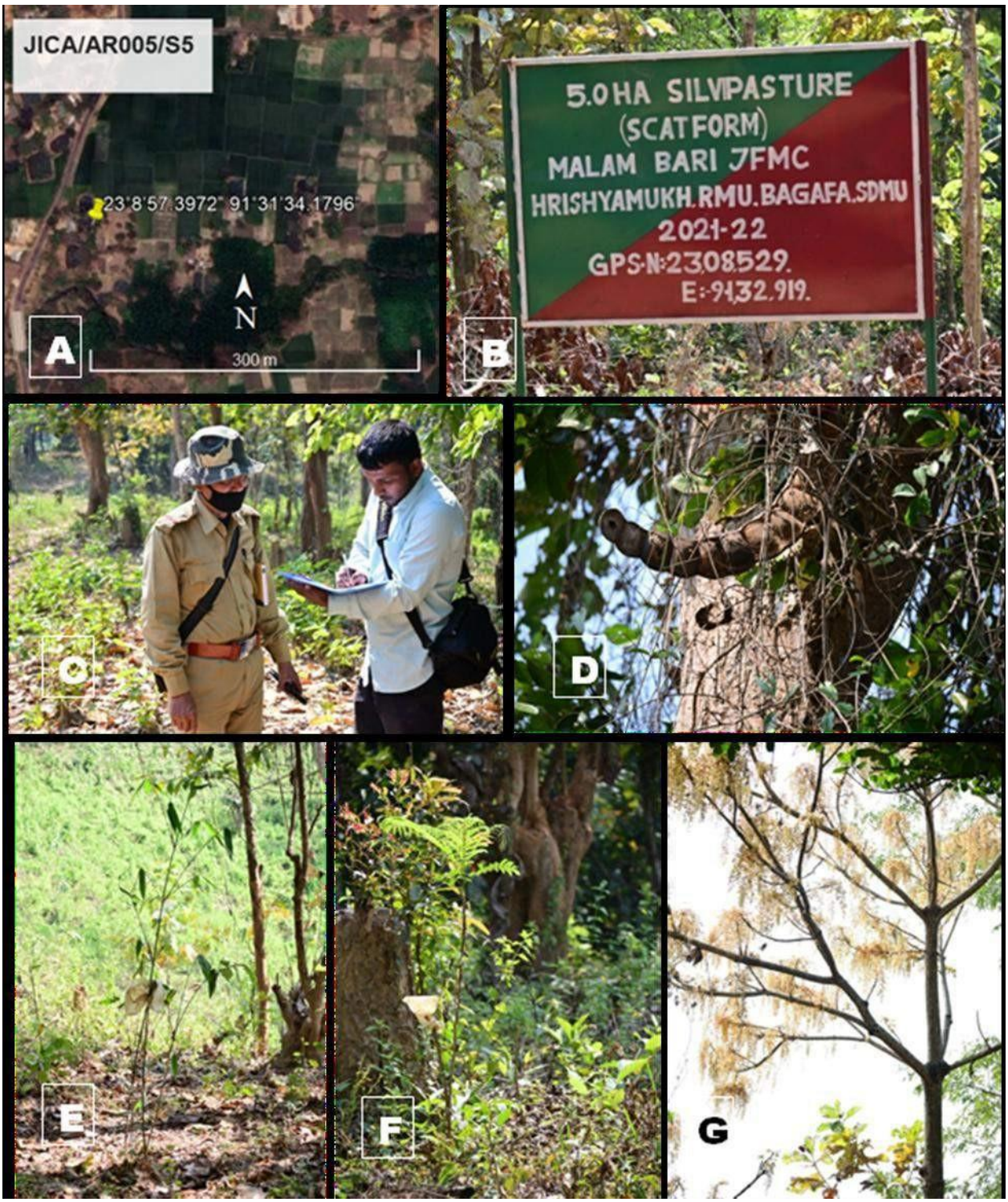


FIGURE 41: STUDY OF DIVERSITY ON SILVIPASTURE SITES (LAXMICHARA JFMC)- A) MAP ALONG WITH GPS COORDINATES (B) SIGN BOARD OF THE STUDY SITE (C) DISCUSSION WITH THE BEAT OFFICER (D) ENTADA PHASEOLOIDES (E) BAMBUSA TULDA (F) CAESALPINIA PULCHERRIMA (G) STERCULIA VILLOSA.

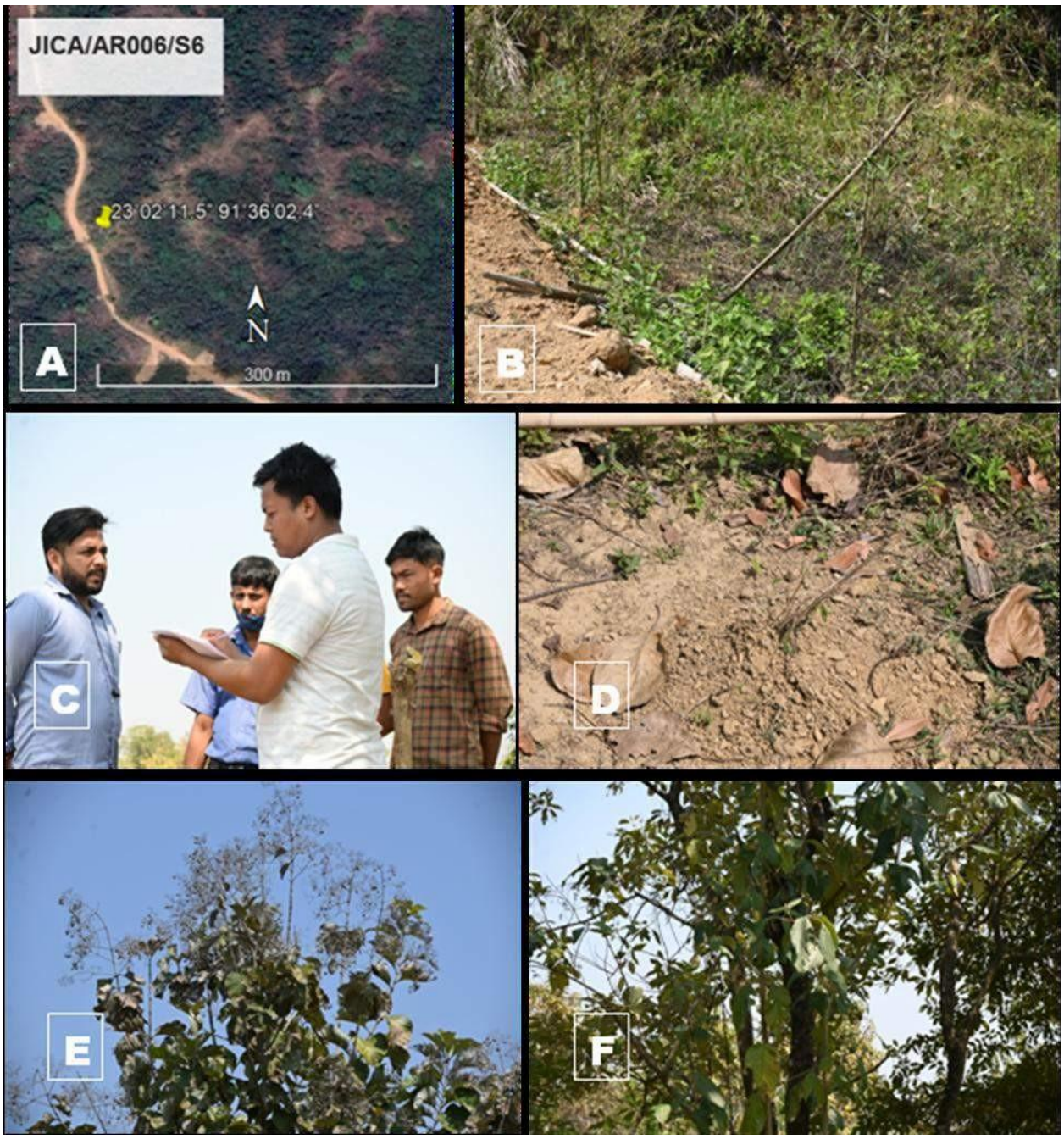


FIGURE 42: STUDY OF DIVERSITY ON AR BAMBOO PLANTATION SITES (KANUPARA/RAMCHAN PARA JFMC)- A) MAP ALONG WITH GPS COORDINATES (B) PLANTATION SITE OF AR BAMBOO (C) DISCUSSION WITH C/O SRINAGAR RANGE (D) SIGN OF GRAZING (E&F) ASSOCIATED TREE SPECIES: TECTONA GRANDIS AND CALLICARPA ARBOREA

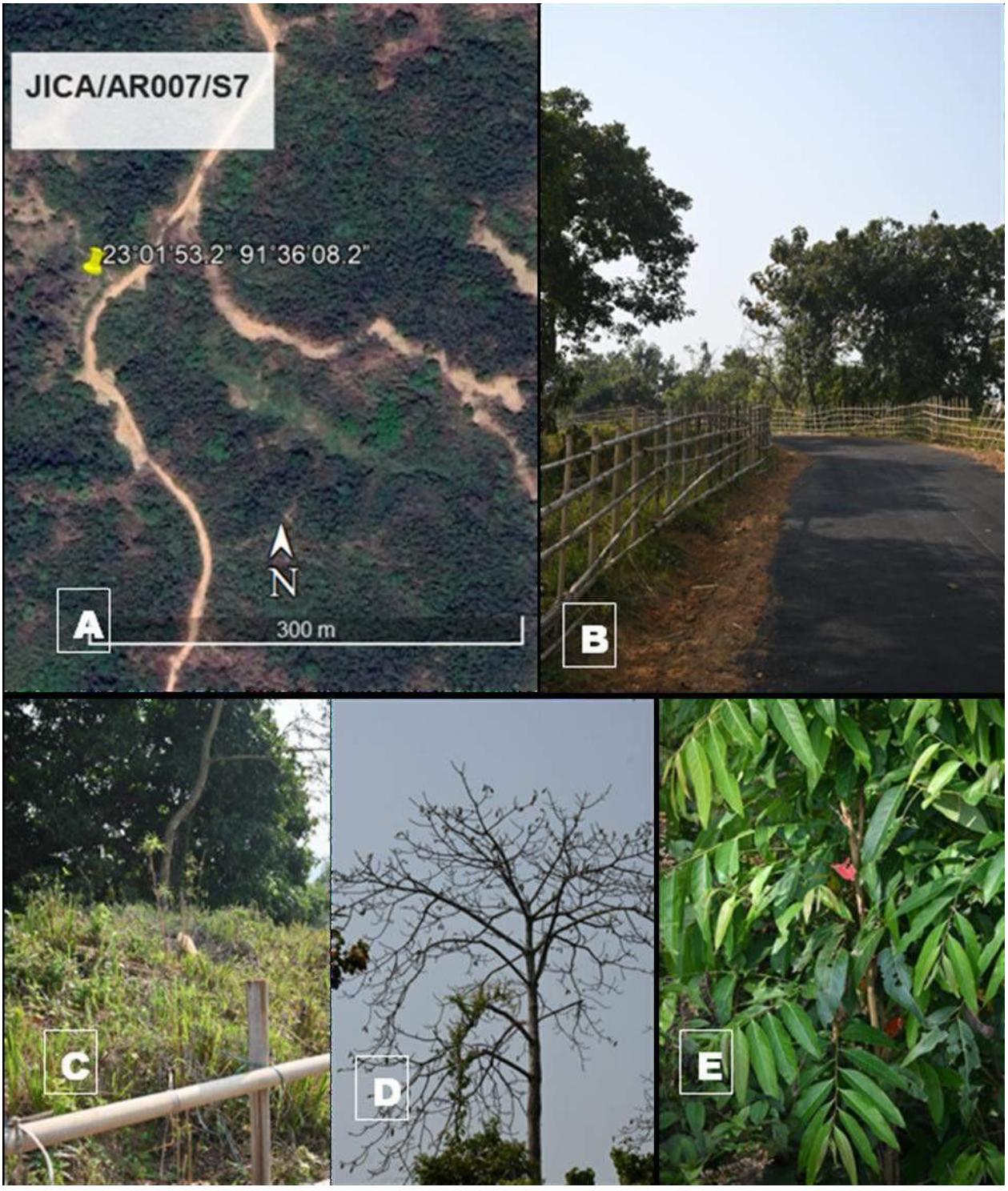


FIGURE 43: STUDY OF DIVERSITY ON AR BAMBOO PLANTATION SITES (JOYSINGH BARI JFMC)- A) MAP ALONG WITH GPS COORDINATES (B) PLANTATION SITE OF AR BAMBOO WITH PROPER FENCING (C) BAMBUSA TULDA (D&E) ASSOCIATED TREE SPECIES: BOMBAX CEIBA AND GLOCHIDION MULTILOCULARE.

FIGURE 44: STUDY OF DIVERSITY ON AR MISC. PLANTATION SITES (KASTA KR PARA JFMC)- A) MAP ALONG WITH GPS COORDINATES (B) SIGN BOARD OF THE STUDY SITE (C) SAPLING OF THE PLANTATION (D) BAMBOO COLLECTED AND STORED FOR MAKING TRADITIONAL UMBRELLA OF MOG COMMUNITY (E&F) ASSOCIATED TREE SPECIES- TERMINALIA BELLIRICA AND SCHIMA WALLICHII.

FIGURE 45: STUDY OF DIVERSITY ON AR BAMBOO PLANTATION SITES (KASTA KR PARA JFMC)- A) MAP ALONG WITH GPS COORDINATES (B) SIGN BOARD OF THE STUDY SITE (C) SITE OF THE PLANTATION WITH PROPER FENCING (D) PLANTATION SITES (E) ASSOCIATED BAMBOO FOREST: MELOCANNA BACCOFERA (F) KEEPING DATA RECORDS.

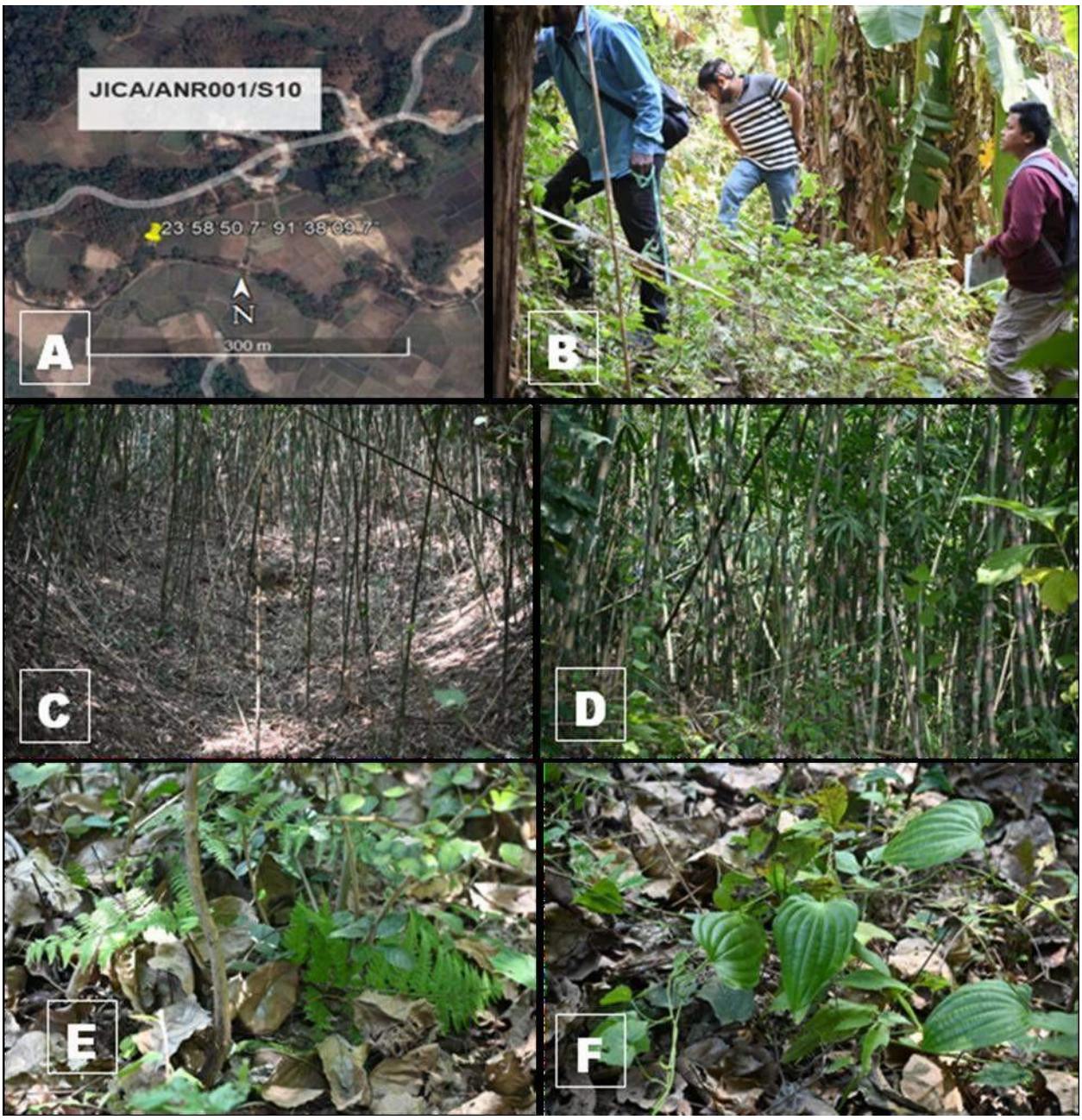


FIGURE 46: STUDY OF DIVERSITY ON ANR BAMBOO PLANTATION SITES (HERBATALI JFMC)- A) MAP ALONG WITH GPS COORDINATES (B) SAMPLING 10×100 PLOT (C&D) ASSOCIATED BAMBOO FOREST: MELOCANNA BACCIFERA (E&F) ASSOCIATED HERBS: DRYOPTERIS WALLICHIANA & STEMONA TUBEROSA.

FIGURE 47: STUDY OF DIVERSITY ON AR002 MICS (SHAMAL TWISA JFMC): (A) MAP ALONG WITH GPS COORDINATES. B) SIGNBOARD OF THE STUDY SITE ALONG WITH BEAT OFFICER & FFW (C) PLANTATION AREA (D) INTERROGATION WITH THE BEAT OFFICER & FFW AND LOCAL INHABITANTS. (E) SAPLING OF TERMINALIA BELLIRICA (F) SAPLING OF PONGAMIA PINNATA.

Figure 48: Study of diversity on AR004 Bamboo (Atharamura JFMC): (A) Map along with GPS Coordinates. B) Signboard of the study site (C) Plantation area (D) Syzygium cumini (E & F) Macaranga denticulate (G) Fruiting of Tinospora sinensis (Climber) (H) Sapling of Bambusa tulda (I) Crinum sp (J) Ricinus communis (K) Duabanga grandiflora.

Figure 49: Study of diversity on AR006 Bamboo (Nabajagaran JFMC): (A) Map along with GPS Coordinates. B) Signboard of the study site (C) Interrogation with C/O & FFW (D) Plantation area (E) Sapling of Bambusa tulda (F) Young shoot of Bambusa tulda.

Figure 50: Study of diversity on AR008 Bamboo (Bolong Naithok JFMC): (A) Map along with GPS Coordinates. B) Signboard of the study site (C) Sapling of Bambusa tulda (D) Anogeissus acuminata (E) GBH measurement (F) Interrogation with C.O. & FFW.

Figure 51: Study of diversity on AR0011 Bamboo (Atharamura JFMC): (A) Map along with GPS Coordinates. B) Plantation area (C) Sapling of Schizostachyum dullooa (E & F) Site visit and interrogation with Beat officer and FFW (F) Rhabdophis subminiatus, Snake found during the visit.

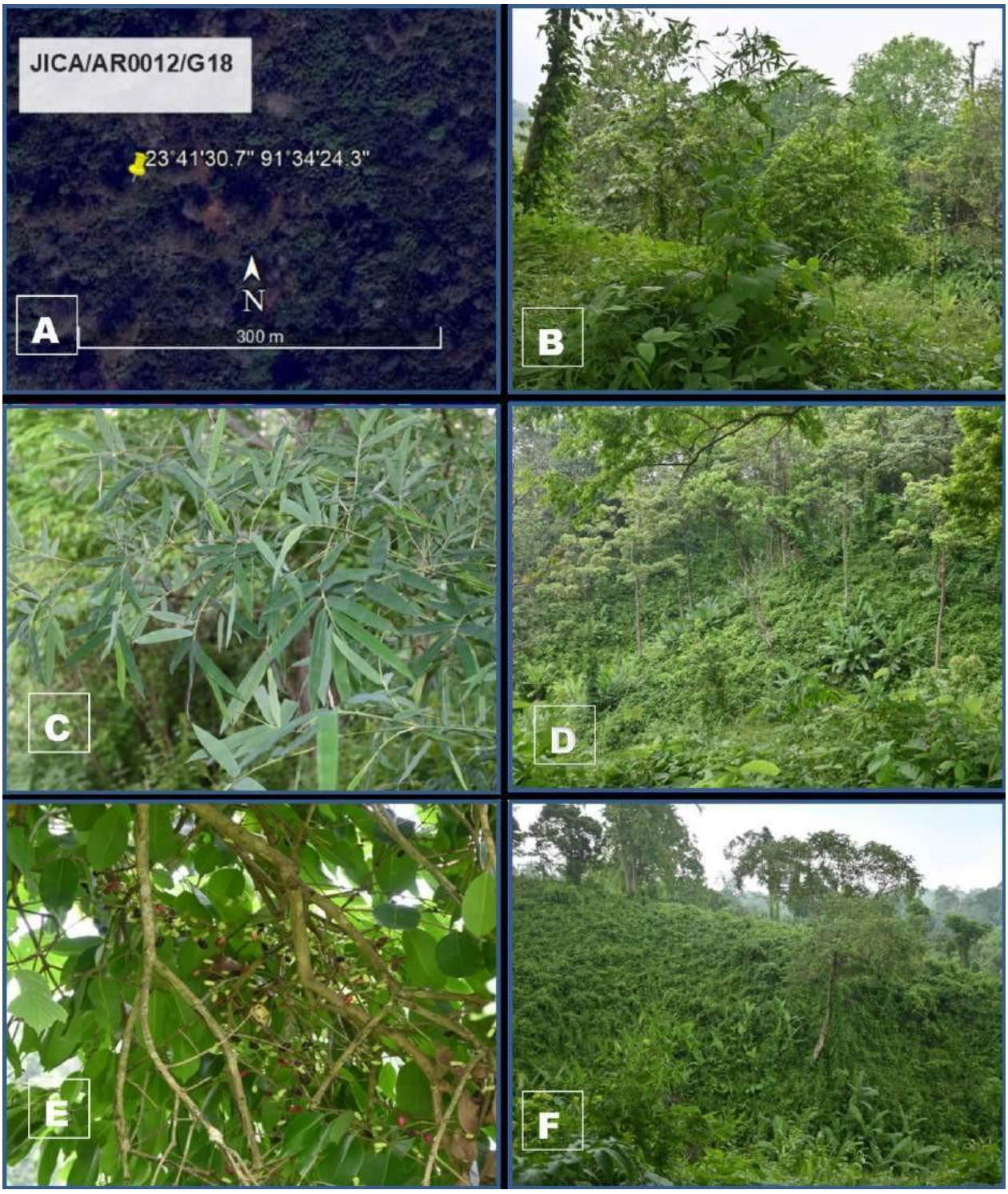


Figure 52: Study of diversity on AR0012 Bamboo (Y-Ghati JFMC): (A) Map along with GPS Coordinates. B) Plantation area (C) sapling of Schizostachyum dullooa (D & F) Adjacent forest of AR plantation (E) Syzygium cumini.

Figure 53: Study of diversity on AR009 (Birchandra Para JFMC) (A) Map along with GPS Coordinates (B) Signboard of the study site (C) Bambusa tulda (D) Bambusa bambos (E & F) Plantation site (G) Aquilaria malaccensis (H) Litsea glutinosa (I) Maesa ramentacea.

TREE SPECIES DIVERSITY PATTERN IN AR PLANTATION:

Species Richness: High Diversity: An AR plantation with a wide variety of tree species indicates successful establishment and a resilient ecosystem. This promotes biodiversity and supports various ecological functions. Number of Taxa ranges from 1 (AR009SH1) to 31 (AR002UT1). Low Diversity: If only a few species dominate the plantation, it might indicate limited success in achieving diverse species composition. Whereas number of individuals ranges between 4 (AR007KHT1) to 240 (AR004GT1). But, Shannon diversity index ranges between 0.004 (AR009SH1) to 3.06 (AR002UT1).

Dominant Species: Single Dominant Species: One tree species overwhelmingly dominates the plantation, potentially indicating that this species is well-suited to the site conditions but could also lead to ecological imbalance.

Co-Dominance: Two or more species share dominance, creating a more balanced and diverse ecosystem. Here dominance intex ranges between 0.003 (AR007KHT1) to 1.00 (AR009SH1).

Evenness: Even Distribution: Species are present in relatively equal proportions, creating a balanced ecosystem. Uneven Distribution: Some species are much more abundant than others, potentially leading to competition and the exclusion of less dominant species. In AR Plantation Species Eveness Index ranges between 0.27 (AR005NT1) to 1.00 (AR009SH1)

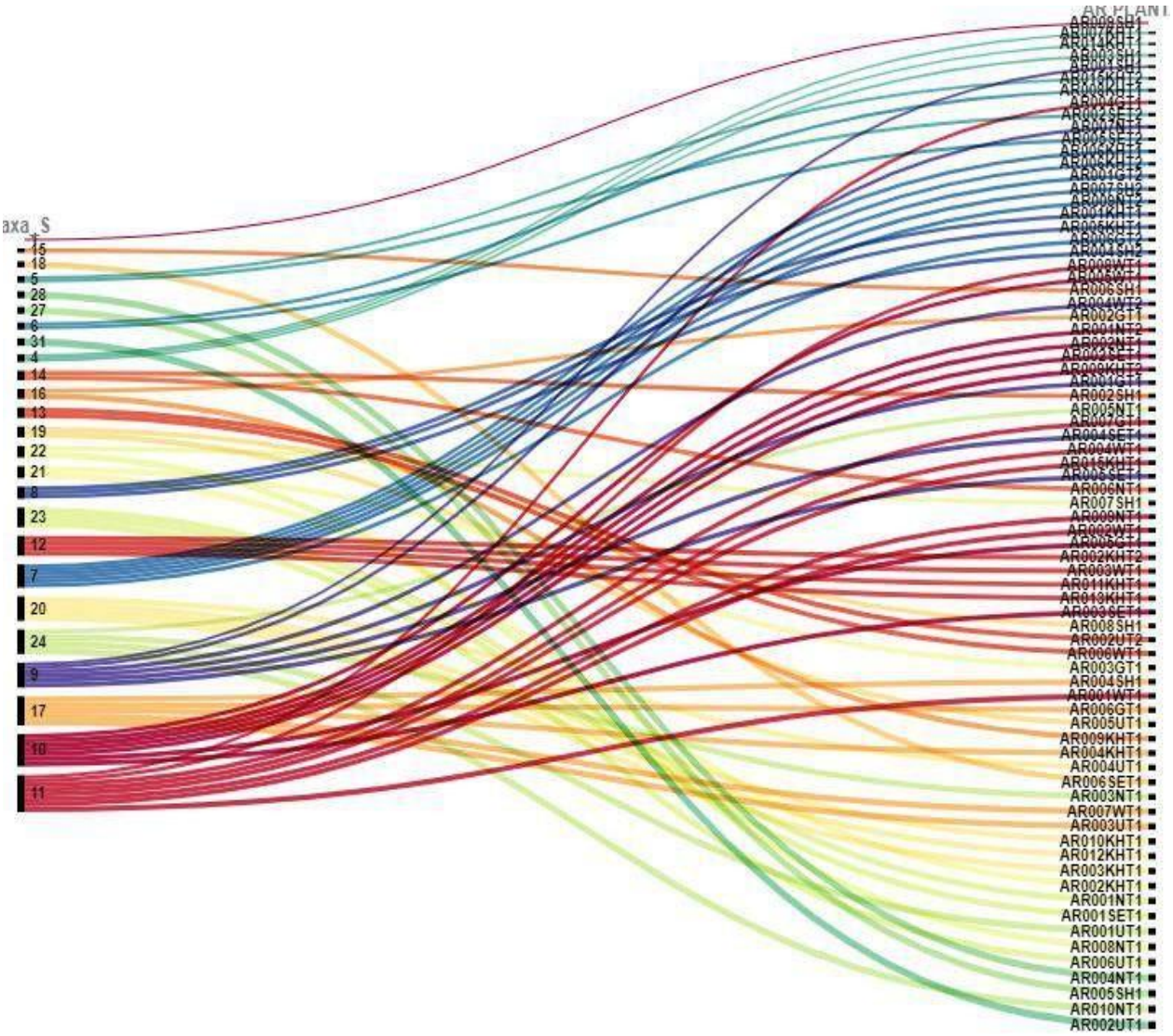


FIGURE 54: TREE SPECIES RICHNESS PATTERN IN AR PLANTATION SITES OF TRIPURA

Left side represent the no. of taxa while the right side represent their respective sites (AR plots) linking by curved color lines to each others.

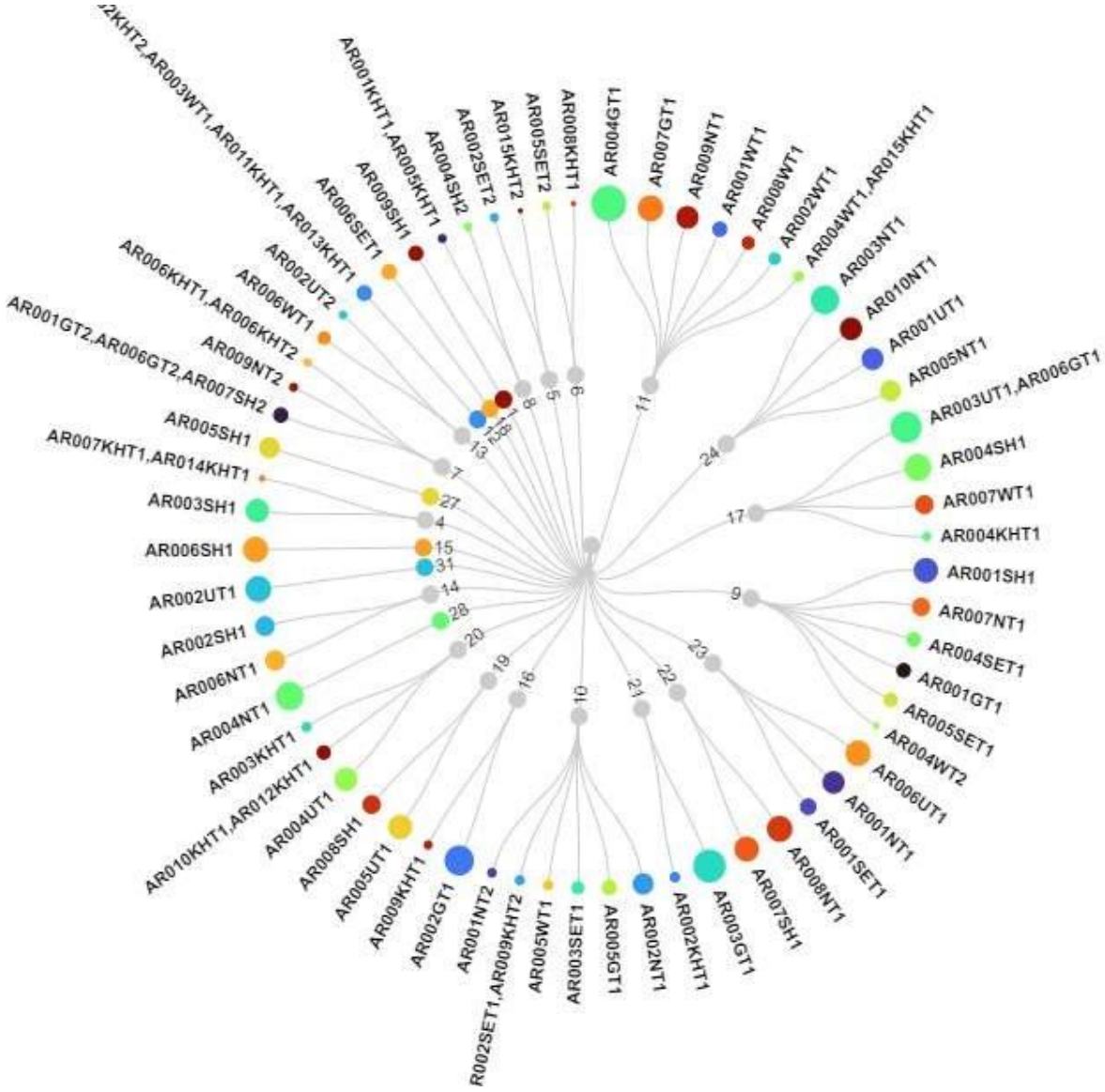


FIGURE 55: RELATIONSHIP BETWEEN TREE SPECIES INDIVIDUALS AND SPECIES RICHNESS PATTERN IN AR PLANTATION SITES OF TRIPURA

The outer circle of the color code (with ***tree*** individual size) and adjoining the inner circle of the color code represent tree species richness.

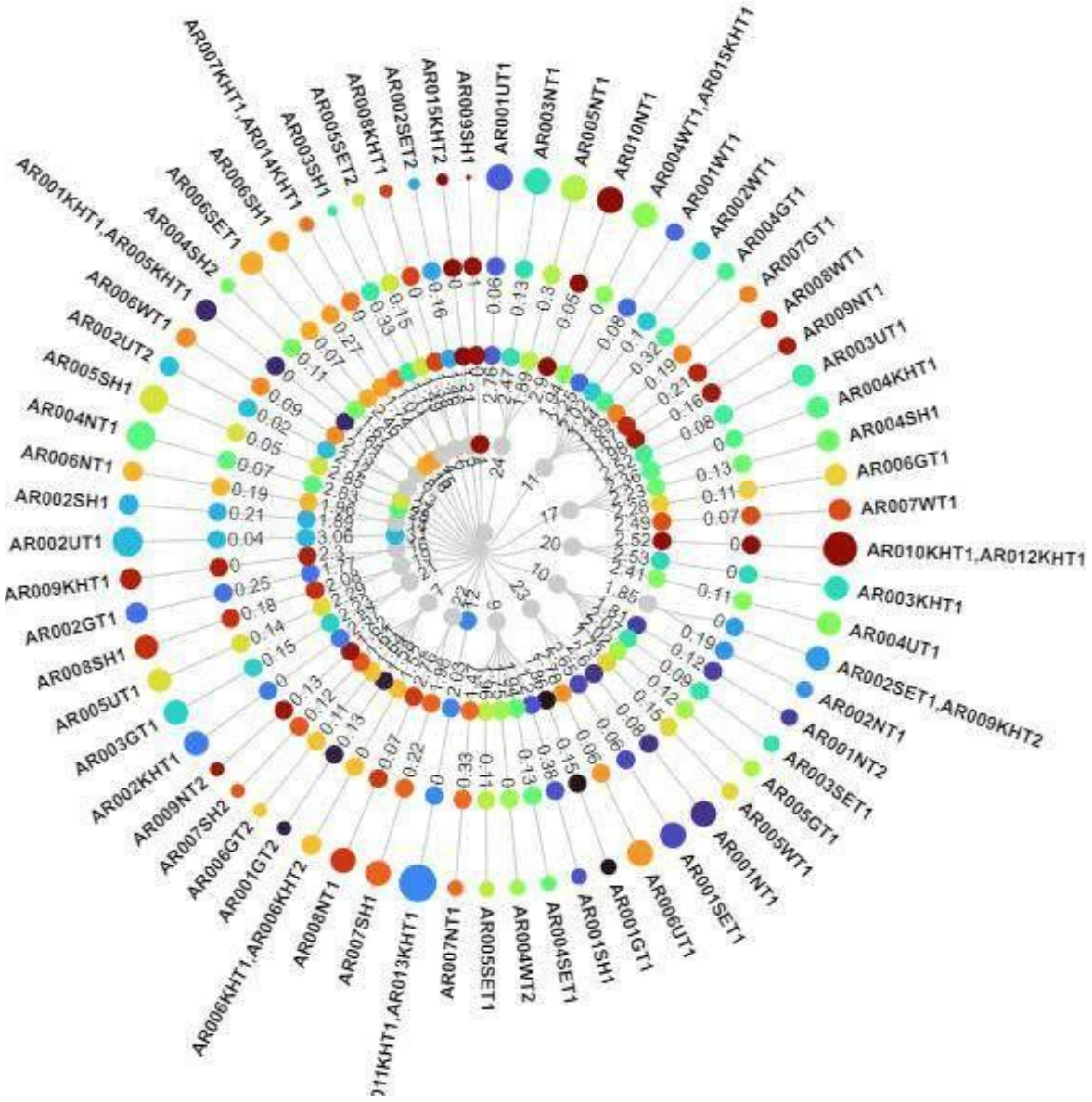


FIGURE 56: TREE SPECIES DOMINANCE AND DIVERSITY PATTERN IN AR PLANTATION SITES OF TRIPURA

The outer circle of the color code (with ***tree*** individual size) and adjoining the inner circle of the color code represent Shannon index, Evenness, and richness of tree species.

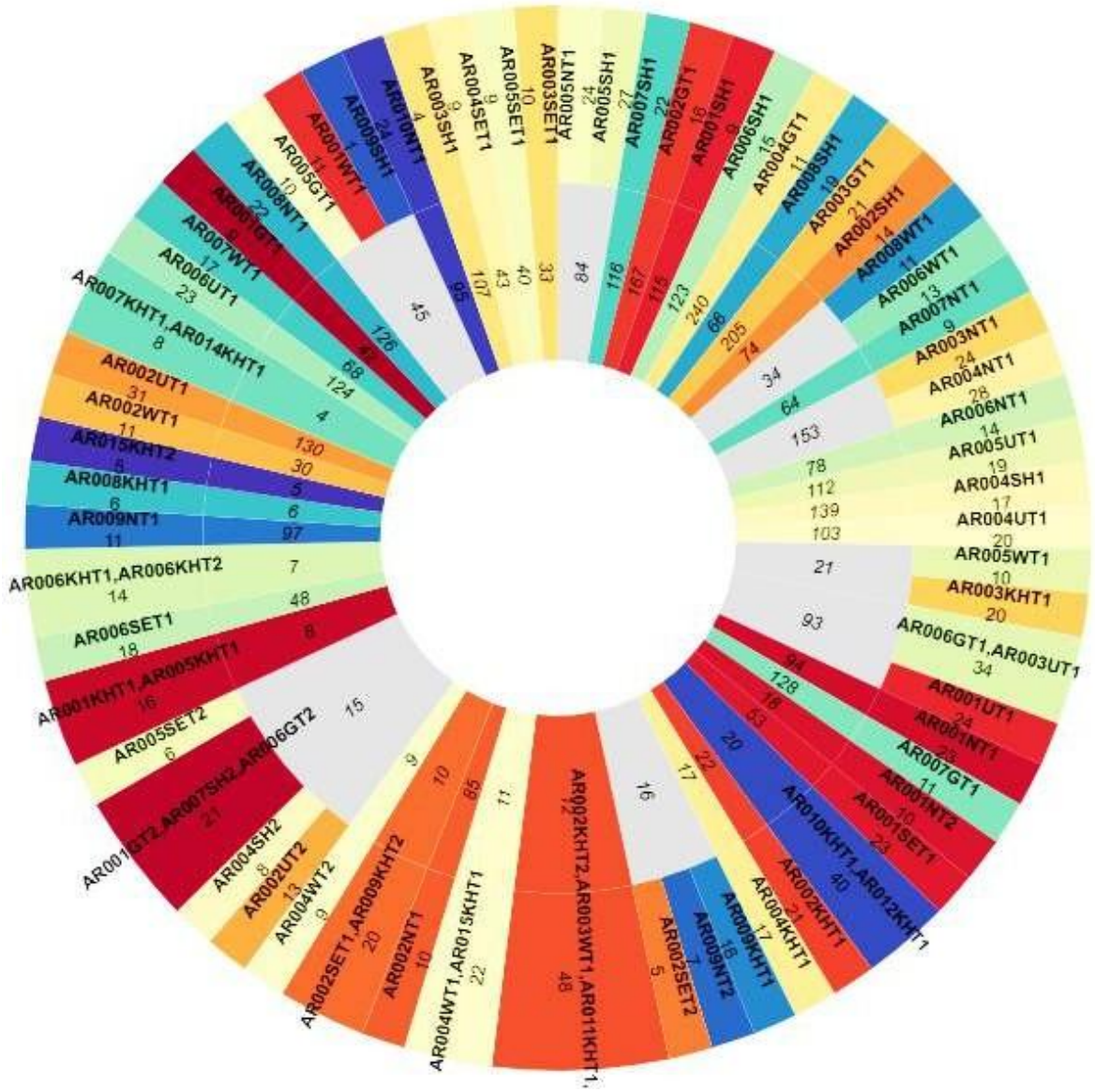


FIGURE 57: PATTERNS OF TREE DIVERSITY AND DENSITY IN ARTIFICIAL REGENERATION (AR)

The graph with darker color code and size denotes higher IVI values for the studied plantation sites.

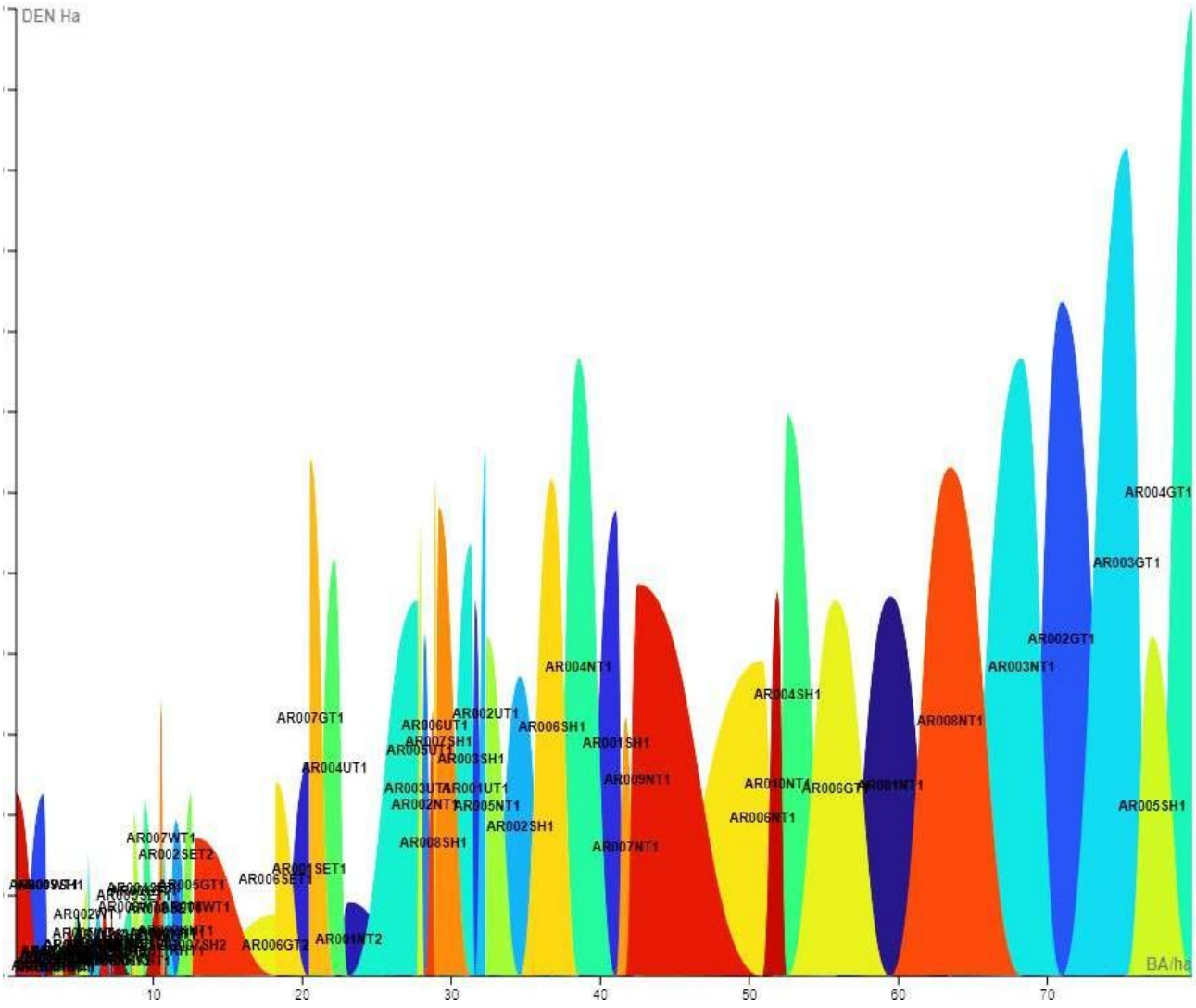


FIGURE 58: STATUS OF TREE DENSITY AND BASAL AREA IN AR PLANTATION SITES

The X-axis represents the density per hectare and the Y-axis represents Basal area per Hectare

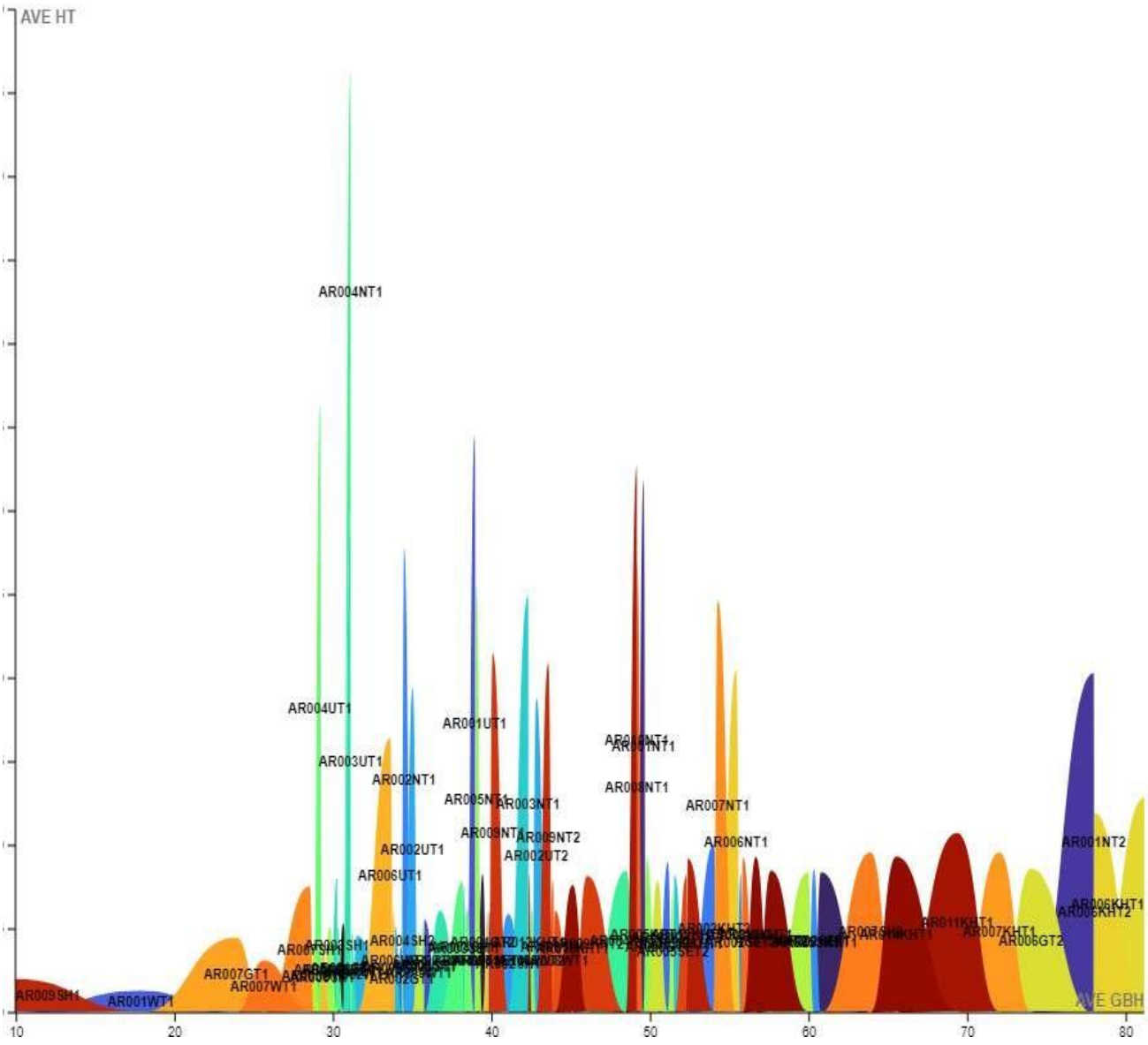


FIGURE 59: DISTRIBUTION OF TREE DENSITY ALONG HEIGHT CLASSES (H) M IN AR PLANTATION SITES

The X-axis represents the average height of the studied species and the Y-axis represents average GBH.

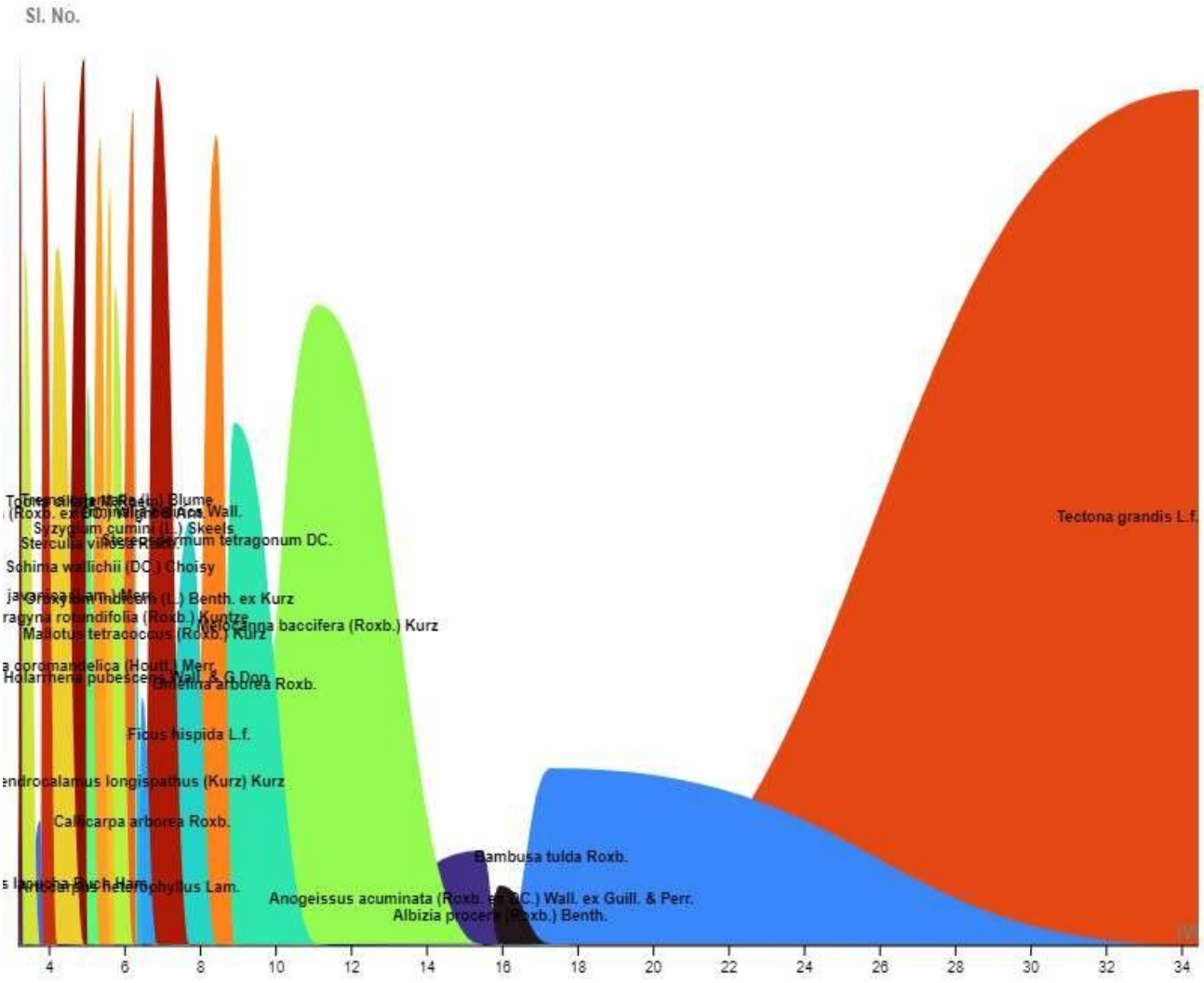


FIGURE 60: CONTRIBUTION OF TOP 25 DOMINANT TREE SPECIES IVI IN AR PLANTATION SITES

The X-axis represents highest IVI for a tree species and the Y-axis represents no.of individual species.

TABLE 15: STATUS OF TREE DIVERSITY IN ARTIFICIAL REGENERATION (AR)

SL. No.	AR PLANTATION	Taxa_S	Individuals	Dominance_D	Shannon_H	Evenness_e^H/S	Menhinick	Fisher_alpha	Chao-1
1	**AR001GT1**	9	42	0.15	1.86	0.72	1.39	3.51	10
2	**AR001GT2**	7	15	0.13	1.58	0.70	1.81	5.11	8
3	**AR001KHT1**	8	8	0.00	1.64	0.65	2.83	0.00	36
4	**AR001NT1**	23	94	0.08	2.60	0.59	2.37	9.71	25.14
5	**AR001NT2**	10	18	0.12	1.81	0.61	2.36	9.26	13.75
6	**AR001SET1**	23	53	0.06	2.65	0.61	3.16	15.45	36.2
7	**AR001SH1**	9	115	0.38	1.20	0.37	0.84	2.29	15
8	**AR001UT1**	24	93	0.06	2.76	0.66	2.49	10.48	31
9	**AR001WT1**	11	45	0.08	2.25	0.87	1.64	4.64	11
10	**AR002GT1**	16	167	0.25	1.77	0.37	1.24	4.36	19
11	**AR002KHT1**	21	22	0.00	2.57	0.62	4.48	227.40	116
12	**AR002KHT2**	12	12	0.00	2.03	0.63	3.46	0.00	78
13	**AR002NT1**	10	85	0.19	1.85	0.64	1.09	2.94	10
14	**AR002SET1**	10	10	0.00	1.85	0.64	3.16	0.00	55
15	**AR002SET2**	5	16	0.16	1.46	0.86	1.25	2.50	5
16	**AR002SH1**	14	74	0.21	1.89	0.47	1.63	5.11	15.2
17	**AR002UT1**	31	130	0.04	3.06	0.69	2.72	12.88	34.5
18	**AR002UT2**	13	15	0.02	2.12	0.64	3.36	46.48	31.33
19	**AR002WT1**	11	30	0.10	2.02	0.68	2.01	6.26	13
20	**AR003GT1**	21	205	0.15	2.23	0.44	1.47	5.86	24.75
21	**AR003KHT1**	20	21	0.00	2.53	0.63	4.36	206.60	105.5
22	**AR003NT1**	24	153	0.13	2.47	0.49	1.94	7.99	26.5
23	**AR003SET1**	10	33	0.09	2.07	0.79	1.74	4.88	10
24	**AR003SH1**	4	107	0.33	1.11	0.76	0.39	0.82	4
25	**AR003UT1**	17	93	0.08	2.52	0.73	1.76	6.10	18
26	**AR003WT1**	12	12	0.00	2.03	0.63	3.46	0.00	78
27	**AR004GT1**	11	240	0.32	1.44	0.38	0.71	2.38	11.25

28	**AR004KHT1**	17	17	0.00	2.36	0.62	4.12	0.00	153
29	**AR004NT1**	28	153	0.07	2.83	0.60	2.26	10.05	31.75
30	**AR004SET1**	9	43	0.13	1.94	0.77	1.37	3.47	9
31	**AR004SH1**	17	139	0.13	2.23	0.55	1.44	5.08	18.5
32	**AR004SH2**	8	15	0.11	1.67	0.66	2.07	6.97	18
33	**AR004UT1**	20	103	0.11	2.41	0.55	1.97	7.40	25
34	**AR004WT1**	11	11	0.00	1.94	0.63	3.32	0.00	66
35	**AR004WT2**	9	9	0.00	1.75	0.64	3.00	0.00	45
36	**AR005GT1**	10	45	0.12	2.02	0.75	1.49	3.99	10
37	**AR005KHT1**	8	8	0.00	1.64	0.65	2.83	0.00	36
38	**AR005NT1**	24	84	0.30	1.89	0.27	2.62	11.22	64
39	**AR005SET1**	9	40	0.11	1.96	0.79	1.42	3.61	10
40	**AR005SET2**	6	15	0.15	1.49	0.74	1.55	3.71	6.5
41	**AR005SH1**	27	84	0.05	2.85	0.64	2.95	13.78	31.5
42	**AR005UT1**	19	112	0.14	2.29	0.52	1.80	6.57	26
43	**AR005WT1**	10	21	0.15	1.73	0.57	2.18	7.48	20.5
44	**AR006GT1**	17	93	0.11	2.28	0.58	1.76	6.10	18.2
45	**AR006GT2**	7	15	0.11	1.64	0.74	1.81	5.11	7.25
46	**AR006KHT1**	7	7	0.00	1.52	0.65	2.65	0.00	28
47	**AR006KHT2**	7	7	0.00	1.52	0.65	2.65	0.00	28
48	**AR006NT1**	14	78	0.19	1.96	0.51	1.59	4.98	14.6
49	**AR006SET1**	18	48	0.07	2.46	0.65	2.60	10.46	22.2
50	**AR006SH1**	15	123	0.27	1.74	0.38	1.35	4.48	20
51	**AR006UT1**	23	124	0.06	2.78	0.70	2.07	8.31	25
52	**AR006WT1**	13	34	0.09	2.13	0.65	2.23	7.69	18
53	**AR007GT1**	11	128	0.19	1.89	0.60	0.97	2.88	11
54	**AR007KHT1**	4	4	0.00	1.01	0.69	2.00	0.00	10
55	**AR007NT1**	9	64	0.33	1.47	0.48	1.13	2.85	9.5
56	**AR007SH1**	22	116	0.22	1.98	0.33	2.04	8.04	26.5
57	**AR007SH2**	7	15	0.12	1.61	0.71	1.81	5.11	8.5
58	**AR007WT1**	17	68	0.07	2.49	0.71	2.06	7.28	19

59	**AR008KHT1**	6	6	0.00	1.38	0.66	2.45	0.00	21
60	**AR008NT1**	22	126	0.07	2.76	0.72	1.96	7.71	22.5
61	**AR008SH1**	19	66	0.18	2.08	0.42	2.34	8.93	32.75
62	**AR008WT1**	11	34	0.21	1.67	0.48	1.89	5.64	39
63	**AR009KHT1**	16	16	0.00	2.30	0.63	4.00	0.00	136
64	**AR009KHT2**	10	10	0.00	1.85	0.64	3.16	0.00	55
65	**AR009NT1**	11	97	0.16	1.98	0.66	1.12	3.19	11
66	**AR009NT2**	7	16	0.13	1.62	0.72	1.75	4.75	7.25
67	**AR009SH1**	1	45	1.00	0.00	1.00	0.15	0.18	1
68	**AR010KHT1**	20	20	0.00	2.52	0.62	4.47	0.00	210
69	**AR010NT1**	24	95	0.05	2.90	0.75	2.46	10.34	24
70	**AR011KHT1**	12	12	0.00	2.03	0.63	3.46	0.00	78
71	**AR012KHT1**	20	20	0.00	2.52	0.62	4.47	0.00	210
72	**AR013KHT1**	12	12	0.00	2.03	0.63	3.46	0.00	78
73	**AR014KHT1**	4	4	0.00	1.01	0.69	2.00	0.00	10
74	**AR015KHT1**	11	11	0.00	1.94	0.63	3.32	0.00	66
75	**AR015KHT2**	5	5	0.00	1.21	0.67	2.24	0.00	15

TABLE 16: RELATIVE FREQUENCY (RFR), RELATIVE DENSITY (RDEN) , RELATIVE BASAL AREA (RBA) AND IMPORTANT VALUE INDEX (IVI) OF TREES IN AR PLANTATIONS

Sl. No.	Species	RFR	RDEN	RBA	IVI
1	Tectona grandis L.f.	3.82	9.69	20.93	34.44
2	Bambusa tulda Roxb.	3.24	13.34	0.71	17.29
3	Albizia procera (Roxb.) Benth.	2.84	3.1	9.99	15.94
4	Anogeissus acuminata (Roxb. ex DC.) Wall. ex Guill.	3.82	3.26	8.36	15.44
5	Melocanna baccifera (Roxb.) Kurz	2.65	7.77	0.69	11.1
6	Gmelina arborea Roxb.	2.35	2.4	4.15	8.9
7	Stereospermum tetragonum DC.	2.65	1.76	4.01	8.42
8	Ficus hispida L.f.	3.24	2.68	1.78	7.7
9	Terminalia belirica Wall.	2.75	1.43	2.67	6.85
10	Callicarpa arborea Roxb.	2.45	1.94	2.06	6.45
11	Dendrocalamus longispathus (Kurz) Kurz	0.49	5.46	0.35	6.3
12	Holarrhena pubescens Wall. & G.Don	2.25	2.38	1.65	6.29
13	Syzygium cumini (L.) Skeels	2.25	1.34	2.63	6.22
14	Mitragyna rotundifolia (Roxb.) Kuntze	2.16	1.85	1.73	5.73
15	Schima wallichii (DC.) Choisy	1.96	1.83	1.81	5.6
16	Sterculia villosa Roxb.	2.35	1.18	1.79	5.33
17	Lannea coromandelica (Houtt.) Merr.	1.27	0.76	2.96	5
18	Toona ciliata M.Roem.	1.57	1.46	1.9	4.92
19	Parkia javanica (Lam.) Merr.	1.27	2.66	0.27	4.2
20	Terminalia arjuna (Roxb. ex DC.) Wight & Arn.	1.67	1.48	0.7	3.84
21	Artocarpus lacucha Buch.Ham.	1.08	0.53	2.14	3.75
22	Oroxylum indicum (L.) Benth. ex Kurz	1.86	1.04	0.44	3.34
23	Mallotus tetracoccus (Roxb.) Kurz	0.98	0.95	1.36	3.29
24	Trema orientalis (L.) Blume	1.27	0.72	1.24	3.23
25	Artocarpus heterophyllus Lam.	0.98	1.29	0.89	3.16
26	Aquilaria malaccensis Lam.	1.18	1.34	0.45	2.97
27	Litsea monopetala (Roxb.) Pers.	1.37	0.72	0.76	2.85
28	Dillenia indica L.	1.27	1.23	0.29	2.79
29	Ficus semicordata Buch.Ham. ex Sm.	1.18	0.58	1.03	2.78
30	Senna siamea (Lam.) H.S.Irwin & Barneby	0.88	0.76	1.12	2.77
31	Litsea glutinosa (Lour.) C.B.Rob.	1.57	0.6	0.51	2.68
32	Phyllanthus emblica L.	1.37	0.92	0.19	2.48
33	Thyrsostachys oliveri Gamble	0.29	2.03	0.12	2.45
34	Derris robusta (Roxb. ex DC.) Benth.	1.18	0.58	0.51	2.27
35	Elaeocarpus floribundus Blume	1.08	0.9	0.25	2.23
36	Albizia chinensis (Osbeck) Merr.	0.88	0.3	1.01	2.2
37	Macaranga denticulata (Blume) Müll.Arg.	0.78	0.65	0.73	2.16
38	Pterospermum acerifolium (L.) Willd.	0.88	0.42	0.82	2.12
39	Microcos paniculata L.	1.18	0.55	0.33	2.06
40	Macaranga peltata (Roxb.) Müll.Arg.	0.78	0.62	0.58	1.98

41	Hymenodictyon orixense (Roxb.) Mabb.	0.88	0.37	0.56	1.82
42	Bombax ceiba L.	0.69	0.16	0.86	1.71
43	Terminalia chebula Retz.	0.78	0.51	0.38	1.67
44	Areca catechu L.	0.29	0.9	0.43	1.62
45	Dillenia pentagyna Roxb.	0.88	0.37	0.37	1.62
46	Syzygium nervosum DC.	0.69	0.32	0.59	1.6
47	Tamarindus indica L.	0.78	0.42	0.34	1.54
48	Swietenia mahagoni (L.) Jacq.	0.78	0.67	0.08	1.53
49	Shorea robusta C.F.Gaertn.	0.49	0.18	0.84	1.51
50	Caryota urens L.	0.69	0.42	0.36	1.47
51	Alangium chinense (Lour.) Harms	0.78	0.3	0.29	1.38
52	Bambusa nutans Wall. ex Munro	0.39	0.95	0.03	1.37
53	Artocarpus chama Buch.Ham.	0.59	0.25	0.5	1.34
54	Mangifera indica L.	0.29	0.25	0.79	1.34
55	Lagerstroemia parviflora Roxb.	0.69	0.23	0.13	1.05
56	Mallotus nudiflorus (L.) Kulju & Welzen	0.39	0.35	0.31	1.05
57	Ceiba pentandra (L.) Gaertn.	0.39	0.21	0.43	1.03
58	Aegle marmelos (L.) Corrêa	0.59	0.37	0.03	0.99
59	Vitex peduncularis Wall.	0.49	0.3	0.19	0.98
60	Bauhinia acuminata L.	0.69	0.18	0.1	0.97
61	Aglaia spectabilis (Miq.) S.S.Jain & Bennet	0.29	0.25	0.36	0.91
62	Careya arborea Roxb.	0.59	0.18	0.14	0.91
63	Oreocnide integrifolia (Gaudich.) Miq.	0.49	0.14	0.21	0.84
64	Mallotus roxburghianus Müll.Arg.	0.1	0.3	0.43	0.83
65	Ficus racemosa L.	0.39	0.12	0.31	0.81
66	Albizia lebbeck (L.) Benth.	0.39	0.18	0.16	0.74
67	Erythrina variegata L.	0.49	0.12	0.13	0.73
68	Bridelia tomentosa Blume	0.39	0.18	0.11	0.69
69	Sterculia lanceolata Cav.	0.29	0.18	0.18	0.66
70	Chaetocarpus castanicarpus (Roxb.) Thwaites	0.29	0.12	0.24	0.65
71	Duabanga grandiflora (Roxb. ex DC.) Walp.	0.29	0.23	0.12	0.65
72	Bambusa balcooa Roxb.	0.29	0.32	0.01	0.63
73	Cassia fistula L.	0.39	0.12	0.11	0.62
74	Lepisanthes rubiginosa (Roxb.) Leenh.	0.29	0.07	0.26	0.62
75	Bridelia retusa (L.) A.Juss.	0.39	0.14	0.06	0.59
76	Ziziphus rugosa Lam.	0.29	0.16	0.13	0.58
77	Ficus auriculata Lour.	0.39	0.09	0.08	0.57
78	Annona squamosa L.	0.2	0.32	0.03	0.55
79	Balakata baccata (Roxb.) Esser	0.29	0.18	0.07	0.55
80	Firmiana colorata (Roxb.) R.Br.	0.29	0.14	0.12	0.55
81	Saraca asoca (Roxb.) Willd.	0.39	0.09	0.05	0.54
82	Suregada multiflora (A.Juss.) Baill.	0.39	0.09	0.05	0.54
83	Protium serratum Engl.	0.29	0.09	0.13	0.52
84	Acacia auriculiformis A.Cunn. ex Benth.	0.29	0.16	0.03	0.48
85	Dipterocarpus turbinatus C.F.Gaertn.	0.2	0.05	0.24	0.48

86	Plumeria alba L.	0.1	0.23	0.14	0.47
87	Dalhousiea bracteata (Roxb.) Graham ex Benth.	0.2	0.09	0.17	0.46
88	Mallotus philippensis (Lam.) Müll.Arg	0.29	0.09	0.08	0.46
89	Spatholobus parviflorus (DC.) Kuntze	0.2	0.09	0.16	0.45
90	Ficus geniculata Kurz	0.29	0.07	0.06	0.42
91	Moringa oleifera Lam.	0.2	0.14	0.09	0.42
92	Ficus microcarpa L.f.	0.29	0.07	0.05	0.41
93	Gardenia resinifera Roth	0.2	0.12	0.1	0.41
94	Ficus rumphii Blume	0.29	0.07	0.03	0.39
95	Actinodaphne obovata (Nees) Blume	0.2	0.09	0.09	0.38
96	Brassaiopsis griffithii C.B.Clarke	0.2	0.12	0.07	0.38
97	Citrus maxima (Burm.) Merr.	0.2	0.07	0.1	0.37
98	Pongamia pinnata (L.) Pierre	0.2	0.07	0.11	0.37
99	Maesa indica (Roxb.) Sweet	0.2	0.12	0.04	0.36
100	Castanopsis indica (Roxb. ex Lindl.) A.DC.	0.2	0.05	0.08	0.32
101	Bambusa polymorpha Munro	0.2	0.12	0	0.31
102	Cordia dichotoma G. Forster	0.2	0.07	0.05	0.31
103	Psidium guajava L.	0.2	0.09	0.01	0.3
104	Schizostachyum dullooa (Gamble) R.B.Majumdar	0.1	0.18	0.01	0.3
105	Acronychia pedunculata Miq.	0.1	0.07	0.13	0.29
106	Azadirachta indica A.Juss.	0.2	0.09	0.01	0.29
107	Baccaurea ramiflora Lour.	0.2	0.05	0.04	0.28
108	Ficus benjamina L.	0.2	0.05	0.03	0.27
109	Ficus prostrata (Wall. ex Miq.) Buch.Ham. ex Miq	0.2	0.05	0.03	0.27
110	Spondias pinnata (L.f.) Kurz	0.2	0.05	0.03	0.27
111	Glochidion multiloculare (Roxb. ex Willd.) Voigt	0.2	0.05	0.02	0.26
112	Albizia julibrissin Durazz.	0.1	0.02	0.13	0.25
113	Bambusa vulgaris Nees	0.2	0.05	0	0.25
114	Brassaiopsis glomerulata (Blume) Regel	0.2	0.05	0.01	0.25
115	Monoon simiarum (Buch.-Ham. ex Hook.f. & Thomson)	0.2	0.05	0	0.25
116	Vitex altissima L.f.	0.2	0.05	0.01	0.25
117	Melia azadirachta L.	0.1	0.09	0.03	0.22
118	Bischofia javanica Blume	0.1	0.05	0.07	0.21
119	Grewia serratula Baill.	0.1	0.05	0.06	0.2
120	Neolamarckia cadamba (Roxb.) Bosser	0.1	0.02	0.07	0.19
121	Lagerstroemia speciosa Pers.	0.1	0.07	0.01	0.18
122	Streblus asper Lour.	0.1	0.05	0.04	0.18
123	Zanthoxylum rhetsa (Roxb.) DC.	0.1	0.02	0.05	0.17
124	Ziziphus mauritiana Lam.	0.1	0.02	0.05	0.17
125	Cynometra polyandra Roxb.	0.1	0.02	0.03	0.16
126	Entada phaseoloides (L.) Merr.	0.1	0.05	0.02	0.16
127	Alphonsea ventricosa (Roxb.) Hook. f. & Thomson	0.1	0.02	0.03	0.15
128	Butea monosperma (Lam.) Kuntze	0.1	0.02	0.03	0.15
129	Elaeocarpus robustus Roxb.	0.1	0.02	0.03	0.15
130	Ficus lamponga Miq.	0.1	0.02	0.03	0.15

131	Glochidion zeylanicum (Gaertn.) A.Juss.	0.1	0.05	0.01	0.15
132	Ziziphus xylopyrus (Retz.) Willd.	0.1	0.02	0.03	0.15
133	Alstonia scholaris (L.) R. Br.	0.1	0.02	0.02	0.14
134	Annona reticulata L.	0.1	0.02	0.02	0.14
135	Brachypterum robustum (Roxb. ex DC.) Dalzell	0.1	0.02	0.02	0.14
136	Cassia javanica subsp. renigera (Wall. ex Baker) K	0.1	0.02	0.02	0.14
137	Dalbergia volubilis Roxb.	0.1	0.02	0.02	0.14
138	Dillenia scabrella Roxb.	0.1	0.02	0.02	0.14
139	Maesa ramentacea (Roxb.) A.DC.	0.1	0.02	0.02	0.14
140	Psidium guineense Sw.	0.1	0.02	0.01	0.14
141	Pterospermum semisagittatum Buch.Ham. ex Roxb.	0.1	0.02	0.02	0.14
142	Alsophila gigantea Wall. ex Hook.	0.1	0.02	0.01	0.13
143	Bridelia micrantha (Hochst.) Baill.	0.1	0.02	0.01	0.13
144	Croton joufra Roxb.	0.1	0.02	0.01	0.13
145	Ficus heteropleura Blume	0.1	0.02	0.01	0.13
146	Ficus nervosa Roth	0.1	0.02	0.01	0.13
147	Ficus religiosa L.	0.1	0.02	0.01	0.13
148	Ficus simplicissima Lour.	0.1	0.02	0.01	0.13
149	Garcinia cowa Roxb.	0.1	0.02	0.01	0.13
150	Syzygium jambos (L.) Alston	0.1	0.02	0.01	0.13
151	Averrhoa carambola L.	0.1	0.02	0	0.12
152	Bambusa cacharensis R.B.Majumdar	0.1	0.02	0	0.12
153	Eurya acuminata DC.	0.1	0.02	0	0.12
154	Ficus variegata Blume	0.1	0.02	0	0.12
155	Flacourtia jangomas (Lour.) Raeusch.	0.1	0.02	0	0.12
156	Mimusops elengi Bojer	0.1	0.02	0	0.12
157	Morinda citrifolia L.	0.1	0.02	0	0.12
158	Spondias mombin L.	0.1	0.02	0	0.12

Data arranged based on ascending order of IVI values for each studied species

REGENERATION STATUS IN ARTIFICIAL REGENERATION (AR) PLANTATION:

Plant diversity status in AR regeneration plots:

The status of plant regeneration pattern in an Artificial Regeneration (AR) plantation refers to the current state and trends of plant regrowth and establishment within the restored area. AR involves allowing natural processes to drive vegetation recovery, with minimal human intervention. Regular monitoring and assessment of these factors will provide insights into the trajectory of the AR plantation's development. It helps determine if the AR efforts are successfully restoring a diverse and functional ecosystem, and whether any adaptive management actions are required to enhance the regeneration process.

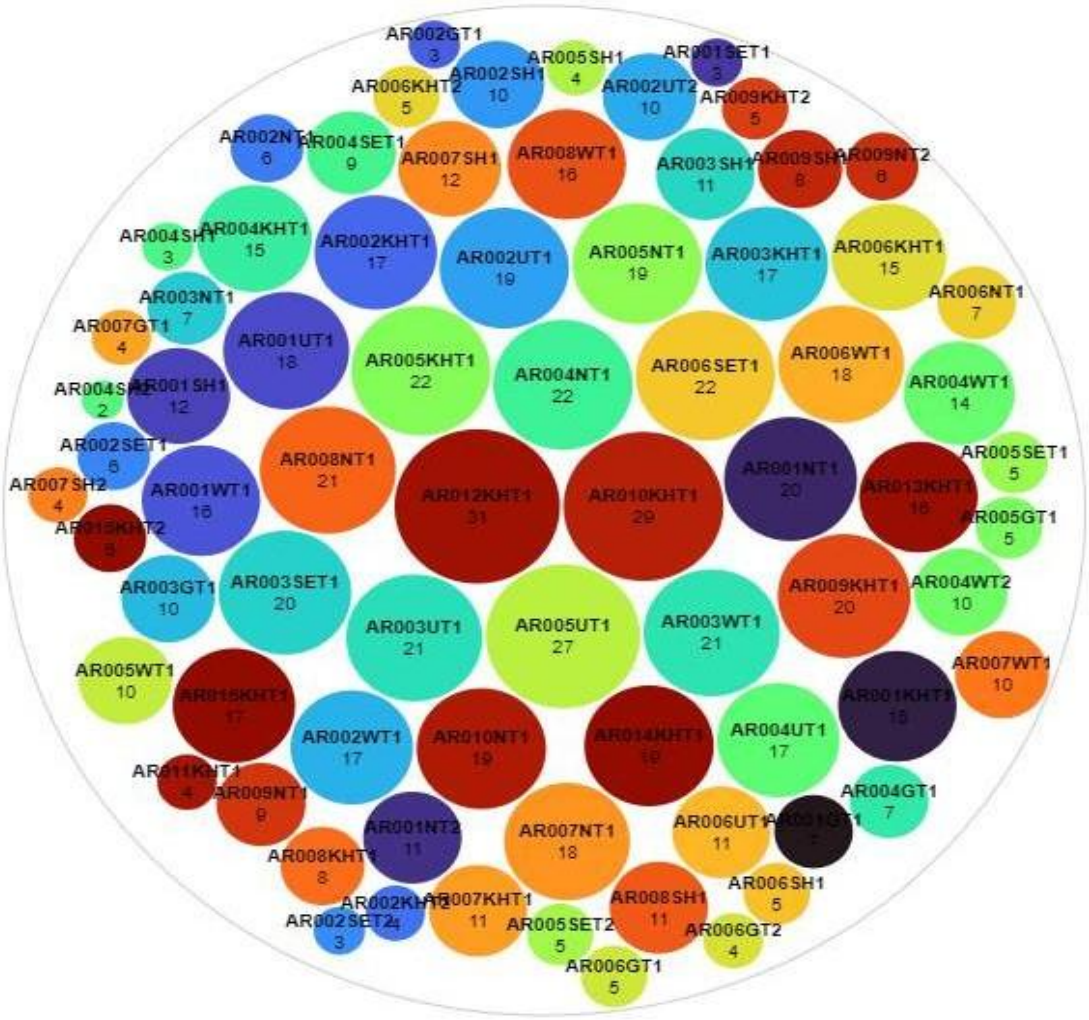


FIGURE 61: STATUS OF SPECIES RICHNESS IN AR REGENERATION PLOTS

Circle graph showing the species richness of regeneration across the ANR plantation sites (Larger size denotes high richness.

Species Richness: A plant species diversity ranging between 4 and 32 species in a regeneration plot of an Aided Natural Regeneration (ANR) plantation indicates the number of different plant species that have naturally regenerated and established in that specific area. Plant species diversity is a key indicator of the ecological health and richness of an ecosystem. When plant species diversity range of 4-32 in an ANR regeneration plot is a reflection of the richness and complexity of the plant community in that specific area. A higher diversity generally indicates a more resilient and ecologically valuable ecosystem, but interpretation should account for various factors influencing the specific context of the ANR plantation.

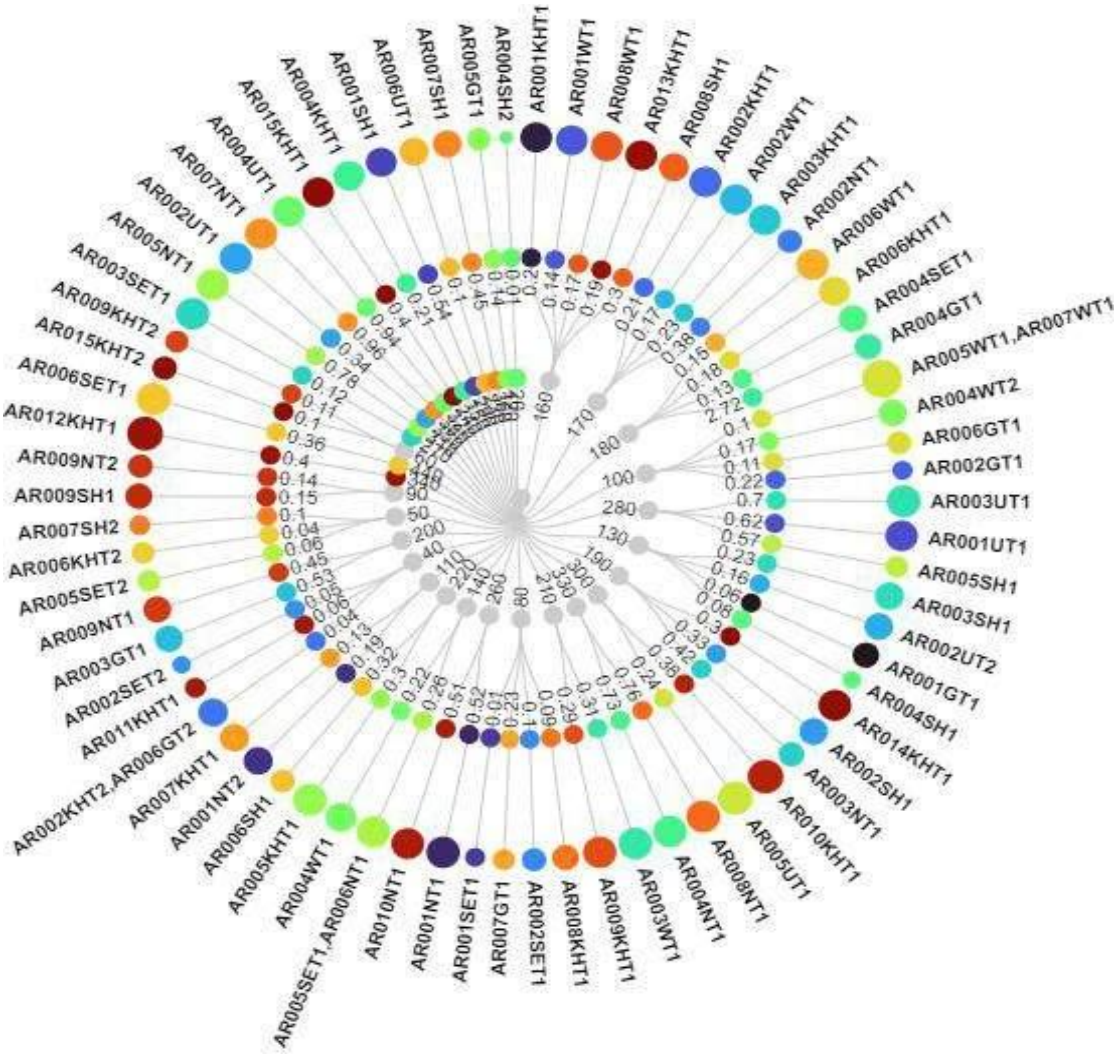


FIGURE 62: STATUS OF TREE SPECIES DENSITY AND BASAL AREA IN AR REGENERATION PLOTS

The outer circle of the color code (with ***regeneration*** individual size) and adjoining the inner circle of the color code represent Shannon index, Evenness, and richness of tree species.

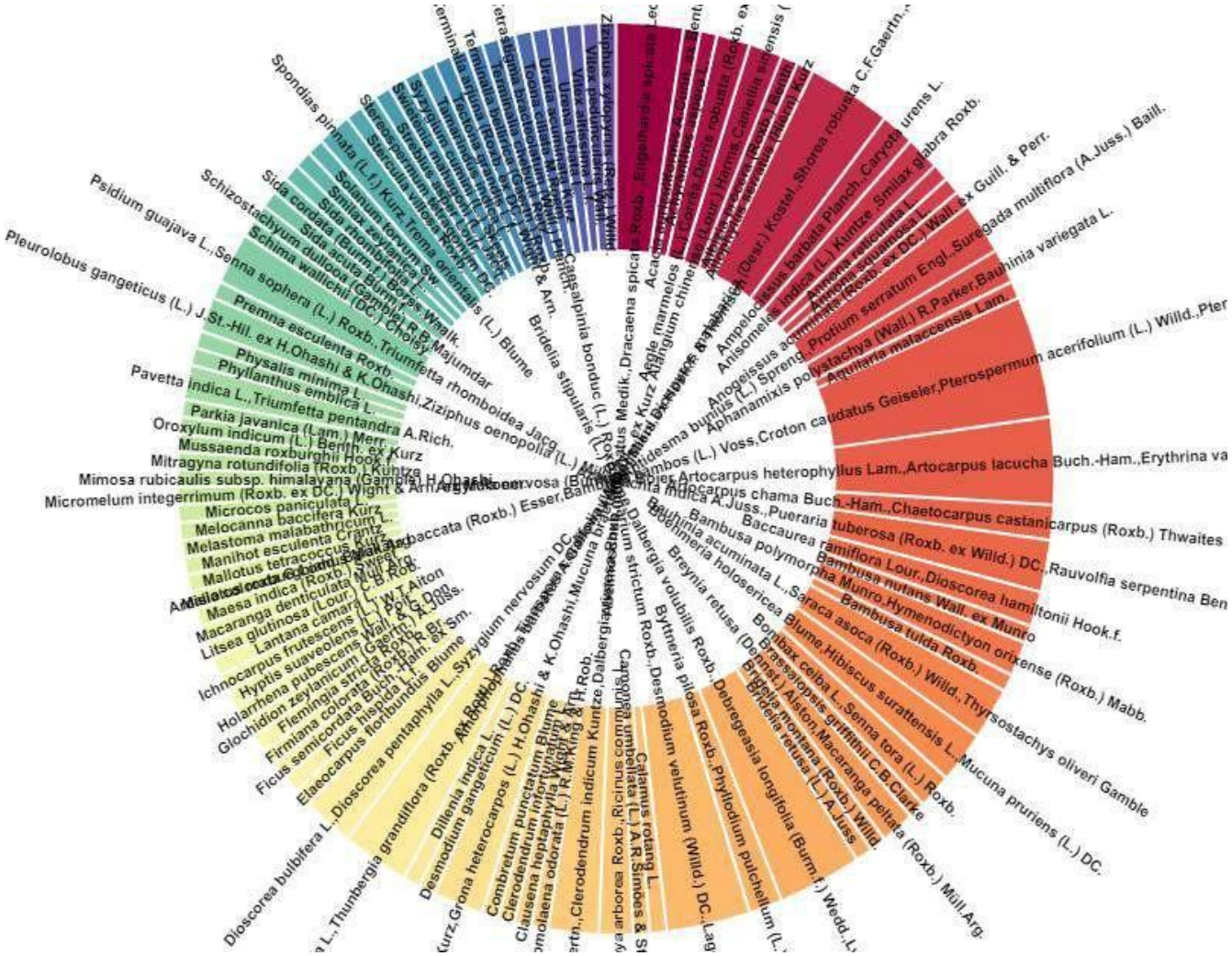


FIGURE 63: STATUS OF IVI AND SPECIES COMPOSITION IN AR REGENERATION PLOTS

The graph with darker color code and size denotes higher IVI values for the studied species.

STATUS OF PLANT DIVERSITY IN REGENERATION PLOTS OF ARTIFICIAL REGENERATION (AR) PLANTATION:

The description you provided outlines the plant species diversity, dominance, and evenness in a set of 75 Artificial Regeneration (AR) plantation sites, including tree seedlings. Let's break down the key findings and their implications: Total Regenerated Species: Across the 75 AR plantation sites, a total of 164 regenerated species, including tree seedlings, were recorded. This indicates a diverse range of regenerated vegetation within the plantations.

Number of Taxa: The number of taxa (taxonomic groups or categories) varies among the sites, ranging from 2 taxa (AR004SH2) to 31 taxa (AR012KHT1). This diversity in the number of taxa reflects variations in the composition of regenerated species from site to site.

Dominance Index: The dominance index ranges between 0.001 (AR004SH2) and 0.44 (AR004SH1). A dominance index closer to 1 suggests that a few herb species dominate the plantations. This dominance can influence ecosystem structure and function, and it's important to assess whether these dominant species are native or invasive.

Shannon Diversity Index: The Shannon diversity index, which measures species richness and evenness, ranges from 0.44 (AR004SH2) to 2.92 (AR012KHT1). Higher Shannon diversity indices indicate more diverse and balanced regenerated communities.

Evenness Index: The evenness index, which measures the relative abundance of different species, ranges between 0.49 (AR006NT1) and 0.84 (AR002GT1). An evenness index closer to 1 indicates a more balanced distribution of species abundance.

IMPLICATIONS FOR REGENERATION IN ARTIFICIAL REGENERATION (AR) PLANTATION SITES: Diversity and Conservation: Sites with higher Shannon diversity indices (closer to 2.92) have more diverse regenerated communities, which can enhance ecosystem resilience and provide habitat for various organisms. Conservation efforts should focus on maintaining and enhancing this diversity. Dominance Impact: Sites with dominant regenerated species (with higher dominance indices) might experience altered ecosystem dynamics and competition among species. It's essential to monitor the impacts of dominant species on other species and ecosystem processes. Evenness and Stability: Higher evenness indices (closer to 0.84) suggest a more balanced distribution of species abundance. This can contribute to ecosystem stability and reduce the risk of one species dominating. Site-Specific Factors: The variations in taxa, diversity indices, and dominance indices highlight the importance of site-specific conditions. Factors like soil type, moisture, sunlight, and management practices can influence regenerated community composition.

Management Strategies: Based on the findings, management strategies can be tailored for each site. Sites with lower diversity might benefit from introducing more native species, while sites with dominant species might require interventions to restore balance. In summary, the regenerated species diversity, dominance, and evenness in the 75 AR plantation sites with tree seedlings exhibit variations that reflect the complex interplay of ecological factors. Understanding these patterns helps guide conservation and management efforts to ensure healthy and resilient ecosystems within the AR plantations.

TABLE 17: STATUS OF PLANT DIVERSITY IN REGENERATION PLOTS OF ARTIFICIAL REGENERATION (AR) PLANTATION

SL. No.	AR PLANTATION	Taxa_S	Individuals	Dominance_D	Shannon_H	Evenness_e^H/S	Menhinick	Fisher_alpha	Chao-1
1	AR001GT1	7	13	0.10	1.61	0.72	1.94	6.18	8
2	AR001KHT1	16	16	0.00	2.30	0.63	4.00	0.00	136
3	AR001NT1	20	26	0.02	2.55	0.64	3.92	39.71	41
4	AR001NT2	11	11	0.00	1.94	0.63	3.32	0.00	66
5	AR001SET1	3	8	0.29	0.91	0.83	1.06	1.74	3
6	AR001SH1	12	29	0.07	2.17	0.73	2.23	7.67	12.5
7	AR001UT1	18	28	0.04	2.42	0.62	3.40	21.77	44
8	AR001WT1	16	16	0.00	2.30	0.63	4.00	0.00	136
9	AR002GT1	3	10	0.31	0.93	0.84	0.95	1.45	3
10	AR002KHT1	17	17	0.00	2.36	0.62	4.12	0.00	153
11	AR002KHT2	4	4	0.00	1.01	0.69	2.00	0.00	10
12	AR002NT1	6	17	0.24	1.38	0.66	1.46	3.31	6
13	AR002SET1	6	8	0.11	1.36	0.65	2.12	10.91	16
14	AR002SET2	3	4	0.17	0.79	0.73	1.50	5.45	3.5
15	AR002SH1	10	19	0.11	1.85	0.63	2.29	8.54	15
16	AR002UT1	19	35	0.06	2.43	0.60	3.21	16.99	58
17	AR002UT2	10	13	0.05	1.86	0.64	2.77	19.86	24
18	AR002WT1	17	17	0.00	2.36	0.62	4.12	0.00	153
19	AR003GT1	10	20	0.12	1.82	0.62	2.24	7.96	15
20	AR003KHT1	17	17	0.00	2.36	0.62	4.12	0.00	153
21	AR003NT1	7	19	0.20	1.52	0.65	1.61	4.00	7.25
22	AR003SET1	20	27	0.03	2.55	0.64	3.85	34.91	46.25
23	AR003SH1	11	13	0.04	1.93	0.62	3.05	33.82	56
24	AR003UT1	21	28	0.02	2.61	0.65	3.97	38.17	38.5
25	AR003WT1	21	21	0.00	2.57	0.62	4.58	0.00	231

26	AR004GT1	7	18	0.12	1.68	0.77	1.65	4.21	8
27	AR004KHT1	15	15	0.00	2.24	0.63	3.87	0.00	120
28	AR004NT1	22	33	0.05	2.54	0.58	3.83	28.85	98.5
29	AR004SET1	9	18	0.08	1.87	0.72	2.12	7.16	9.6
30	AR004SH1	3	13	0.44	0.78	0.73	0.83	1.22	3
31	AR004SH2	2	2	0.00	0.44	0.78	1.41	0.00	3
32	AR004UT1	17	32	0.06	2.38	0.64	3.01	14.72	20.5
33	AR004WT1	14	14	0.00	2.18	0.63	3.74	0.00	105
34	AR004WT2	10	10	0.00	1.85	0.64	3.16	0.00	55
35	AR005GT1	5	12	0.18	1.31	0.74	1.44	3.22	6
36	AR005KHT1	22	22	0.00	2.61	0.62	4.69	0.00	253
37	AR005NT1	19	31	0.05	2.48	0.63	3.41	20.87	45
38	AR005SET1	5	14	0.21	1.29	0.73	1.34	2.78	6
39	AR005SET2	5	5	0.00	1.21	0.67	2.24	0.00	15
40	AR005SH1	4	28	0.29	1.20	0.83	0.76	1.28	4
41	AR005UT1	27	30	0.01	2.81	0.62	4.93	130.30	177
42	AR005WT1	10	10	0.00	1.85	0.64	3.16	0.00	55
43	AR006GT1	5	10	0.13	1.36	0.78	1.58	3.98	5
44	AR006GT2	4	4	0.00	1.01	0.69	2.00	0.00	10
45	AR006KHT1	15	18	0.04	2.19	0.60	3.54	42.35	106
46	AR006KHT2	5	5	0.00	1.21	0.67	2.24	0.00	15
47	AR006NT1	7	14	0.31	1.24	0.49	1.87	5.57	22
48	AR006SET1	22	44	0.04	2.69	0.67	3.32	17.51	33
49	AR006SH1	5	22	0.24	1.33	0.76	1.07	2.02	5
50	AR006UT1	11	23	0.09	1.98	0.66	2.29	8.27	18.5
51	AR006WT1	18	18	0.00	2.42	0.62	4.24	0.00	171
52	AR007GT1	4	8	0.18	1.13	0.78	1.41	3.18	4
53	AR007KHT1	11	11	0.00	1.94	0.63	3.32	0.00	66
54	AR007NT1	18	38	0.06	2.42	0.62	2.92	13.38	45.5
55	AR007SH1	12	36	0.15	1.90	0.56	2.00	6.30	22.5
56	AR007SH2	4	5	0.10	1.03	0.70	1.79	9.28	5.5

57	AR007WT1	10	10	0.00	1.85	0.64	3.16	0.00	55
58	AR008KHT1	8	8	0.00	1.64	0.65	2.83	0.00	36
59	AR008NT1	21	33	0.04	2.58	0.63	3.66	24.86	39.2
60	AR008SH1	11	16	0.05	1.99	0.67	2.75	15.54	16.25
61	AR008WT1	16	16	0.00	2.30	0.63	4.00	0.00	136
62	AR009KHT1	20	21	0.00	2.53	0.63	4.36	206.60	105.5
63	AR009KHT2	5	6	0.07	1.23	0.68	2.04	14.12	8
64	AR009NT1	9	20	0.13	1.75	0.64	2.01	6.30	14
65	AR009NT2	6	9	0.11	1.40	0.68	2.00	7.87	9
66	AR009SH1	8	9	0.03	1.65	0.65	2.67	34.61	18.5
67	AR010KHT1	29	30	0.00	2.89	0.62	5.30	430.10	218
68	AR010NT1	19	26	0.04	2.44	0.61	3.73	31.79	45.25
69	AR011KHT1	4	4	0.00	1.01	0.69	2.00	0.00	10
70	AR012KHT1	31	34	0.01	2.92	0.60	5.32	170.30	466
71	AR013KHT1	16	16	0.00	2.30	0.63	4.00	0.00	136
72	AR014KHT1	19	19	0.00	2.47	0.62	4.36	0.00	190
73	AR015KHT1	17	24	0.06	2.28	0.57	3.47	25.99	122
74	AR015KHT2	6	6	0.00	1.38	0.66	2.45	0.00	21

STRUCTURE AND IMPORTANT VALUE INDEX (IVI) OF PLANTS IN REGENERATION PLOTS OF ARTIFICIAL REGENERATION (AR) PLANTATIONS:

Structure of regeneration Plots:

A plant density per hectare that ranges between 60 and 970 in a regeneration plot of an Aided Natural Regeneration (ANR) plantation refers to the number of individual plants of various species that have naturally regenerated and established within that specific area. Plant density is a key indicator of the abundance of vegetation and the ecological success of the regeneration process. Here's how to interpret the range of 60-970 plants per hectare: Closer to 60: A plant density of around 60 plants per hectare suggests a lower density of regenerating plants. This might indicate early stages of regeneration or a site with certain limiting factors that influence the establishment of vegetation. Closer to 970: A plant density of around 970 plants per hectare indicates a higher density of regenerating plants. This suggests more successful regeneration efforts, possibly with a mix of pioneer, early-successional, and potentially mid-successional species.

A Basal Area per hectare that ranges between 0.07 and 1.20 in a regeneration plot of an Aided Natural Regeneration (ANR) plantation refers to the total cross-sectional area of tree trunks at breast height (usually 1.3 meters above the ground) within that specific area. Basal area is a key indicator of the amount of space occupied by tree trunks, which provides insights into tree density and canopy cover. Here's how to interpret the range of 0.07-1.20 square meters per hectare: Closer to 0.07: A basal area of around 0.07 square meters per hectare indicates a lower density of tree trunks and potentially a more open canopy. This might reflect early stages of regeneration or a site with certain limiting factors that influence tree growth. Closer to 1.20: A basal area of around 1.20 square meters per hectare suggests a higher density of tree trunks and a denser canopy. This suggests more successful tree regeneration efforts, with a greater number of trees occupying the space.

The Important Value Index (IVI) calculated on a scale of 300 for 164 plant species in 74 Regeneration Plots of Artificial Regeneration (AR) plantation sites provides insights into the dominance and significance of different species within these plots. The IVI takes into account relative frequency, relative density, and relative dominance to assess the overall importance of each species. Here's a breakdown of the top dominant species and those with low IVI values:

Top Dominant Species (Based on IVI): Chromolaena odorata (L.) R.M.King & H.Rob.: IVI 19.94 - This species has the highest IVI, indicating that it's the most dominant species in the regeneration plots across the AR plantation sites. Clerodendrum infortunatum L.: IVI 19.04 - This species ranks second in dominance based on IVI. Its presence in multiple plots suggests its adaptability and ecological significance. Urena lobata L.: IVI 16.59 - Another dominant species, indicating its ability to establish itself in the AR plantation plots. *Anogeissus acuminata* (Roxb.

ex DC.) Wall. ex Guill. & Perr.: IVI 10.11 - This species contributes significantly to the dominance and structure of the plots. Melastoma malabathricum L.: IVI 10.06 - While less dominant compared to the top four, it still has substantial influence in the regeneration plots.

Species with Low IVI Values: Amorphophallus barbatus A.Galloway & Ongsakul: IVI 0.28 - This species has a very low IVI, indicating its low presence and importance across the plots. Diospyros malabarica (Desr.) Kostel.: IVI 0.28 - Similar to the previous species, it has low dominance and might be less adapted to the plots. Shorea robusta C.F.Gaertn.: IVI 0.28 - This species has low importance based on IVI, indicating its marginal presence in the regeneration plots. Syzygium jambos (L.) Alston: IVI 0.28 - Similar to the other low-IVI species, it contributes minimally to the regeneration plots. Thysanolaena latifolia Honda: IVI 0.28 - With an IVI of 0.28, this species has limited impact on the structure and dominance of the plots.

IMPLICATIONS FOR REGENERATION IN ARTIFICIAL REGENERATION (AR) PLANTATIONS:

Dominance and Plant Community Structure: Species with high IVI values are key players in shaping the structure of the plant community in the regeneration plots. Invasive Species: Dominant species should be evaluated to determine if they are invasive or native, as invasive species can alter ecosystem dynamics. Ecosystem Function: The dominance of certain species might influence resource availability, habitat creation, and other ecosystem functions. Conservation: Species with low IVI values might require attention for conservation efforts if they are native or ecologically significant. Understanding the IVI values helps prioritize management strategies, conserve native species, address invasive species, and ensure that the AR plantation plots promote a diverse and resilient plant community.

TABLE 18: RELATIVE FREQUENCY (RFR), RELATIVE DENSITY (RDEN) , RELATIVE BASAL AREA (RBA) AND IMPORTANT VALUE INDEX (IVI) OF PLANTS IN REGENERATION PLOTS OF ARTIFICIAL REGENERATION (AR) PLANTATIONS

Sl. No.	Species	RFR	RDEN	RBA	IVI
1	Chromolaena odorata (L.) R.M.King & H.Rob.	3.4	8.42	8.12	19.9
2	Clerodendrum infortunatum L.	3.97	7.43	7.65	19
3	Urena lobata L.	4.72	7.35	4.52	16.59
4	Anogeissus acuminata (Roxb. ex DC.) Wall. ex Guill. & Perr.	0.94	0.69	8.48	10.1
5	Melastoma malabathricum L.	2.27	3.68	4.11	10
6	Mitragyna rotundifolia (Roxb.) Kuntze	1.61	2.53	5.81	9.95
7	Hyptis suaveolens (L.) Poit.	1.89	2.91	4.47	9.27
8	Microcos paniculata L.	1.98	2.83	3.73	8.55
9	Bambusa tulda Roxb.	1.7	2.53	2.26	6.49
10	Melocanna baccifera Kurz	1.7	2.14	1.56	5.4
11	Parkia javanica (Lam.) Merr.	1.89	1.53	1.18	4.6
12	Elaeocarpus floribundus Blume	1.61	1.3	1.59	4.49
13	Syzygium cumini (L.) Skeels	1.7	1.53	0.84	4.07
14	Phyllanthus emblica L.	1.61	1.3	0.99	3.89
15	Solanum torvum Sw.	1.13	0.92	1.62	3.67
16	Terminalia bellirica (Gaertn.) Roxb.	1.61	1.3	0.68	3.58
17	Combretum punctatum Blume	1.04	1.45	1.04	3.54
18	Maesa indica (Roxb.) Sweet	1.42	1.15	0.97	3.53
19	Dillenia indica L.	1.51	1.38	0.56	3.45
20	Tectona grandis L.f.	0.66	1.15	1.54	3.35
21	Clausena heptaphylla Wight & Arn.	1.04	1.07	1.22	3.33
22	Lantana camara L.	1.13	1.23	0.91	3.27
23	Micromelum integerrimum (Roxb. ex DC.) Wight & Arn. ex	0.94	0.84	1.26	3.04
24	Terminalia arjuna (Roxb. ex DC.) Wight & Arn.	1.32	1.07	0.63	3.02
25	Mallotus tetracoccus Kurz	0.94	0.92	1.13	3
26	Swietenia mahagoni (L.) Jacq.	0.85	0.69	1.41	2.95
27	Mussaenda roxburghii Hook.f.	0.94	0.84	1.12	2.91
28	Bridelia retusa (L.) A.Juss	1.04	0.84	0.87	2.75
29	Tamarindus indica L.	0.94	0.69	1.01	2.65
30	Pavetta indica L.	1.23	1	0.33	2.55
31	Triumfetta pentandra A.Rich.	1.04	1	0.52	2.55
32	Ichnocarpus frutescens (L.) W.T.Aiton	1.32	1.07	0.12	2.51
33	Oroxylum indicum (L.) Benth. ex Kurz	0.85	0.69	0.96	2.5
34	Sida rhombifolia L.	1.32	1	0.18	2.49
35	Macaranga denticulata Müll.Arg.	0.57	0.77	1.13	2.46
36	Vitex altissima L.f.	0.85	0.77	0.76	2.38

37	Litsea glutinosa (Lour.) C.B.Rob.	1.04	0.77	0.57	2.37
38	Manihot esculenta Crantz	0.38	0.69	1.2	2.27
39	Smilax zeylanica L.	1.13	0.92	0.2	2.26
40	Aquilaria malaccensis Lam.	0.76	0.61	0.65	2.02
41	Desmodium gangeticum (L.) DC.	0.94	0.69	0.38	2.01
42	Achyranthes aspera L.	0.76	0.54	0.64	1.93
43	Mallotus roxburghianus Müll.Arg.	0.76	0.61	0.44	1.81
44	Sterculia villosa Roxb.	0.76	0.54	0.49	1.79
45	Uraria acuminata Kurz	0.47	0.69	0.61	1.77
46	Holarrhena pubescens Wall. & G.Don	0.66	0.54	0.48	1.68
47	Acacia auriculiformis A.Cunn. ex Benth.	0.57	0.46	0.62	1.64
48	Ficus hispida L.f.	0.57	0.54	0.47	1.57
49	Terminalia chebula Retz.	0.85	0.61	0.09	1.55
50	Aegle marmelos (L.) Corrêa	0.57	0.38	0.59	1.54
51	Derris robusta (Roxb. ex DC.) Benth.	0.47	0.46	0.61	1.54
52	Sida acuta Burm.f.	0.76	0.54	0.23	1.53
53	Toona ciliata M.Roem.	0.47	0.46	0.58	1.51
54	Stereospermum tetragonum DC.	0.66	0.46	0.37	1.49
55	Artocarpus chama Buch.-Ham.	0.47	0.31	0.63	1.41
56	Chaetocarpus castanicarpus (Roxb.) Thwaites	0.47	0.31	0.63	1.41
57	Premna esculenta Roxb.	0.57	0.46	0.33	1.36
58	Breynia retusa (Dennst.) Alston	0.47	0.38	0.46	1.31
59	Macaranga peltata (Roxb.) Müll.Arg.	0.28	0.38	0.64	1.31
60	Sida cordata (Burm.f.) Borss.Waalk.	0.57	0.46	0.27	1.29
61	Byttneria pilosa Roxb.	0.66	0.46	0.15	1.27
62	Phyllodium pulchellum (L.) Desv.	0.57	0.38	0.32	1.27
63	Schima wallichii (DC.) Choisy	0.47	0.54	0.25	1.25
64	Ampelocissus barbata Planch.	0.57	0.38	0.29	1.24
65	Caryota urens L.	0.38	0.38	0.48	1.24
66	Physalis minima L.	0.47	0.31	0.45	1.23
67	Bridelia montana (Roxb.) Willd.	0.47	0.31	0.43	1.21
68	Bambusa nutans Wall. ex Munro	0.38	0.61	0.18	1.17
69	Dendrocalamus longispathus (Kurz) Kurz	0.47	0.31	0.34	1.12
70	Grona heterocarpos (L.) H.Ohashi & K.Ohashi	0.57	0.38	0.17	1.12
71	Mucuna bracteata DC. ex Kurz	0.57	0.38	0.17	1.12
72	Mimosa rubicaulis subsp. himalayana (Gamble) H.Ohashi	0.38	0.23	0.34	0.95
73	Brassaiopsis griffithii C.B.Clarke	0.38	0.23	0.33	0.94
74	Bambusa polymorpha Munro	0.38	0.46	0.07	0.9
75	Hymenodictyon orixense (Roxb.) Mabb.	0.38	0.23	0.29	0.9
76	Streblus asper Lour.	0.38	0.46	0.04	0.88
77	Spondias pinnata (L.f.) Kurz	0.28	0.23	0.35	0.86
78	Trema orientalis (L.) Blume	0.38	0.23	0.25	0.86
79	Baccaurea ramiflora Lour.	0.38	0.23	0.22	0.83
80	Dioscorea hamiltonii Hook.f.	0.47	0.31	0.06	0.83
81	Psidium guajava L.	0.38	0.23	0.21	0.82

82	Senna sophera (L.) Roxb.	0.38	0.23	0.21	0.82
83	Triumfetta rhomboidea Jacq.	0.38	0.23	0.21	0.82
84	Pleurolobus gangeticus (L.) J.St.-Hil. ex H.Ohashi & K.	0.28	0.31	0.21	0.8
85	Ziziphus oenopolia (L.) Mill.	0.38	0.31	0.12	0.8
86	Bombax ceiba L.	0.38	0.23	0.17	0.78
87	Senna tora (L.) Roxb.	0.38	0.31	0.09	0.78
88	Vitex peduncularis Wall.	0.38	0.31	0.08	0.76
89	Firmiana colorata (Roxb.) R.Br.	0.38	0.23	0.13	0.74
90	Schizostachyum dullooa (Gamble) R.B.Majumdar	0.28	0.31	0.14	0.73
91	Boehmeria holosericea Blume	0.28	0.15	0.28	0.71
92	Hibiscus surattensis L.	0.38	0.23	0.1	0.71
93	Mucuna pruriens (L.) DC.	0.38	0.23	0.1	0.71
94	Albizia procera (Roxb.) Benth.	0.28	0.15	0.27	0.7
95	Calamus rotang L.	0.28	0.15	0.26	0.69
96	Annona squamosa L.	0.38	0.23	0.05	0.66
97	Dioscorea bulbifera L.	0.28	0.31	0.06	0.65
98	Dioscorea pentaphylla L.	0.38	0.23	0.04	0.65
99	Syzygium nervosum DC.	0.28	0.31	0.06	0.65
100	Bauhinia acuminata L.	0.28	0.15	0.2	0.64
101	Saraca asoca (Roxb.) Willd.	0.28	0.15	0.2	0.64
102	Thyrsostachys oliveri Gamble	0.38	0.23	0.03	0.64
103	Annona reticulata L.	0.28	0.15	0.19	0.63
104	Flemingia stricta Roxb.	0.38	0.23	0.01	0.62
105	Glochidion zeylanicum (Gaertn.) A.Juss.	0.28	0.15	0.17	0.61
106	Ceiba pentandra (L.) Gaertn.	0.28	0.23	0.08	0.59
107	Clerodendrum indicum Kuntze	0.28	0.15	0.15	0.59
108	Dalbergia rimosa Roxb.	0.28	0.15	0.15	0.59
109	Camonea umbellata (L.) A.R.Simões & Staples	0.19	0.23	0.13	0.55
110	Caesalpinia bonduc (L.) Roxb.	0.19	0.15	0.19	0.53
111	Canarium strictum Roxb.	0.28	0.15	0.09	0.53
112	Desmodium velutinum (Willd.) DC.	0.28	0.15	0.09	0.53
113	Lagerstroemia parviflora Roxb.	0.28	0.15	0.09	0.53
114	Sida mysorensis Wight & Arn.	0.28	0.15	0.09	0.53
115	Azadirachta indica A.Juss.	0.28	0.15	0.07	0.5
116	Pueraria tuberosa (Roxb. ex Willd.) DC.	0.28	0.15	0.07	0.5
117	Rauvolfia serpentina Benth. ex Kurz	0.28	0.15	0.07	0.5
118	Alangium chinense (Lour.) Harms	0.28	0.15	0.05	0.49
119	Camellia sinensis (L.) Kuntze	0.28	0.15	0.05	0.49
120	Dillenia pentagyna Roxb.	0.28	0.15	0.03	0.46
121	Dioscorea oppositifolia L.	0.28	0.15	0.03	0.46
122	Thunbergia grandiflora (Roxb. ex Rottl.) Roxb.	0.28	0.15	0.02	0.46
123	Tinospora cordifolia (Willd.) Miers ex Hook.f. & Thomson	0.28	0.15	0.02	0.46
124	Anisomeles indica (L.) Kuntze	0.28	0.15	0.02	0.45
125	Smilax glabra Roxb.	0.28	0.15	0.01	0.45

126	Allophylus serratus (Hiern) Kurz	0.28	0.15	0.01	0.44
127	Antidesma bunius (L.) Spreng.	0.19	0.08	0.16	0.42
128	Protium serratum Engl.	0.19	0.08	0.16	0.42
129	Suregada multiflora (A.Juss.) Baill.	0.19	0.08	0.16	0.42
130	Abelmoschus moschatus Medik.	0.19	0.08	0.14	0.4
131	Dracaena spicata Roxb.	0.19	0.08	0.14	0.4
132	Engelhardia spicata Lechen ex Blume	0.19	0.08	0.14	0.4
133	Microcos hirsuta (Korth.) Burret	0.19	0.08	0.14	0.4
134	Ficus semicordata Buch.-Ham. ex Sm.	0.19	0.08	0.13	0.39
135	Careya arborea Roxb.	0.19	0.15	0.04	0.38
136	Ricinus communis L.	0.19	0.15	0.04	0.38
137	Aphanamixis polystachya (Wall.) R.Parker	0.19	0.08	0.1	0.37
138	Bauhinia variegata L.	0.19	0.15	0.02	0.37
139	Tetrastigma bracteolatum (Wall.) Planch.	0.19	0.15	0.02	0.36
140	Ardisia colorata G.Lodd.	0.19	0.08	0.07	0.34
141	Balakata baccata (Roxb.) Esser	0.19	0.08	0.07	0.34
142	Bambusa bambos (L.) Voss	0.19	0.08	0.07	0.34
143	Croton caudatus Geiseler	0.19	0.08	0.08	0.34
144	Pterospermum acerifolium (L.) Willd.	0.19	0.08	0.07	0.34
145	Pterospermum lanceifolium Roxb.	0.19	0.08	0.07	0.34
146	Pueraria phaseoloides (Roxb.) Benth.	0.19	0.08	0.07	0.34
147	Ziziphus xylopyrus (Retz.) Willd.	0.19	0.08	0.04	0.31
148	Argyreia nervosa (Burm. f.) Bojer	0.19	0.08	0.03	0.3
149	Artocarpus heterophyllus Lam.	0.19	0.08	0.03	0.3
150	Artocarpus lacucha Buch.-Ham.	0.19	0.08	0.03	0.3
151	Erythrina variegata L.	0.19	0.08	0.03	0.3
152	Ficus auriculata Lour.	0.19	0.08	0.03	0.3
153	Bridelia stipularis (L.) Blume	0.19	0.08	0.03	0.29
154	Dalbergia volubilis Roxb.	0.19	0.08	0.03	0.29
155	Debregeasia longifolia (Burm.f.) Wedd.	0.19	0.08	0.03	0.29
156	Lygodium flexuosum (L.) Sw.	0.19	0.08	0.03	0.29
157	Vitex negundo L.	0.19	0.08	0.03	0.29
158	Amorphophallus barbatus A.Galloway & Ongsakul	0.19	0.08	0.02	0.28
159	Diospyros malabarica (Desr.) Kostel.	0.19	0.08	0.01	0.28
160	Shorea robusta C.F.Gaertn.	0.19	0.08	0.01	0.28
161	Syzygium jambos (L.) Alston	0.19	0.08	0.01	0.28
162	Thysanolaena latifolia Honda	0.19	0.08	0.01	0.28

Data arranged based on ascending order of IVI values for each studied species

HERBACEOUS DIVERSITY IN PATTERNS IN AR:

Herbaceous diversity patterns in Artificial Regeneration (AR) plantations within tropical forests can provide valuable insights into the dynamics of understory vegetation, which includes various grasses, herbs, and shrubs. Understanding these patterns is essential for assessing the success of AR efforts and the overall health of the restored ecosystem. Here are some key points to consider regarding herbaceous diversity patterns:

Species Richness and Evenness: Herbaceous diversity refers to the variety of herbaceous plant species present in the AR plantation. High species richness (a large number of different species) indicates a more diverse ecosystem. Evenness refers to how evenly these species are distributed. A balanced distribution of species contributes to a more resilient ecosystem.

Vertical and Horizontal Structure: The arrangement of herbaceous plants at different height levels, from ground cover to understory. Different species may occupy distinct vertical layers, contributing to habitat complexity. The spatial distribution of herbaceous species across the AR area. Clumps, gaps, and patterns of distribution can influence ecosystem dynamics.

Herbaceous diversity can change with the successional stages of the AR plantation. Early stages might be dominated by pioneer species, while later stages might exhibit a more diverse array of species, including shade-tolerant and climax species. Herbaceous plants play critical roles in the ecosystem, such as nutrient cycling, soil stabilization, and providing food and habitat for insects, birds, and small mammals. The amount of light reaching the forest floor, influenced by the canopy structure, impacts the composition and growth of herbaceous species. Open canopies allow for a more diverse understory. AR plantations might have edges where the forest meets open areas. These edges can influence herbaceous diversity, potentially supporting species adapted to different light and moisture conditions. Herbaceous plants interact with each other and with other organisms. Some species might suppress others, while some may facilitate growth. Monitoring invasive plant species is important, as they can negatively impact herbaceous diversity by outcompeting native species.

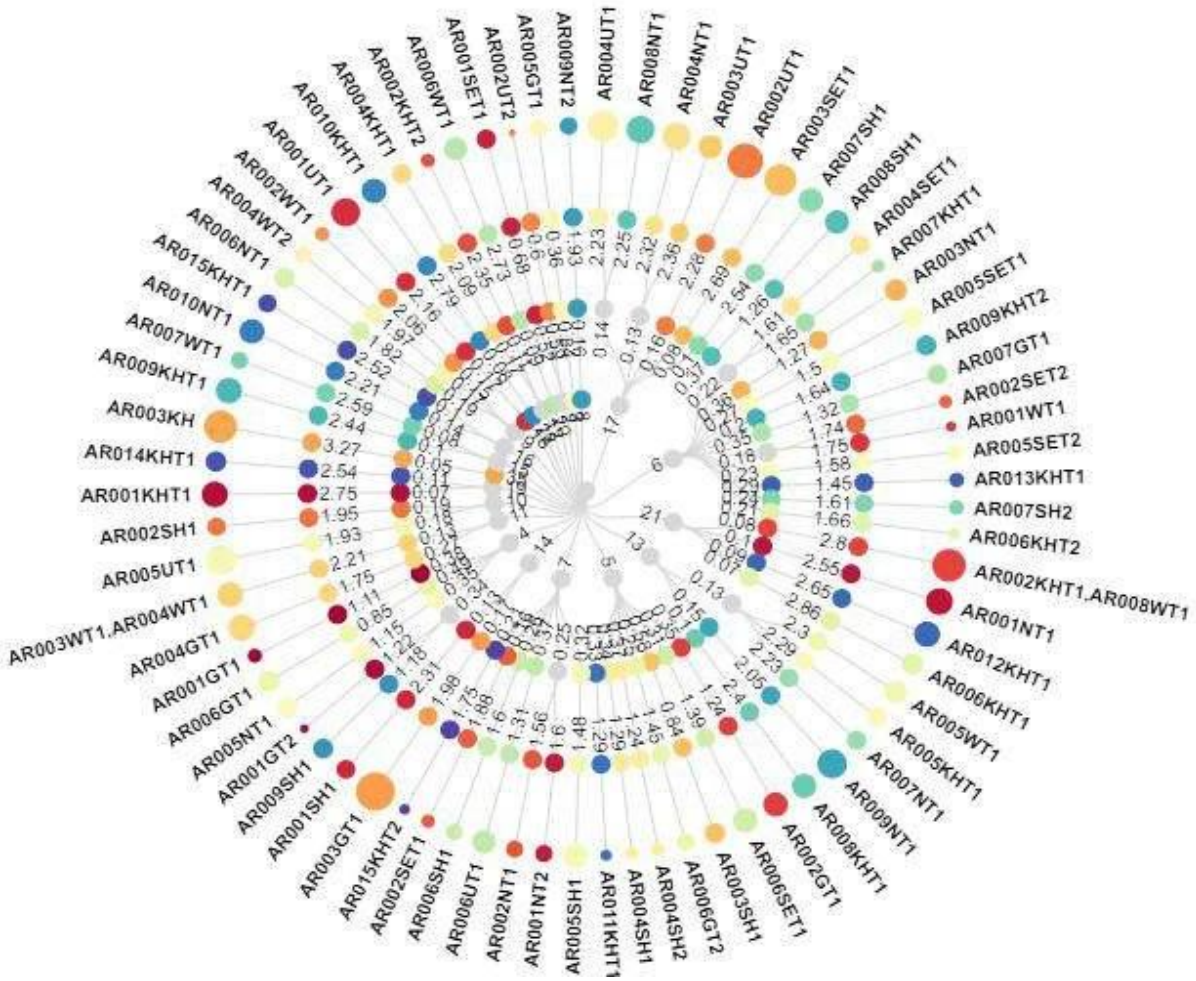


FIGURE 64: STATUS HERBACEOUS DIVERSITY PATTERNS IN ARTIFICIAL REGENERATION (AR) PLANTATIONS

The outer circle of the color code (with ***regeneration*** individual size) and adjoining the inner circle of the color code represent Shannon index, Evenness, and richness of tree species.

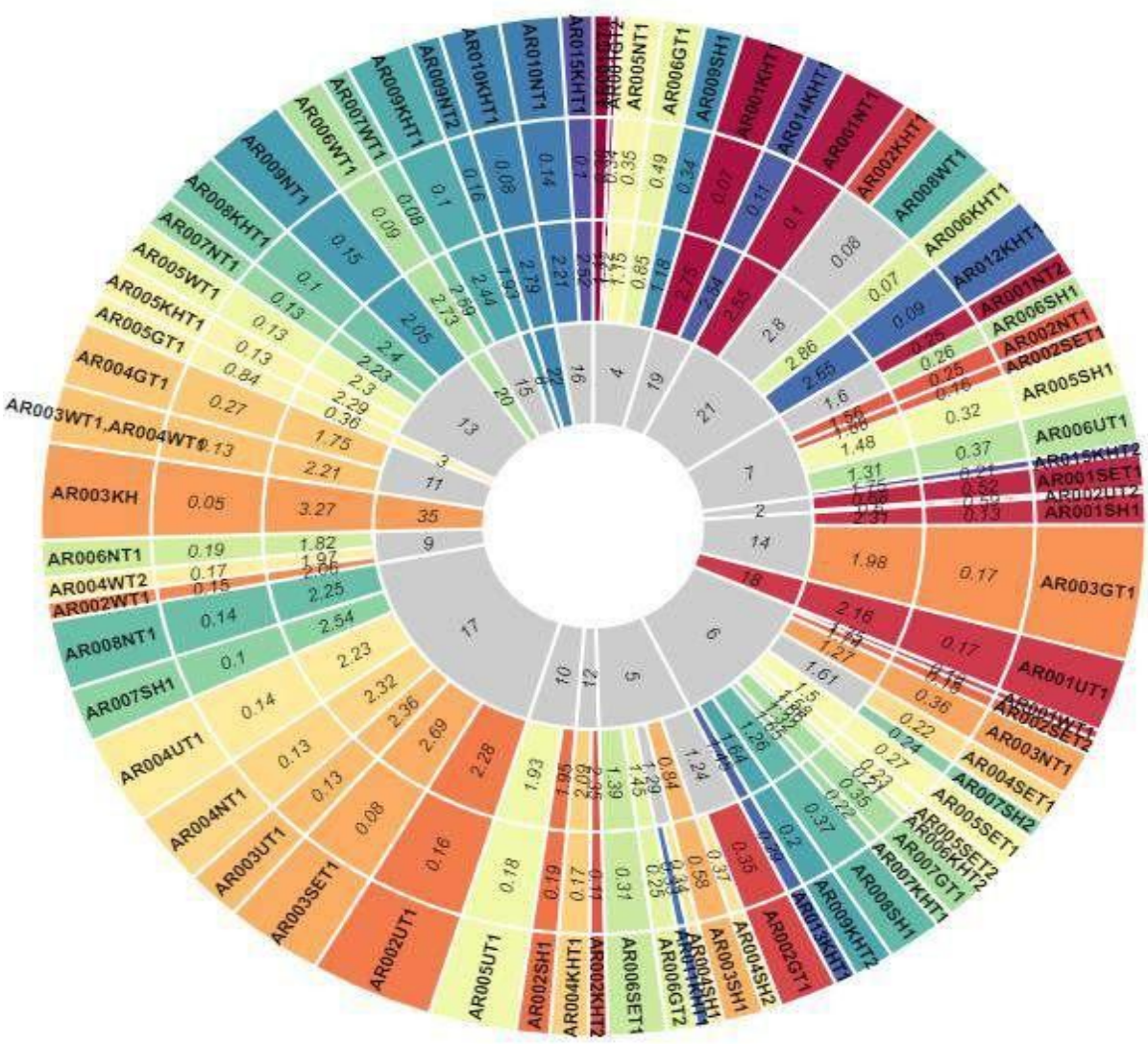


FIGURE 65: STATUS HERBACEOUS PLANT RICHNESS AND DOMINANCE PATTERNS IN ARTIFICIAL REGENERATION (AR) PLANTATIONS

The graph with darker color code and size denotes higher richness and dominance values for each plantation sites.

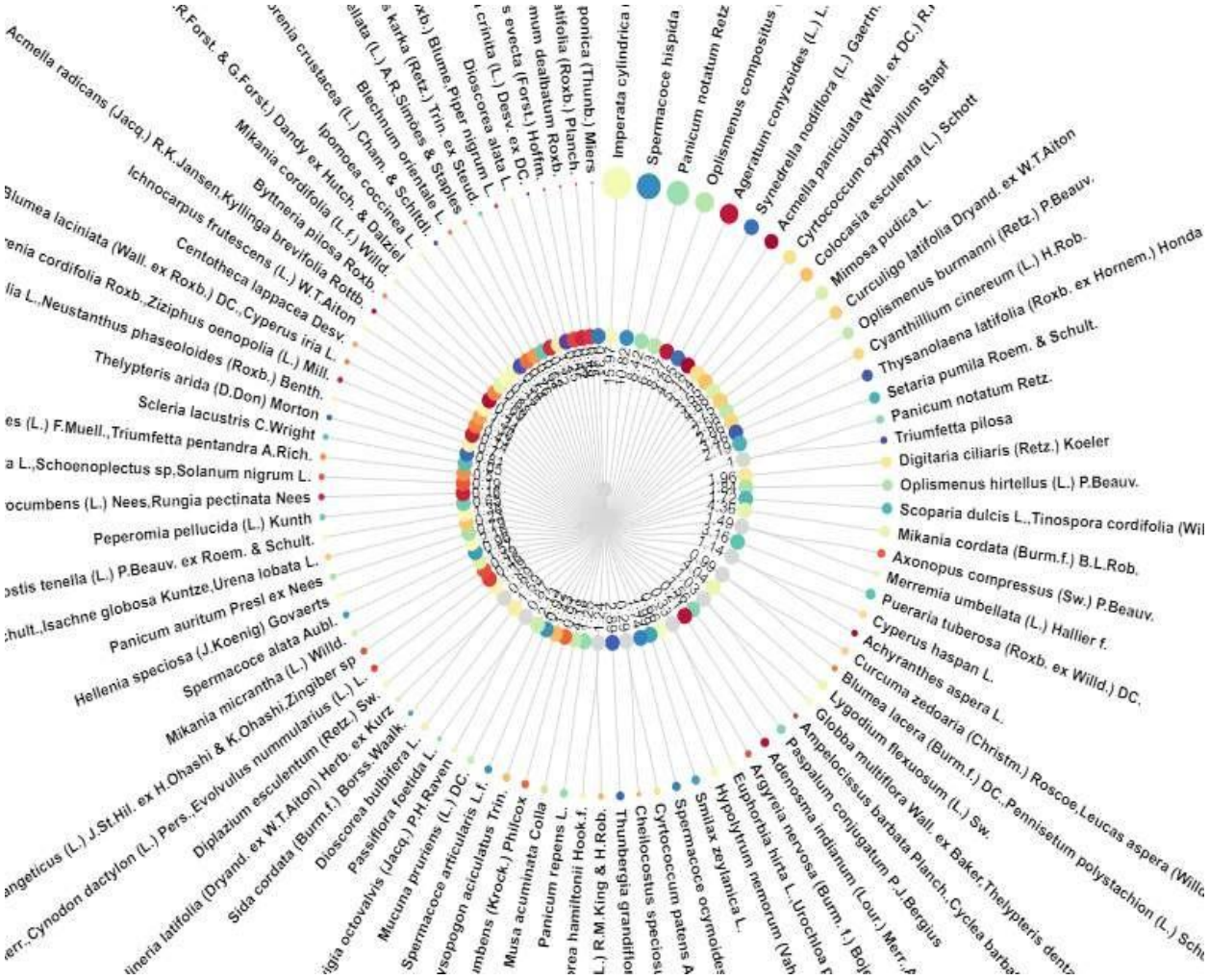


FIGURE 66: STATUS OF RIV AND HERBACEOUS SPECIES COMPOSITION IN ARTIFICIAL REGENERATION (AR) PLANTATIONS

The graph with larger size color circle denotes higher RIV values for the studied herbaceous species.

DIVERSITY OF HERBACEOUS SPECIES IN ARTIFICIAL REGENERATION (AR) PLANTATIONS:

Total Herbaceous Species: Across the 75 AR plantation sites, a total of 180 herbaceous species were recorded. This indicates a diverse range of herbaceous vegetation within the plantations.

Number of Taxa: The number of taxa (taxonomic groups or categories) varies among the sites, ranging from 2 taxa (AR001SET1) to 35 taxa (AR003KH). This diversity in the number of taxa reflects variations in the composition of herbaceous species from site to site.

Dominance Index: The dominance index ranges between 0.05 (AR003KH) and 0.84 (AR005GT1). A dominance index closer to 1 suggests that a few herbaceous species dominate the plantations. This dominance can influence ecosystem structure and function, and it's important to assess whether these dominant species are native or invasive.

Shannon Diversity Index: The Shannon diversity index, which measures species richness and evenness, ranges from 0.36 (AR005GT1) to 3.27 (AR003KH). Higher Shannon diversity indices indicate more diverse and balanced herbaceous communities.

Evenness Index: The evenness index, which measures the relative abundance of different species, ranges between 0.46 (AR003SH1) and 0.98 (AR001SET1). An evenness index closer to 1 indicates a more balanced distribution of species abundance.

IMPLICATIONS FOR ARTIFICIAL REGENERATION (AR) PLANTATIONS:

Diversity and Conservation: Sites with higher Shannon diversity indices (closer to 3.27) have more diverse herbaceous communities, which can enhance ecosystem resilience and provide habitat for various organisms. Conservation efforts should focus on maintaining and enhancing this diversity.

Dominance Impact: Sites with dominant herbaceous species (with higher dominance indices) might experience altered ecosystem dynamics and competition among species. It's essential to monitor the impacts of dominant species on other species and ecosystem processes.

Evenness and Stability: Higher evenness indices (closer to 0.98) suggest a more balanced distribution of species abundance. This can contribute to ecosystem stability and reduce the risk of one species dominating.

Site-Specific Factors: The variations in taxa, diversity indices, and dominance indices highlight the importance of site-specific conditions. Factors like soil type, moisture, sunlight, and management practices can influence herbaceous community composition.

Management Strategies: Based on the findings, management strategies can be tailored for each site. Sites with lower diversity might benefit from introducing more native species, while sites with dominant species might require interventions to restore balance.

In summary, the herbaceous species diversity, dominance, and evenness in the 75 AR plantation sites exhibit variations that reflect the complex interplay of ecological factors. Understanding these patterns helps guide conservation and management efforts to ensure healthy and resilient ecosystems within the AR plantations.

TABLE 19: STATUS OF HERBACEOUS SPECIES DIVERSITY IN ARTIFICIAL REGENERATION (AR) PLANTATIONS

Sl. No.	AR HERBS	Taxa_S	Individuals	Dominance_D	Shannon_H	Evenness_e^H/S	Menhinick	Fisher_alpha	Chao-1
1	AR001GT1	4	27	0.38	1.11	0.76	0.77	1.30	4
2	AR001GT2	4	10	0.34	1.22	0.85	1.27	2.47	4
3	AR001KHT1	19	91	0.07	2.75	0.82	1.99	7.31	19.2
4	AR001NT1	21	98	0.10	2.55	0.61	2.12	8.20	26.6
5	AR001NT2	7	41	0.25	1.60	0.71	1.09	2.43	7
6	AR001SET1	2	51	0.52	0.68	0.98	0.28	0.42	2
7	AR001SH1	14	49	0.13	2.31	0.72	2.00	6.55	17.33
8	AR001UT1	18	111	0.17	2.16	0.48	1.71	6.09	21.5
9	AR001WT1	6	14	0.18	1.75	0.96	1.60	3.98	6
10	AR002GT1	5	82	0.35	1.24	0.69	0.55	1.17	5
11	AR002KHT1	21	55	0.08	2.80	0.78	2.83	12.41	23.33
12	AR002KHT2	12	26	0.11	2.35	0.88	2.35	8.64	13
13	AR002NT1	7	40	0.25	1.56	0.68	1.11	2.46	10
14	AR002SET1	7	26	0.16	1.88	0.93	1.37	3.14	7
15	AR002SET2	6	24	0.18	1.74	0.95	1.23	2.57	6
16	AR002SH1	10	47	0.19	1.95	0.70	1.46	3.89	10
17	AR002UT1	17	172	0.16	2.28	0.57	1.30	4.68	17
18	AR002UT2	2	7	0.59	0.60	0.91	0.76	0.94	2
19	AR002WT1	9	28	0.15	2.06	0.87	1.70	4.59	9
20	AR003GT1	14	204	0.17	1.98	0.52	0.98	3.41	14.75
21	AR003KH	35	147	0.05	3.27	0.75	2.89	14.53	35.91
22	AR003NT1	6	67	0.36	1.27	0.59	0.73	1.60	6
23	AR003SET1	17	138	0.08	2.69	0.86	1.45	5.10	17
24	AR003SH1	5	57	0.58	0.84	0.46	0.66	1.32	5
25	AR003UT1	17	77	0.13	2.36	0.62	1.94	6.75	20
26	AR003WT1	11	44	0.13	2.21	0.83	1.66	4.71	11
27	AR004GT1	11	98	0.27	1.75	0.52	1.11	3.18	11.33

28	AR004KHT1	12	54	0.17	2.09	0.67	1.63	4.78	12.25
29	AR004NT1	17	111	0.13	2.32	0.60	1.61	5.60	20.33
30	AR004SET1	6	51	0.22	1.61	0.83	0.84	1.77	6
31	AR004SH1	5	20	0.34	1.29	0.73	1.12	2.14	6
32	AR004SH2	5	25	0.37	1.24	0.69	1.00	1.88	5
33	AR004UT1	17	136	0.14	2.23	0.55	1.46	5.13	18
34	AR004WT1	11	44	0.13	2.21	0.83	1.66	4.71	11
35	AR004WT2	9	36	0.17	1.97	0.79	1.50	3.85	9
36	AR005GT1	3	46	0.84	0.36	0.48	0.44	0.72	3
37	AR005KHT1	13	55	0.13	2.29	0.76	1.75	5.37	14.5
38	AR005NT1	4	59	0.35	1.15	0.79	0.52	0.97	4
39	AR005SET1	6	58	0.27	1.50	0.75	0.79	1.68	6
40	AR005SET2	6	31	0.23	1.58	0.81	1.08	2.22	6
41	AR005SH1	7	85	0.32	1.48	0.63	0.76	1.81	7
42	AR005UT1	10	122	0.18	1.93	0.69	0.91	2.58	10
43	AR005WT1	13	68	0.13	2.30	0.77	1.58	4.77	13
44	AR006GT1	4	59	0.49	0.85	0.59	0.52	0.97	4
45	AR006GT2	5	42	0.25	1.45	0.85	0.77	1.48	5
46	AR006KHT1	21	61	0.07	2.86	0.83	2.69	11.33	21.67
47	AR006KHT2	6	16	0.21	1.66	0.88	1.50	3.49	6
48	AR006NT1	9	57	0.19	1.82	0.68	1.19	3.01	9.333
49	AR006SET1	5	82	0.31	1.39	0.80	0.55	1.17	5
50	AR006SH1	7	39	0.26	1.60	0.71	1.12	2.49	7
51	AR006UT1	7	76	0.37	1.31	0.53	0.80	1.88	7
52	AR006WT1	20	72	0.09	2.73	0.77	2.36	9.17	20.1
53	AR007GT1	6	53	0.35	1.32	0.62	0.82	1.74	6
54	AR007KHT1	6	24	0.22	1.65	0.87	1.23	2.57	6
55	AR007NT1	13	50	0.13	2.23	0.72	1.84	5.71	16.33
56	AR007SH1	17	82	0.10	2.54	0.75	1.88	6.52	17.2
57	AR007SH2	6	30	0.24	1.61	0.84	1.10	2.26	6
58	AR007WT1	15	41	0.08	2.59	0.89	2.34	8.53	15.13

59	AR008KHT1	13	82	0.10	2.40	0.85	1.44	4.35	13
60	AR008NT1	17	106	0.14	2.25	0.56	1.65	5.72	24
61	AR008SH1	6	78	0.37	1.26	0.59	0.68	1.52	6
62	AR008WT1	21	96	0.08	2.80	0.78	2.14	8.30	21
63	AR009KHT1	15	92	0.10	2.44	0.76	1.56	5.09	16.5
64	AR009KHT2	6	57	0.20	1.64	0.86	0.79	1.69	6
65	AR009NT1	13	118	0.15	2.05	0.60	1.20	3.73	18
66	AR009NT2	8	44	0.16	1.93	0.86	1.21	2.86	8
67	AR009SH1	4	55	0.34	1.18	0.82	0.54	0.99	4
68	AR010KHT1	22	84	0.08	2.79	0.74	2.40	9.70	27.25
69	AR010NT1	16	84	0.14	2.21	0.57	1.75	5.86	23
70	AR011KHT1	5	18	0.33	1.29	0.73	1.18	2.29	5.5
71	AR012KHT1	21	92	0.09	2.65	0.68	2.19	8.50	22.43
72	AR013KHT1	6	31	0.29	1.45	0.71	1.08	2.22	6
73	AR014KHT1	19	59	0.11	2.54	0.67	2.47	9.71	22
74	AR015KHT1	16	46	0.10	2.52	0.78	2.36	8.71	16.75
75	AR015KHT2	7	16	0.21	1.75	0.83	1.75	4.75	7.2

TABLE 20: relative frequency (RFR), relative density (RDEN) and relative important value (RIV) of herbaceous species diversity inartificial regeneration (AR) plantations

Sl.No.	HERBS	RFR	RDEN	RIV
1	Imperata cylindrica (L.) P.Beauv.	4.55	11.42	15.97
2	Spermacoce hispida L.	3.32	7.5	10.82
3	Panicum notatum Retz.	1.72	6.7	8.42
4	Ageratum conyzoides (L.) L.	3.81	4.46	8.27
5	Oplismenus compositus (L.) P.Beauv.	1.48	4.65	6.13
6	Acmella paniculata (Wall. ex DC.) R.K.Jansen	2.58	2.6	5.18
7	Mimosa pudica L.	2.71	2.18	4.88
8	Synedrella nodiflora (L.) Gaertn.	1.72	2.93	4.65
9	Mikania cordata (Burm.f.) B.L.Rob.	2.95	1.4	4.36
10	Musa acuminata Colla	3.32	0.86	4.18
11	Lygodium flexuosum (L.) Sw.	2.83	1.21	4.04
12	Curculigo latifolia Dryand. ex W.T.Aiton	1.72	2.03	3.75
13	Colocasia esculenta (L.) Schott	1.35	2.2	3.55
14	Thysanolaena latifolia (Roxb. ex Hornem.) Honda	1.85	1.61	3.46
15	Pueraria tuberosa (Roxb. ex Willd.) DC.	1.85	1.32	3.16
16	Cyrtococcum oxyphyllum Stapf	0.86	2.28	3.14
17	Thunbergia grandiflora (Roxb. ex Rottl.) Roxb.	1.97	0.92	2.89
18	Cyanthillium cinereum (L.) H.Rob.	1.23	1.63	2.86
19	Oplismenus burmanni (Retz.) P.Beauv.	0.86	1.72	2.58
20	Setaria pumila Roem. & Schult.	0.62	1.57	2.19
21	Hellenia speciosa (J.Koenig) Govaerts	1.6	0.57	2.16
22	Mucuna pruriens (L.) DC.	1.35	0.78	2.13
23	Smilax zeylanica L.	0.98	1.01	1.99
24	Digitaria ciliaris (Retz.) Koeler	0.49	1.47	1.96
25	Oplismenus hirtellus (L.) P.Beauv.	0.37	1.47	1.84
26	Spermacoce ocymoides Burm.f.	0.74	1.01	1.74
27	Scoparia dulcis L.	0.98	0.73	1.72
28	Tinospora cordifolia (Willd.) Miers ex Hook.f. & Thomson	0.98	0.73	1.72
29	Byttneria pilosa Roxb.	1.35	0.34	1.69
30	Dioscorea bulbifera L.	0.86	0.73	1.59
31	Mikania micrantha (L.) Willd.	0.98	0.59	1.57
32	Paspalum conjugatum P.J.Bergius	0.49	1.07	1.56
33	Axonopus compressus (Sw.) P.Beauv.	0.62	0.88	1.49
34	Merremia umbellata (L.) Hallier f.	0.98	0.5	1.49
35	Chrysopogon aciculatus Trin.	0.62	0.82	1.43
36	Diplazium esculentum (Retz.) Sw.	0.74	0.65	1.39
37	Eragrostis tenella (L.) P.Beauv. ex Roem. & Schult.	0.86	0.52	1.38
38	Centotheca lappacea Desv.	0.98	0.38	1.36
39	Ichnocarpus frutescens (L.) W.T.Aiton	0.98	0.36	1.34
40	Dioscorea alata L.	1.11	0.19	1.3
41	Panicum repens L.	0.37	0.88	1.25
42	Chromolaena odorata (L.) R.M.King & H.Rob.	0.74	0.5	1.24

Data arranged based on ascending order of IVI values for each studied species

43	Dioscorea hamiltonii Hook.f.	0.86	0.38	1.24
44	Ipomoea coccinea L.	0.86	0.29	1.15
45	Achyranthes aspera L.	0.62	0.52	1.14
46	Cyperus haspan L.	0.37	0.78	1.14
47	Scleria lacustris C.Wright	0.62	0.44	1.05
48	Ampelocissus barbata Planch.	0.86	0.17	1.03
49	Cyclea barbata Miers	0.86	0.17	1.03
50	Globba multiflora Wall. ex Baker	0.62	0.42	1.03
51	Thelypteris dentata E.P.St.John	0.62	0.42	1.03
52	Panicum notatum Retz.	0.12	0.88	1
53	Triumfetta pilosa	0.37	0.63	1
54	Blumea lacera (Burm.f.) DC.	0.74	0.25	0.99
55	Curcuma zedoaria (Christm.) Roscoe	0.62	0.38	0.99
56	Leucas aspera (Willd.) Link	0.62	0.38	0.99
57	Pennisetum polystachion (L.) Schult.	0.74	0.25	0.99
58	Spermacoce alata Aubl.	0.37	0.59	0.96
59	Spermacoce articularis L.f.	0.12	0.8	0.92
60	Axonopus fissifolius (Raddi) Kuhlm.	0.49	0.42	0.91
61	Lindernia procumbens (Krock.) Philcox	0.49	0.42	0.91
62	Molineria latifolia (Dryand. ex W.T.Aiton) Herb. ex Kurz	0.62	0.27	0.89
63	Sida cordata (Burm.f.) Borss.Waalk.	0.49	0.4	0.89
64	Ludwigia octovalvis (Jacq.) P.H.Raven	0.37	0.5	0.87
65	Passiflora foetida L.	0.62	0.25	0.87
66	Thelypteris arida (D.Don) Morton	0.37	0.44	0.81
67	Panicum auritum Presl ex Nees	0.25	0.54	0.79
68	Blechnum orientale L.	0.49	0.27	0.76
69	Amorphophallus bulbifer (Roxb.) Blume	0.62	0.1	0.72
70	Piper nigrum L.	0.62	0.1	0.72
71	Dioscorea oppositifolia L.	0.49	0.21	0.7
72	Neustanthus phaseoloides (Roxb.) Benth.	0.49	0.21	0.7
73	Mikania cordifolia (L.f.) Willd.	0.37	0.31	0.68
74	Hypolytrum nemorum (Vahl) Spreng.	0.49	0.17	0.66
75	Ipomoea hederifolia L.	0.49	0.17	0.66
76	Merremia tridentata (L.) Hallier f.	0.49	0.17	0.66
77	Mucuna bracteata DC. ex Kurz	0.49	0.17	0.66
78	Physalis minima L.	0.49	0.17	0.66
79	Themeda caudata (Nees) A.Camus	0.49	0.17	0.66
80	Peperomia pellucida (L.) Kunth	0.12	0.52	0.65
81	Phragmites karka (Retz.) Trin. ex Steud.	0.37	0.25	0.62
82	Amomum dealbatum Roxb.	0.49	0.08	0.58
83	Torenia crustacea (L.) Cham. & Schltdl.	0.25	0.29	0.54
84	Cajanus scarabaeoides (L.) F.Muell.	0.25	0.25	0.5
85	Triumfetta pentandra A.Rich.	0.25	0.25	0.5
86	Argyreia sp	0.37	0.13	0.49
87	Blumea lanceolaria Druce	0.37	0.13	0.49

88	Etlingera linguiformis (Roxb.) R.M.Sm.	0.37	0.13	0.49
89	Pleurolobus gangeticus (L.) J.St.Hil. ex H.Ohashi & K.Ohashi	0.37	0.13	0.49
90	Zingiber sp	0.37	0.13	0.49
91	Angiopteris evecta (Forst.) Hoffm.	0.37	0.1	0.47
92	Ananas comosus (L.) Merr.	0.25	0.21	0.46
93	Cynodon dactylon (L.) Pers.	0.25	0.21	0.46
94	Evolvulus nummularius (L.) L.	0.25	0.21	0.46
95	Ampelocissus latifolia (Roxb.) Planch.	0.37	0.08	0.45
96	Blumea laciniata (Wall. ex Roxb.) DC.	0.25	0.19	0.43
97	Cyperus iria L.	0.25	0.19	0.43
98	Acmella radicans (Jacq.) R.K.Jansen	0.25	0.17	0.41
99	Kyllinga brevifolia Rottb.	0.25	0.17	0.41
100	Camonea umbellata (L.) A.R.Simões & Staples	0.12	0.25	0.37
101	Argyreia nervosa (Burm. f.) Bojer	0.25	0.08	0.33
102	Clerodendrum infortunatum L.	0.25	0.08	0.33
103	Crotalaria retusa L.	0.25	0.08	0.33
104	Elephantopus scaber L.	0.25	0.08	0.33
105	Euphorbia hirta L.	0.12	0.21	0.33
106	Mimosa himalayana Gamble	0.25	0.08	0.33
107	Pteris ensiformis Burm.	0.25	0.08	0.33
108	Rhynchospora corymbosa (L.) Britton	0.25	0.08	0.33
109	Urochloa panicoides P.Beauv.	0.12	0.21	0.33
110	Stephania japonica (Thunb.) Miers	0.25	0.06	0.31
111	Cheilocostus speciosus (J.Koenig) C.D.Specht	0.25	0.04	0.29
112	Cyrtococcum patens A.Camus	0.12	0.17	0.29
113	Dactyloctenium aegyptium (L.) Willd.	0.12	0.17	0.29
114	Dioscorea pentaphylla L.	0.25	0.04	0.29
115	Dioscorea wallichii Hook.f.	0.25	0.04	0.29
116	Dryopteris wallichiana (Spreng.) Hyl.	0.25	0.04	0.29
117	Fimbristylis dichotoma (L.) Vahl	0.12	0.17	0.29
118	Hewittia malabarica (L.) Suresh	0.25	0.04	0.29
119	Smilax glabra Roxb.	0.25	0.04	0.29
120	Sphagneticola trilobata (L.) Pruski	0.12	0.17	0.29
121	Stemona tuberosa Lour.	0.25	0.04	0.29
122	Helminthostachys zeylanica (L.) Hook.	0.12	0.15	0.27
123	Kyllinga nemoralis (J.R.Forst. & G.Forst.) Dandy ex Hutch.	0.12	0.15	0.27
124	Uraria crinita (L.) Desv. ex DC.	0.12	0.13	0.25
125	Commelina benghalensis L.	0.12	0.1	0.23
126	Commelina diffusa Burm.f.	0.12	0.1	0.23
127	Hemidesmus indicus (L.) R. Br. ex Schult.	0.12	0.1	0.23
128	Isachne globosa Kuntze	0.12	0.1	0.23
129	Urena lobata L.	0.12	0.1	0.23
130	Adenosma indianum (Lour.) Merr.	0.12	0.08	0.21
131	Aglaonema hookerianum Schott	0.12	0.08	0.21
132	Amaranthus spinosus L.	0.12	0.08	0.21

133	Aristolochia acuminata L.	0.12	0.08	0.21
134	Curculigo orchioides Gaertn.	0.12	0.08	0.21
135	Desmodium gangeticum (L.) DC.	0.12	0.08	0.21
136	Ipomoea obscura (L.) Ker Gawl	0.12	0.08	0.21
137	Ipomoea pileata Roxb.	0.12	0.08	0.21
138	Ipomoea triloba L.	0.12	0.08	0.21
139	Merremia vitifolia Hallier f.	0.12	0.08	0.21
140	Sacciolepis interrupta Stapf	0.12	0.08	0.21
141	Scleria terrestris (L.) Fassett	0.12	0.08	0.21
142	Arundinella bengalensis Druce	0.12	0.06	0.19
143	Bidens pilosa L.	0.12	0.06	0.19
144	Biophytum reinwardtii (Zucc.) Klotzsch	0.12	0.06	0.19
145	Pavetta indica L.	0.12	0.06	0.19
146	Phyllanthus niruri L.	0.12	0.06	0.19
147	Physalis angulata L.	0.12	0.06	0.19
148	Schoenoplectus sp	0.12	0.06	0.19
149	Solanum nigrum L.	0.12	0.06	0.19
150	Alternanthera sessilis (L.) DC.	0.12	0.04	0.16
151	Argyreia cymosa Sweet	0.12	0.04	0.16
152	Centrosema pubescens Benth.	0.12	0.04	0.16
153	Combretum punctatum Blume	0.12	0.04	0.16
154	Crassocephalum crepidioides (Benth.) S.Moore	0.12	0.04	0.16
155	Cyperus cyperoides Kuntze	0.12	0.04	0.16
156	Cyperus exaltatus Retz.	0.12	0.04	0.16
157	Mecardonia procumbens (Mill.) Small	0.12	0.04	0.16
158	Phyllanthus emblica L.	0.12	0.04	0.16
159	Piper longum L.	0.12	0.04	0.16
160	Rostellularia procumbens (L.) Nees	0.12	0.04	0.16
161	Rungia pectinata Nees	0.12	0.04	0.16
162	Alpinia nigra (Gaertn.) B.L.Burtt	0.12	0.02	0.14
163	Aristolochia tagala Cham.	0.12	0.02	0.14
164	Cissampelos mucronata A.Rich.	0.12	0.02	0.14
165	Cissampelos pareira L.	0.12	0.02	0.14
166	Cissus repanda Vahl	0.12	0.02	0.14
167	Dendrophthoe falcata (L.f.) Ettingsh.	0.12	0.02	0.14
168	Dioscorea villosa L.	0.12	0.02	0.14
169	Eleusine indica Gaertn.	0.12	0.02	0.14
170	Ficus lamponga Miq.	0.12	0.02	0.14
171	Hemigraphis hirta T.Anderson	0.12	0.02	0.14
172	Homalomena aromatica Schott	0.12	0.02	0.14
173	Ocimum tenuiflorum L.	0.12	0.02	0.14
174	Phyllanthus urinaria L.	0.12	0.02	0.14
175	Pogostemon hispidus Prain	0.12	0.02	0.14
176	Tetrastigma bracteolatum (Wall.) Planch.	0.12	0.02	0.14
177	Tetrastigma obovatum Gagnep.	0.12	0.02	0.14

178	Tetrastigma sp	0.12	0.02	0.14
179	Torenia cordifolia Roxb.	0.12	0.02	0.14
180	Ziziphus oenopolia (L.) Mill.	0.12	0.02	0.14

RELATIVE IMPORTANT VALUE (RIV) OF HERBACEOUS SPECIES DIVERSITY IN ARTIFICIAL REGENERATION (AR) PLANTATIONS:

The Relative Important Value (RIV) calculated on a scale of 200 for 180 herbaceous species in 75 Artificial Regeneration (AR) plantation sites provides insights into the significance and dominance of different species within these sites. The RIV takes into account factors like relative frequency, relative density, and relative dominance to assess the overall importance of each species. Here's a breakdown of the top dominant species and those with low RIV values:

Top Dominant Species (Based on RIV):

Imperata cylindrica (L.) P.Beauv: RIV 15.97 - This species has the highest RIV, indicating that it's the most dominant herbaceous species across the AR plantation sites. It's important to assess whether this species is native or invasive and to understand its ecological impact.

Spermacoce hispida L.: RIV 10.82 - This species ranks second in dominance based on RIV. Its presence in multiple sites suggests its adaptability and ecological significance.

Panicum notatum Retz.: RIV 8.42 - Another dominant species, indicating its ability to establish itself in the AR plantation sites.

Ageratum conyzoides (L.) L.: RIV 8.27 - This species also shows significant dominance and might influence ecosystem dynamics.

Oplismenus compositus (L.) P.Beauv.: RIV 6.13 - While less dominant compared to the top four, it still contributes significantly to the herbaceous community.

SPECIES WITH LOW RIV VALUES:

Tetrastigma bracteolatum (Wall.) Planch.: RIV 0.14 - This species has a very low RIV, indicating its low presence and importance across the sites.

Tetrastigma obovatum Gagnep.: RIV 0.14 - Similar to the previous species, it has low dominance and might be less adapted to the sites.

Tetrastigma sp: RIV 0.14 - "Tetrastigma sp" refers to an unidentified species within the Tetrastigma genus. Its low RIV suggests its limited impact.

Torenia cordifolia Roxb.: RIV 0.14 - This species has low importance based on RIV, indicating its marginal presence.

Ziziphus oenopolia (L.) Mill.: RIV 0.14 - Similar to the other low-RIV species, it contributes minimally to the herbaceous community.

IMPLICATIONS FOR HERBACEOUS SPECIES DIVERSITY IN ARTIFICIAL REGENERATION (AR) PLANTATIONS::

Dominance and Community Structure: Species with high RIV values play a significant role in shaping the herbaceous community's structure and dynamics.

Invasive Species: Dominant species should be examined to determine if they are invasive or native. Invasive species can impact ecosystem health.

Ecosystem Function: The dominance of certain species might influence nutrient cycling, habitat availability, and other ecosystem functions.

Conservation: Species with low RIV values might need attention for conservation efforts if they are native or have ecological significance.

Understanding the RIV values helps in prioritizing management strategies, conserving native species, addressing invasive species, and promoting balanced and resilient herbaceous communities within the AR plantation sites.

CHECK DAMS (CD) PLANTATIONS

CHECK DAMS (CD) PLANTATIONS:

"Check dams" (also spelled as "check dams") and "filter strip plantations" are two distinct concepts related to water management and land conservation. Let's explore how plant diversity and structure can be relevant to both of these concepts:

Check Dams (CD):

Chek dams are small, low, temporary dams constructed across gullies, channels, or small streams to control erosion and manage water flow. They slow down the flow of water, allowing sediment to settle out and promoting soil retention. In the context of chek dams, plant diversity and structure can play roles in the following ways: Vegetation for Erosion Control: Planting a diverse range of native grasses, shrubs, and trees around chek dams and along watercourses can help stabilize soil and prevent erosion. The root systems of these plants bind the soil and reduce the potential for sediment runoff.

Enhancing Water Infiltration: Well-structured vegetation can increase the water-holding capacity of the soil. This enhances infiltration and reduces surface runoff, which can help recharge groundwater and minimize erosion downstream of the chek dam. Biodiversity Support: By selecting native plant species for chek dam areas, you can create habitat for local wildlife, insects, and pollinators. This contributes to biodiversity conservation and supports ecosystem health. Stabilizing Embankments: Planting grasses and deep-rooted plants on the dam's embankments can help stabilize the structure and prevent soil erosion, ensuring the longevity of the chek dam. Both chek dams and filter strip plantations benefit from thoughtful planning, proper selection of native plant species, and regular maintenance. The goal is to create resilient ecosystems that support water management, soil conservation, and biodiversity while addressing local environmental challenges.

DIVERSITY OF TREE SPECIES IN CHECK DAMS (CD) PLANTATIONS SITES:

Tree species diversity, dominance, and evenness in a set of 31 CheckDams (CD) plantation sites. Let's break down the key findings and their implications: Total Tree Species: Across the 30 CD plantation sites, a total of 91 tree species were recorded. This indicates a diverse range of tree species within the CD plantations. Number of Taxa: The number of taxa (taxonomic groups or categories) varies among the sites, ranging from 1 taxa (CDI004G) to 31 taxa (CDII005SE). This diversity in the number of taxa reflects variations in the composition of tree species from site to site. Dominance Index: The dominance index ranges between 0.001 (CDI004G) and 1 (CDII003N). A dominance index of 1 indicates that a single tree species dominates the plantation, while a lower index suggests a more balanced distribution of species. Shannon Diversity Index: The Shannon diversity index, which measures species richness and evenness, ranges from 0.001 (CDI004G) to 2.81 (CDII005SE). Higher Shannon diversity indices indicate more diverse and balanced tree communities. Evenness Index: The evenness index, which measures the relative abundance of different species, ranges between 0.47 (CDI001N) and 1 (CDII003N). An evenness index of 1 indicates a perfectly even distribution of species abundance.

IMPLICATIONS FOR TREE SPECIES IN CHECK DAMS (CD) PLANTATIONS SITES:

Diversity and Conservation: Sites with higher Shannon diversity indices (closer to 2.81) have more diverse tree communities, which can enhance ecosystem resilience, provide habitat for various organisms, and contribute to overall biodiversity conservation. Dominance Impact: Sites with dominant tree species (with higher dominance indices) might experience altered ecosystem dynamics and competition among species. It's important to assess whether dominant species are native or invasive and to consider their ecological impact. Evenness and Stability: Higher evenness indices (closer to 1) suggest a more balanced distribution of species abundance. This can contribute to ecosystem stability and reduce the risk of one species dominating. Site-Specific Factors: The variations in taxa, diversity indices, and dominance indices highlight the influence of site-specific conditions such as soil, climate, and management practices on tree community composition.

Management Strategies: Understanding the dominance and diversity patterns can guide management strategies. If dominance is an issue, interventions might be needed to promote greater species diversity and balance. In summary, the tree species diversity, dominance, and evenness in the 31 CheckDams (CD) plantation sites exhibit variations that reflect the complex interplay of ecological factors. These patterns provide insights into the health and resilience of the tree communities within the CD plantations and help guide conservation and management efforts.

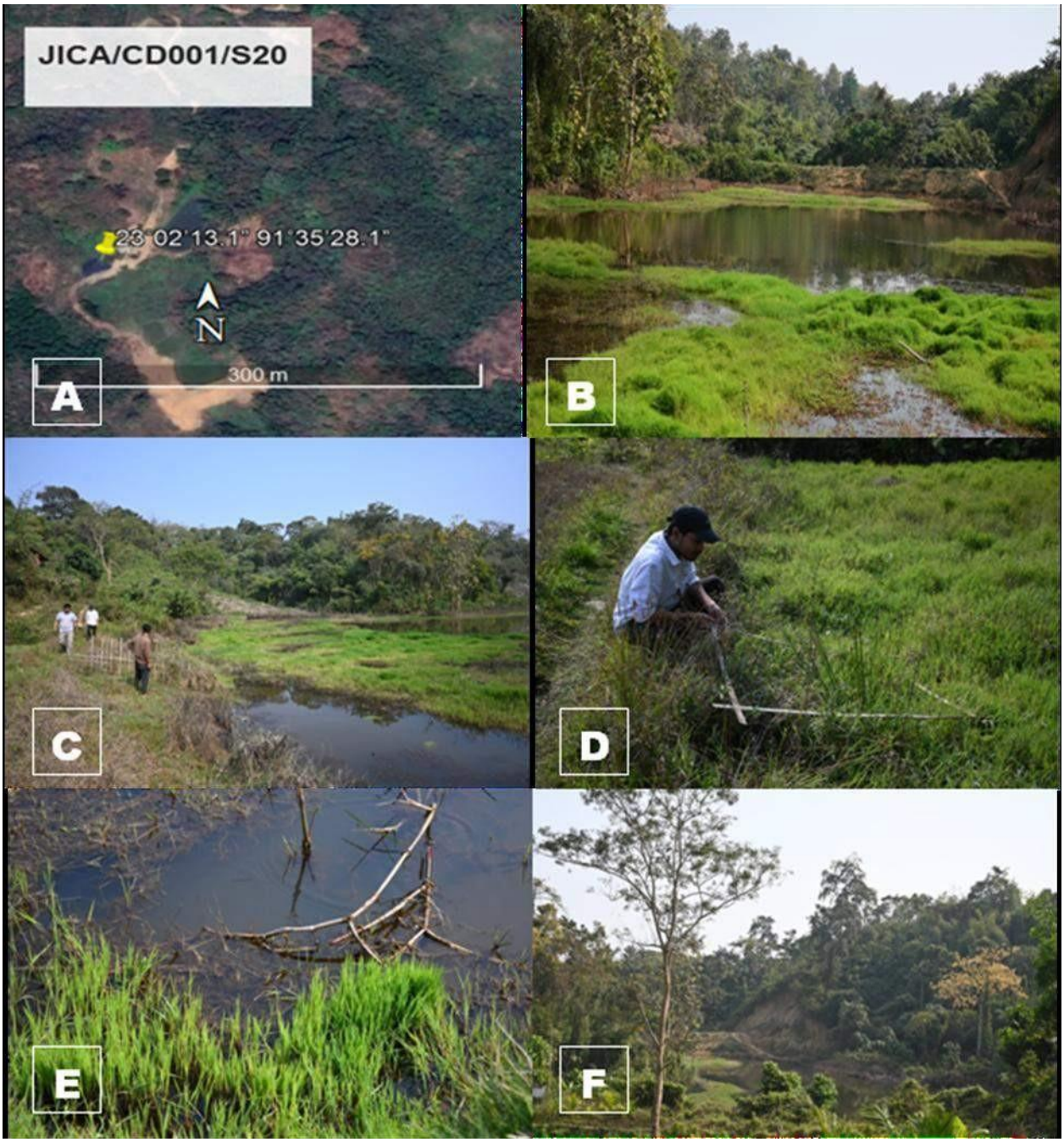


FIGURE 67: STUDY OF DIVERSITY ON CHECK DAMS (JOYSINGH BARI JFMC)- A) MAP ALONG WITH GPS COORDINATES (B&C) SITE OF CHECK DAMS (D) SAMPLING OF HERBACEOUS PLANT (E) ASSOCIATED HERB SPECIES (F) ASSOCIATED TREE SPECIES.

FIGURE 68: STUDY OF DIVERSITY ON CHECK DAMS (KANUPARA/RAMCHAND PARA JFMC)- A) MAP ALONG WITH GPS COORDINATES (B&C) SITE OF CHECK DAMS (D-F) HERBACEOUS PLANT: CRASSOCEPHALUM CREPIDIOIDES, HYPOLYTRUM NEMORUM AND HIBISCUS SURATTENSIS.

FIGURE 67: STUDY OF DIVERSITY ON CHECK DAMS (LAXMICHARA JFMC)- A) MAP ALONG WITH GPS COORDINATES (B) SIGN BOARD OF THE CHECK DAMS (C) ASSOCIATED TREE: LAGERSTROEMIA SPECIOSA (D) IPOMEA CARNEA (E) ASSOCIATED HERBACEOUS PLANT (F) DIPLAZIUM ESCULENTUM.

FIGURE 68: STUDY OF DIVERSITY ON CHECK DAMS (MALAM BARI JFMC)- A) MAP ALONG WITH GPS COORDINATES (B) SIGN BOARD OF THE CHECK DAMS (C) CHECK DAMS (D) MUSA ACUMINATA (E) DESMODIUM GANGETICUM (F) THYSANOLAENA LATIFOLIA.

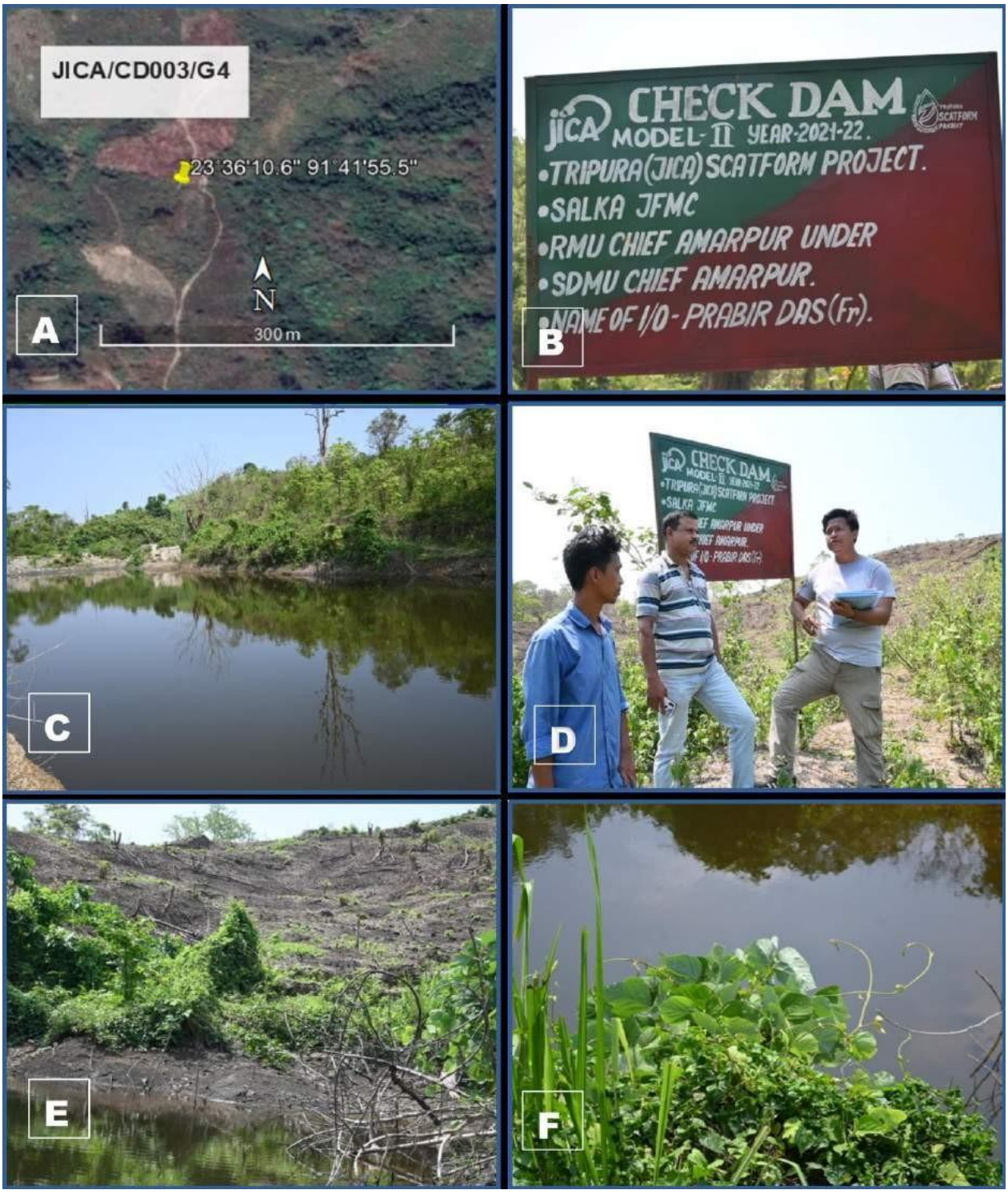


FIGURE 69: STUDY OF DIVERSITY ON CD003 (SALKA JFMC): (A) MAP ALONG WITH GPS COORDINATES. B) SIGNBOARD OF THE STUDY SITE (C) WATER BODY OF CHECKDAM (D) INTERROGATION WITH BEAT OFFICER AND FFW (E) OCCUPANCY OF JHUM LAND BESIDE CHECK DAM (F) CLIMBERS AND HERBACEOUS PLANT BESIDE CHECKDAM.

FIGURE 70: STUDY OF DIVERSITY ON CD005 (KUNARAM PARA JFMC): (A) MAP ALONG WITH GPS COORDINATES. B) SIGNBOARD OF THE STUDY SITE (C) CHECKDAM SITE (D) ADJACENT HERBACEOUS PLANT (E) DIPLAZIUM ESCULENTA (F) ACMELLA PANICULA AND PERSICARIA HYDROPIPER.

FIGURE 71: STUDY OF DIVERSITY ON CD006 (NABAJAGARAN JFMC): (A) MAP ALONG WITH GPS COORDINATES. B) WATER BODY OF CHECKDAM (C) INTEROGATION WITH BEAT OFFIER ALONG WITH C.OS, JFMC PRESIDENT AND FFW (D). AGRICULTURAL LAND ADJACENT TO CHECKDAM (E) HERBACEOUS PLANT BESIDE CHECK DAM (F) ADJACENT FOREST BESIDE CHECKDAM.

FIGURE 72: STUDY OF DIVERSITY ON CD007 (PATICHARI JFMC): (A) MAP ALONG WITH GPS COORDINATES. B) WATER BODY OF CHECKDAM AND RUBBER PLANTATION ADJACENT TO CHECKDAM (C & D) ADJACENT BAMBOO FOREST BESIDE (E) ADJACENT AGRICULTURE LAND (F) HERBACEOUS PLANT BESIDE CHECKDAM.

FIGURE 73: STUDY OF DIVERSITY ON CD0011 (LAILAK JFMC): (A) MAP ALONG WITH GPS COORDINATES. B) SIGNBOARD OF THE STUDY SITE (C & D) WATER BODY OF CHECKDAM (E) BROOM GRASS (THYSANOLAENA LATIFOLIA) (F) ADJACENT FOREST WITH DOMINANT BANANA PLANTS AND MANIHOT ESCULENTA (TAPIOCA).

FIGURE 74: STUDY OF DIVERSITY ON CD0012 (Y-GHATI JFMC): (A) MAP ALONG WITH GPS COORDINATES. B) SIGNBOARD OF THE STUDY SITE (C & D) WATER BODY OF CHECKDAM (E) NEOLAMARCKIA CADAMBA FROM THE ADJACENT FOREST (F) AMORPHOPHALLUS BULBIFER.

STRUCTURE OF TREE SPECIES IN CHECK DAMS (CD) PLANTATIONS SITES:

The Important Value Index (IVI) calculated for 91 tree species in the 31 Check Dams (CD) plantation sites provides insights into the dominance and significance of different species within these sites. The IVI takes into account relative frequency, relative density, and relative dominance to assess the overall importance of each species. Here's a breakdown of the top dominant species and those with low IVI values:

Top Dominant Species (Based on IVI): Trema orientalis (L.) Blume: IVI 14.05 - This species has the highest IVI, indicating that it's the most dominant tree species in the regeneration plots across the CD plantation sites. Bambusa tulda Roxb.: IVI 14.72 - This species ranks second in dominance based on IVI. Its presence in multiple plots suggests its adaptability and ecological significance. Tectona grandis L.f.: IVI 17.40 - Another dominant species, indicating its ability to establish itself in the CD plantation sites. Melocanna baccifera (Roxb.) Kurz: IVI 25.76 - This species contributes significantly to the dominance and structure of the plots. Albizia procera (Roxb.) Benth.: IVI 27.08 - While less dominant compared to the top four, it still has substantial influence in the CD plantation sites.

Species with Low IVI Values: Bambusa polymorpha Munro: IVI 0.74 - This species has a very low IVI, indicating its low presence and importance across the sites. Bambusa cacharensis R.B.Majumdar: IVI 0.74 - Similar to the previous species, it has low dominance and might be less adapted to the CD plantation sites. Thyrsostachys oliveri Gamble: IVI 0.75 - This species has low importance based on IVI, indicating its marginal presence in the regeneration plots. Cyathea gigantea (Wall. ex Hook.) Holtt.: IVI 0.75 - Similar to the other low-IVI species, it contributes minimally to the regeneration plots. Saurauia roxburghii Wall.: IVI 0.76 - With an IVI of 0.76, this species has limited impact on the structure and dominance of the CD plantation sites.

IMPLICATIONS FOR TREE SPECIES IN CHECK DAMS (CD) PLANTATIONS SITES:

Dominance and Community Structure: Species with high IVI values are key players in shaping the structure of the tree community in the CD plantation sites. Invasive Species: Dominant species should be evaluated to determine if they are invasive or native, as invasive species can alter ecosystem dynamics. Ecosystem Function: The dominance of certain species might influence resource availability, habitat creation, and other ecosystem functions. Conservation: Species with low IVI values might require attention for conservation efforts if they are native or ecologically significant. Understanding the IVI values helps prioritize management strategies, conserve native species, address invasive species, and ensure that the CD plantation sites promote a diverse and resilient tree community.

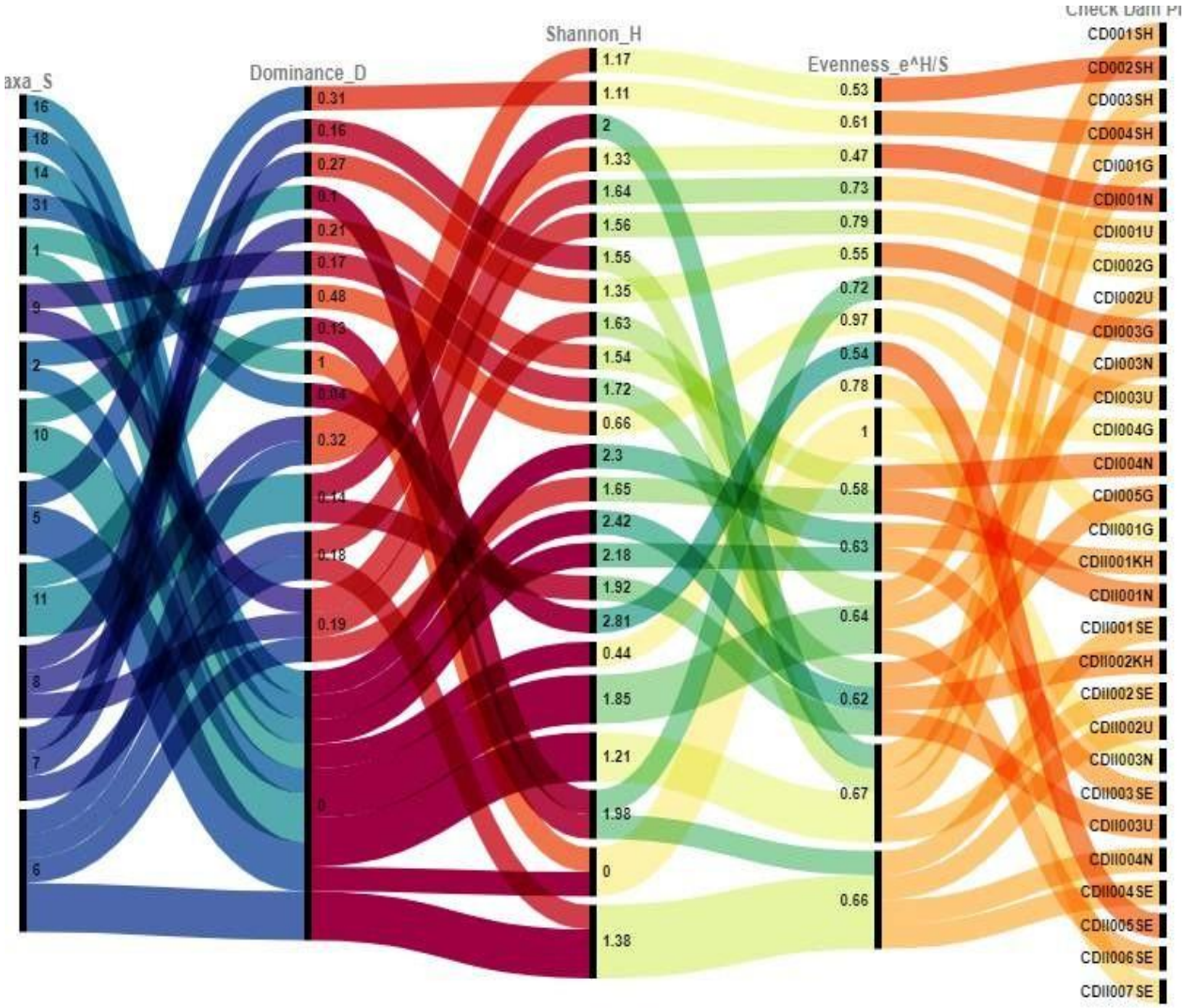


FIGURE 75: TREE SPECIES DIVERSITY AND DOMINANCE PATTERNS IN CHECK DAMS (CD) PLANTATIONS SITES

The snakey chart represent the no.of taxa (species) relations between dominance index, Shannon index, evennessindex and its plantation sites.

TABLE 21: STATUS OF TREE SPECIES DIVERSITY IN CHECK DAMS (CD) PLANTATIONS SITES

Sl. No.	Check Dam Plantations	Taxa_S	Individuals	Dominance_D	Shannon_H	Evenness_e^H/S	Menhinick	Fisher_alpha	Chao-1
1	CD001SH	10	10	0.00	1.85	0.64	3.16	0.00	55
2	CD002SH	6	23	0.32	1.17	0.53	1.25	2.64	12
3	CD003SH	5	5	0.00	1.21	0.67	2.24	0.00	15
4	CD004SH	5	17	0.31	1.11	0.61	1.21	2.39	8
5	CDI001G	11	56	0.14	2.00	0.67	1.47	4.10	11.5
6	CDI001N	8	21	0.32	1.33	0.47	1.75	4.72	11.3
7	CDI001U	7	28	0.18	1.64	0.73	1.32	3.00	7
8	CDI002G	6	27	0.19	1.56	0.79	1.16	2.39	6
9	CDI002U	7	17	0.16	1.55	0.67	1.70	4.45	8
10	CDI003G	7	20	0.27	1.35	0.55	1.57	3.83	10
11	CDI003N	8	29	0.19	1.63	0.64	1.49	3.65	9.5
12	CDI003U	10	27	0.10	1.98	0.72	1.93	5.75	11
13	CDI004G	1	1	0.00	0.00	1.00	1.00	0.00	1
14	CDI004N	8	24	0.21	1.54	0.58	1.63	4.20	11
15	CDI005G	9	28	0.17	1.72	0.62	1.70	4.59	12
16	CDII001G	2	20	0.48	0.66	0.97	0.45	0.55	2
17	CDII001KH	16	16	0.00	2.30	0.63	4.00	0.00	136
18	CDII001N	9	33	0.19	1.65	0.58	1.57	4.08	11
19	CDII001SE	6	6	0.00	1.38	0.66	2.45	0.00	21
20	CDII002KH	18	18	0.00	2.42	0.62	4.24	0.00	171
21	CDII002SE	5	5	0.00	1.21	0.67	2.24	0.00	15
22	CDII002U	11	45	0.13	1.98	0.66	1.64	4.64	12
23	CDII003N	1	20	1.00	0.00	1.00	0.22	0.22	1
24	CDII003SE	14	14	0.00	2.18	0.63	3.74	0.00	105
25	CDII003U	11	31	0.14	1.92	0.62	1.98	6.09	12.5
26	CDII004N	6	12	0.18	1.38	0.66	1.73	4.78	7
27	CDII004SE	6	6	0.00	1.38	0.66	2.45	0.00	21
28	CDII005SE	31	47	0.04	2.81	0.54	4.52	39.66	206
29	CDII006SE	10	10	0.00	1.85	0.64	3.16	0.00	55
30	CDII007SE	2	2	0.00	0.44	0.78	1.41	0.00	3

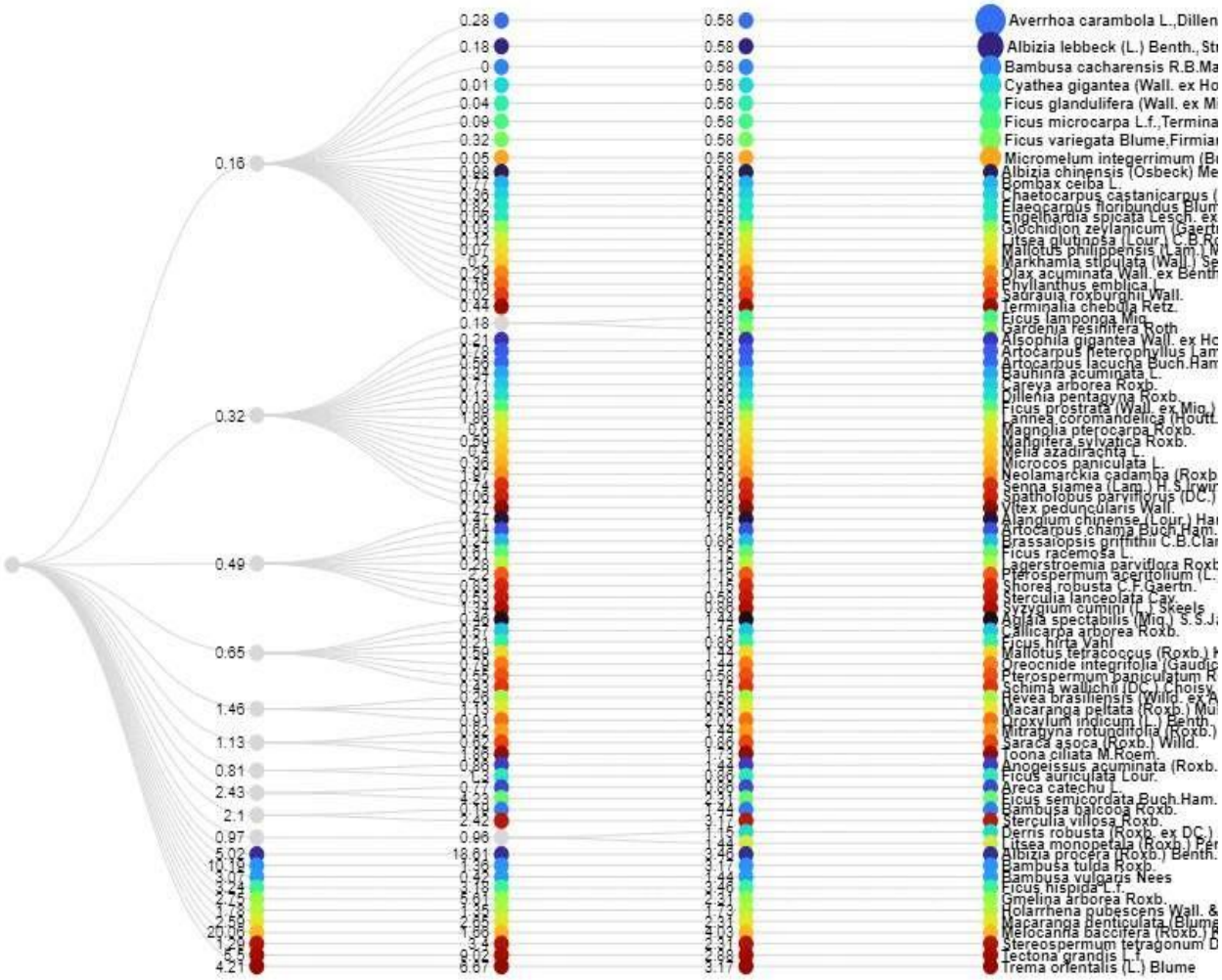


FIGURE 76: RELATIVE FREQUENCY (RFR), RELATIVE DENSITY (RDEN) AND RELATIVE BASAL AREA (RBA) OF TREE SPECIES IN CHECK DAMS (CD) PLANTATIONS SITES

The chart shows RFR, RDEN & RBA of Tree Species in Check Dams (CD).

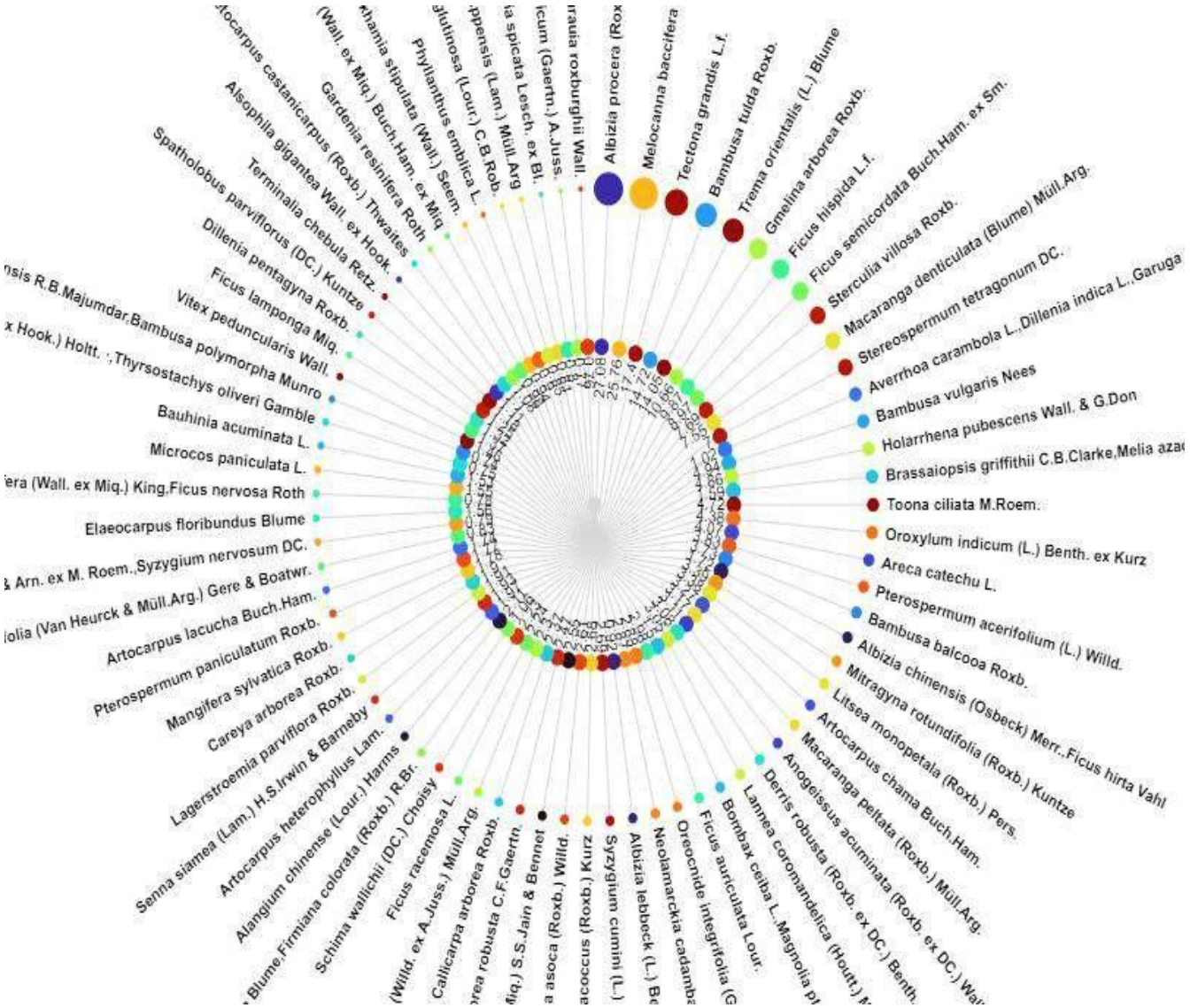


FIGURE 77: IMPORTANT VALUE INDEX (IVI) OF TREE SPECIES IN CHECK DAMS (CD) PLANTATIONS SITES

The graph with larger size color circle denotes higher IVI values for the studied species.

TABLE 22: RELATIVE FREQUENCY (RFR), RELATIVE DENSITY (RDEN) AND IMPORTANT VALUE INDEX (IVI) OF TREE SPECIES IN CHECK DAMS (CD) PLANTATIONS SITES

Sl. No.	Species	RFR	RDEN	RBA	IVI
1	Albizia procera (Roxb.) Benth.	3.46	5.02	18.61	27.08
2	Melocanna baccifera (Roxb.) Kurz	4.03	20.06	1.66	25.76
3	Tectona grandis L.f.	2.88	5.5	9.02	17.4
4	Bambusa tulda Roxb.	3.17	10.19	1.36	14.72
5	Trema orientalis (L.) Blume	3.17	4.21	6.67	14.05
6	Gmelina arborea Roxb.	2.31	2.75	5.61	10.66
7	Ficus hispida L.f.	3.46	3.24	3.18	9.87
8	Ficus semicordata Buch.Ham. ex Sm.	2.31	2.43	4.23	8.97
9	Sterculia villosa Roxb.	3.17	2.1	2.42	7.69
10	Macaranga denticulata (Blume) Müll.Arg.	2.31	2.59	2.65	7.55
11	Stereospermum tetragonum DC.	2.31	1.29	3.4	7
12	Bambusa vulgaris Nees	1.44	3.07	0.42	4.94
13	Holarrhena pubescens Wall. & G.Don	1.73	1.78	1.35	4.86
14	Toona ciliata M.Roem.	1.73	1.13	1.86	4.72
15	Oroxylum indicum (L.) Benth. ex Kurz	2.02	1.46	0.91	4.38
16	Areca catechu L.	0.86	2.43	0.77	4.07
17	Pterospermum acerifolium (L.) Willd.	1.15	0.49	2.2	3.83
18	Bambusa balcooa Roxb.	1.44	2.1	0.19	3.73
19	Mitragyna rotundifolia (Roxb.) Kuntze	1.44	1.13	0.82	3.39
20	Litsea monopetala (Roxb.) Pers.	1.44	0.97	0.96	3.38
21	Artocarpus chama Buch.Ham.	1.15	0.49	1.64	3.27
22	Macaranga peltata (Roxb.) Müll.Arg.	0.58	1.46	1.13	3.17
23	Anogeissus acuminata (Roxb. ex DC.) Wall. ex Guill. & Perr.	1.44	0.81	0.86	3.11
24	Derris robusta (Roxb. ex DC.) Benth.	1.15	0.97	0.96	3.08
25	Lannea coromandelica (Houtt.) Merr.	0.86	0.32	1.86	3.05
26	Ficus auriculata Lour.	0.86	0.81	1.3	2.98
27	Oreocnide integrifolia (Gaudich.) Miq.	1.44	0.65	0.79	2.88
28	Neolamarckia cadamba (Roxb.) Bosser	0.58	0.32	1.97	2.87
29	Syzygium cumini (L.) Skeels	0.86	0.49	1.34	2.69
30	Mallotus tetracoccus (Roxb.) Kurz	1.44	0.65	0.59	2.68
31	Saraca asoca (Roxb.) Willd.	0.86	1.13	0.62	2.61
32	Aglaia spectabilis (Miq.) S.S.Jain & Bennet	1.44	0.65	0.46	2.55
33	Shorea robusta C.F.Gaertn.	1.15	0.49	0.83	2.47
34	Callicarpa arborea Roxb.	1.15	0.65	0.57	2.37
35	Hevea brasiliensis (Willd. ex A.Juss.) Müll.Arg.	0.58	1.46	0.26	2.3
36	Ficus racemosa L.	1.15	0.49	0.61	2.24
37	Schima wallichii (DC.) Choisy	1.15	0.65	0.43	2.23
38	Alangium chinense (Lour.) Harms	1.15	0.49	0.47	2.11

Data arranged based on ascending order of IVI values for each studied species

39	Artocarpus heterophyllus Lam.	0.86	0.32	0.78	1.97
40	Senna siamea (Lam.) H.S.Irwin & Barneby	0.86	0.32	0.74	1.93
41	Lagerstroemia parviflora Roxb.	1.15	0.49	0.28	1.91
42	Careya arborea Roxb.	0.86	0.32	0.71	1.9
43	Mangifera sylvatica Roxb.	0.86	0.32	0.59	1.78
44	Pterospermum paniculatum Roxb.	0.58	0.65	0.55	1.77
45	Artocarpus lacucha Buch.Ham.	0.86	0.32	0.56	1.74
46	Albizia chinensis (Osbeck) Merr.	0.58	0.16	0.98	1.72
47	Ficus hirta Vahl	0.86	0.65	0.21	1.72
48	Brassaiopsis griffithii C.B.Clarke	0.86	0.49	0.24	1.59
49	Melia azadirachta L.	0.86	0.32	0.4	1.59
50	Sterculia lanceolata Cav.	0.58	0.49	0.53	1.59
51	Elaeocarpus floribundus Blume	0.58	0.16	0.82	1.56
52	Microcos paniculata L.	0.86	0.32	0.36	1.55
53	Bauhinia acuminata L.	0.86	0.32	0.34	1.53
54	Bombax ceiba L.	0.58	0.16	0.77	1.5
55	Magnolia pterocarpa Roxb.	0.58	0.32	0.6	1.5
56	Vitex peduncularis Wall.	0.86	0.32	0.27	1.46
57	Ficus lamponga Miq.	0.86	0.32	0.18	1.37
58	Dillenia pentagyna Roxb.	0.86	0.32	0.13	1.32
59	Spatholobus parviflorus (DC.) Kuntze	0.86	0.32	0.06	1.25
60	Terminalia chebula Retz.	0.58	0.16	0.44	1.18
61	Alsophila gigantea Wall. ex Hook.	0.58	0.32	0.21	1.11
62	Chaetocarpus castanicarpus (Roxb.) Thwaites	0.58	0.16	0.36	1.1
63	Gardenia resinifera Roth	0.58	0.32	0.18	1.08
64	Ficus variegata Blume	0.58	0.16	0.32	1.06
65	Firmiana colorata (Roxb.) R.Br.	0.58	0.16	0.32	1.06
66	Averrhoa carambola L.	0.58	0.16	0.28	1.02
67	Dillenia indica L.	0.58	0.16	0.28	1.02
68	Garuga pinnata Roxb.	0.58	0.16	0.28	1.02
69	Magnolia champaca (L.) Baill. ex Pierre	0.58	0.16	0.28	1.02
70	Olax acuminata Wall. ex Benth.	0.58	0.16	0.29	1.02
71	Ficus prostrata (Wall. ex Miq.) Buch.Ham. ex Miq	0.58	0.32	0.08	0.98
72	Markhamia stipulata (Wall.) Seem.	0.58	0.16	0.2	0.94
73	Albizia lebbeck (L.) Benth.	0.58	0.16	0.18	0.92
74	Streblus asper Lour.	0.58	0.16	0.18	0.92
75	Terminalia belirica Wall.	0.58	0.16	0.18	0.92
76	Phyllanthus emblica L.	0.58	0.16	0.16	0.9
77	Litsea glutinosa (Lour.) C.B.Rob.	0.58	0.16	0.12	0.85
78	Ficus microcarpa L.f.	0.58	0.16	0.09	0.83
79	Terminalia phillyreifolia (Van Heurck & Müll.Arg.) Gere	0.58	0.16	0.09	0.83
80	Mallotus philippensis (Lam.) Müll.Arg	0.58	0.16	0.07	0.81
81	Engelhardia spicata Lesch. ex Bl.	0.58	0.16	0.06	0.8
82	Micromelum integerrimum (Buch.Ham. ex DC.)	0.58	0.16	0.05	0.79

	Wight				
83	Syzygium nervosum DC.	0.58	0.16	0.05	0.79
84	Ficus glandulifera (Wall. ex Miq.) King	0.58	0.16	0.04	0.78
85	Ficus nervosa Roth	0.58	0.16	0.04	0.78
86	Glochidion zeylanicum (Gaertn.) A.Juss.	0.58	0.16	0.03	0.77
87	Saurauia roxburghii Wall.	0.58	0.16	0.02	0.76
88	Cyathea gigantea (Wall. ex Hook.) Holtt. ·	0.58	0.16	0.01	0.75
89	Thyrsostachys oliveri Gamble	0.58	0.16	0.01	0.75
90	Bambusa cacharensis R.B.Majumdar	0.58	0.16	0	0.74
91	Bambusa polymorpha Munro	0.58	0.16	0	0.74

TABLE 23: STATUS OF PLANT SPECIES DIVERSITY IN REGENERATION PLOTS OF CHECK DAMS (CD) PLANTATIONS SITES

Sl. N0.	CD PLANTATION	Taxa_S	Individuals	Dominance_D	Shannon_H	Evenness_e^H/S	Menhinick	Fisher_alpha	Chao-1
1	CD001SH	9	11	0.04	1.78	0.66	2.71	23.15	16
2	CD002SH	5	5	0.00	1.21	0.67	2.24	0.00	15
3	CD003SH	2	2	0.00	0.44	0.78	1.41	0.00	3
4	CD004SH	7	10	0.09	1.53	0.66	2.21	10.36	12
5	CDI-001G	9	24	0.10	1.91	0.75	1.84	5.23	12
6	CDI-001N	7	14	0.10	1.66	0.75	1.87	5.57	7.25
7	CDI-001U	14	22	0.04	2.24	0.67	2.99	16.57	19.6
8	CDI-002G	11	25	0.17	1.80	0.55	2.20	7.50	14.7
9	CDI-002U	9	18	0.12	1.76	0.65	2.12	7.16	12.3
10	CDI-003G	5	27	0.24	1.34	0.77	0.96	1.81	5
11	CDI-003N	6	13	0.10	1.59	0.81	1.66	4.32	6
12	CDI-003U	3	9	0.25	0.99	0.89	1.00	1.58	3
13	CDI-004G	17	36	0.07	2.37	0.63	2.83	12.59	21.6
14	CDI-004N	3	10	0.38	0.85	0.78	0.95	1.45	3
15	CDI-005G	3	9	0.36	0.83	0.76	1.00	1.58	3
16	CDII-001G	7	16	0.13	1.60	0.71	1.75	4.75	8.5
17	CDII-001KH	4	4	0.00	1.01	0.69	2.00	0.00	10
18	CDII-001N	7	14	0.10	1.66	0.75	1.87	5.57	7.25
19	CDII-001SE	13	13	0.00	2.10	0.63	3.61	0.00	91
20	CDII-002KH	7	7	0.00	1.52	0.65	2.65	0.00	28
21	CDII-002SE	5	5	0.00	1.21	0.67	2.24	0.00	15
22	CDII-002U	8	22	0.10	1.85	0.80	1.71	4.52	8

23	CDII-003N	3	15	0.47	0.79	0.74	0.77	1.13	3
24	CDII-003SE	6	7	0.05	1.39	0.67	2.27	19.95	11
25	CDII-003U	10	20	0.08	1.96	0.71	2.24	7.96	11.5
26	CDII-004N	1	5	1.00	0.00	1.00	0.45	0.38	1
27	CDII-004SE	3	3	0.00	0.77	0.72	1.73	0.00	6
28	CDII-005SE	18	18	0.00	2.42	0.62	4.24	0.00	171
29	CDII-006SE	10	10	0.00	1.85	0.64	3.16	0.00	55
30	CDII-007SE	3	3	0.00	0.77	0.72	1.73	0.00	6

TABLE 24: RELATIVE FREQUENCY (RFR), RELATIVE DENSITY (RDEN) AND RELATIVE IMPORTANT VALUE (RIV) OF PLANT SPECIES IN REGENERATION PLOTS OF CHECK DAMS (CD) PLANTATIONS SITES

Sl. No.	Species	RFR	RDEN	RBA	IVI
1	Chromolaena odorata (L.) R.M.King & H.Rob.	5.37	14.36	14	33.73
2	Clerodendrum infortunatum L.	5.37	8.56	10.43	24.36
3	Urena lobata L.	5.37	8.31	5.26	18.94
4	Manihot esculenta Crantz	2.01	5.79	8.6	16.41
5	Melocanna baccifera Kurz	3.36	4.79	5.15	13.29
6	Hyptis suaveolens (L.) Poit.	3.02	3.78	3.47	10.27
7	Triumfetta pentandra A.Rich.	2.35	3.78	3.07	9.2
8	Mussaenda roxburghii Hook.f.	2.35	3.02	3.37	8.74
9	Melastoma malabathricum L.	2.68	2.27	2.87	7.83
10	Solanum torvum Sw.	2.68	2.02	2.87	7.57
11	Macaranga denticulata Müll.Arg.	2.01	2.52	2.82	7.35
12	Tectona grandis L.f.	1.68	2.02	2.95	6.64
13	Physalis minima L.	1.68	2.27	2.56	6.51
14	Ficus hispida L.f.	2.35	2.02	1.95	6.31
15	Brassaiopsis griffithii C.B.Clarke	1.01	1.01	3.01	5.03
16	Sterculia villosa Roxb.	1.68	1.51	1.58	4.76
17	Combretum punctatum Blume	2.01	1.51	1.12	4.64
18	Anogeissus acuminata (Roxb. ex DC.) Wall. ex Guill. & Perr.	1.68	1.26	1.7	4.63
19	Trema orientalis (L.) Blume	1.34	1.26	1.54	4.14
20	Debregeasia orientalis C.J.Chen	1.01	1.01	2.05	4.07
21	Mimosa rubicaulis subsp. himalayana (Gamble) H.Ohashi	1.34	1.01	1.15	3.5
22	Mitragyna rotundifolia (Roxb.) Kuntze	1.68	1.26	0.36	3.3
23	Oreocnide integrifolia (Gaudich.) Miq.	1.34	0.76	0.92	3.02
24	Oroxylum indicum (L.) Benth. ex Kurz	1.01	0.76	1.07	2.83
25	Debregeasia longifolia (Burm.f.) Wedd.	1.01	0.76	0.85	2.62
26	Microcos paniculata L.	1.01	0.76	0.81	2.57
27	Lantana camara L.	0.67	0.76	1.11	2.54

Data arranged based on ascending order of IVI values for each studied species

28	Jatropha gossypiifolia L.	0.67	0.76	1.06	2.49
29	Boehmeria virgata (G.Forst.) Guill.	0.67	0.76	1.03	2.46
30	Knema angustifolia (Roxb.) Warb.	1.01	0.5	0.73	2.24
31	Mikania micrantha Kunth	1.01	1.01	0.23	2.24
32	Hymenodictyon orixense (Roxb.) Mabb.	1.01	0.5	0.68	2.19
33	Pueraria phaseoloides (Roxb.) Benth.	0.67	1.01	0.27	1.95
34	Clausena heptaphylla Wight & Arn.	1.01	0.5	0.43	1.94
35	Mucuna pruriens (L.) DC.	1.01	0.76	0.15	1.91
36	Callicarpa arborea Roxb.	0.67	0.5	0.68	1.85
37	Calotropis gigantea (L.) W.T.Aiton	0.67	0.76	0.33	1.76
38	Flemingia strobilifera (L.)W.T.Aiton	0.67	0.76	0.33	1.76
39	Ficus hirta Vahl	1.01	0.5	0.17	1.68
40	Bridelia retusa (L.) A.Juss	1.01	0.5	0.12	1.63
41	Carallia brachiata Merr.	1.01	0.5	0.09	1.6
42	Acmella paniculata (Wall. ex DC.) R.K.Jansen	1.01	0.5	0.06	1.57
43	Thunbergia grandiflora (Roxb. ex Rottl.) Roxb.	1.01	0.5	0.06	1.57
44	Solanum ferrugineum Jacq.	0.67	0.5	0.17	1.35
45	Artocarpus chama Buch.-Ham.	0.67	0.25	0.39	1.31
46	Suregada multiflora (A.Juss.) Baill.	0.67	0.25	0.39	1.31
47	Alstonia scholaris (L.) R.Br.	0.67	0.25	0.36	1.28
48	Boehmeria macrophylla Hornem.	0.67	0.25	0.34	1.27
49	Boehmeria penduliflora Wedd. ex D.G.Long	0.67	0.25	0.34	1.27
50	Bridelia montana (Roxb.) Willd.	0.67	0.25	0.34	1.26
51	Litsea glutinosa (Lour.) C.B.Rob.	0.67	0.25	0.34	1.26
52	Merremia umbellata (L.) Hallier f.	0.67	0.25	0.34	1.26
53	Uvaria argentea var. bracteata (Roxb.) Meade & J.Parn.	0.67	0.25	0.34	1.26
54	Vitex peduncularis Wall.	0.67	0.25	0.34	1.26
55	Pavetta indica L.	0.67	0.5	0.07	1.25
56	Ludwigia octovalvis (Jacq.) P.H.Raven	0.67	0.25	0.28	1.21
57	Ricinus communis L.	0.67	0.25	0.28	1.21
58	Micromelum integerrimum (Roxb. ex DC.) Wight & Arn. ex M.	0.67	0.25	0.27	1.19
59	Abelmoschus moschatus Medik.	0.67	0.25	0.25	1.17
60	Ficus semicordata Buch.-Ham. ex Sm.	0.67	0.25	0.25	1.17
61	Cassia fistula L.	0.67	0.25	0.21	1.13
62	Flemingia stricta Roxb.	0.67	0.25	0.18	1.1
63	Premna esculenta Roxb.	0.67	0.25	0.17	1.1
64	Digitaria ciliaris (Retz.) Koeler	0.67	0.25	0.11	1.03
65	Diplazium peruvianum Mynssen & Sylvestre	0.67	0.25	0.11	1.03
66	Lagerstroemia parviflora Roxb.	0.67	0.25	0.11	1.03
67	Ludwigia adscendens (L.) H.Hara	0.67	0.25	0.11	1.03
68	Maesa indica (Roxb.) Sweet	0.67	0.25	0.11	1.03
69	Mallotus roxburghianus Müll.Arg.	0.67	0.25	0.11	1.03
70	Markhamia stipulata Seem.	0.67	0.25	0.11	1.03

71	Ziziphus rugosa Lam.	0.67	0.25	0.11	1.03
72	Hibiscus surattensis L.	0.67	0.25	0.08	1.01
73	Dalbergia volubilis Roxb.	0.67	0.25	0.06	0.99
74	Derris robusta (Roxb. ex DC.) Benth.	0.67	0.25	0.06	0.99
75	Holarrhena pubescens Wall. & G.Don	0.67	0.25	0.04	0.97
76	Mimosa pudica L.	0.67	0.25	0.04	0.97
77	Crotalaria pallida Aiton	0.67	0.25	0.03	0.95
78	Ipomoea aquatica Forssk.	0.67	0.25	0.03	0.95
79	Tinospora sinensis (Lour.) Merr.	0.67	0.25	0.03	0.95
80	Lygodium japonicum (Thunb.) Sw.	0.67	0.25	0.02	0.94
81	Sida acuta Burm.f.	0.67	0.25	0.02	0.94
82	Allophylus serratus (Hiern) Kurz	0.67	0.25	0.01	0.93
83	Gardenia resinifera Roth	0.67	0.25	0.01	0.93

STRATEGIES FOR MANAGEMENT OF CHECK DAMS (CD) PLANTATIONS:

The management of Check Dams (CD) plantation sites is crucial for preserving water resources, preventing soil erosion, enhancing biodiversity, and supporting sustainable land use. Here are some strategies for effectively managing CD plantation sites:

Site Assessment and Planning: Conduct a thorough assessment of site conditions, including soil type, hydrology, slope, and vegetation cover. Determine the goals and objectives of the CD plantation, such as erosion control, water retention, and habitat enhancement. Plan the layout and design of the CD plantation, considering factors like species selection and spacing.

Species Selection: Choose native plant species that are well-suited to the local environment and can thrive in the specific conditions of the CD site. Select a mix of tree, shrub, and herbaceous species to create a diverse and resilient ecosystem.

Erosion Control and Slope Stabilization: Plant deep-rooted species to stabilize the soil and prevent erosion in and around the CD structures. Consider using erosion control blankets, matting, or other stabilization techniques on exposed slopes.

Water Management: Select plant species that can help manage water flow and retention, especially during heavy rainfall events. Avoid planting invasive species that could negatively impact water quality or flow. Use appropriate planting methods, such as seedlings, cuttings, or

direct seeding, based on site conditions and species characteristics. Ensure proper spacing to avoid overcrowding and competition among plants.

Maintenance and Monitoring: Regularly inspect the CD structures and the planted vegetation for signs of damage, erosion, or sediment buildup. Maintain vegetation by pruning, weeding, and replacing any plants that do not survive. Incorporate plant species that provide habitat and food sources for local wildlife, including birds, insects, and small mammals.

Community Involvement and Education: Engage local communities, volunteers, and stakeholders in the management and maintenance of CD plantation sites. Raise awareness about the benefits of CD plantations for water conservation, erosion control, and habitat restoration. Continuously assess the effectiveness of CD plantation strategies and adapt management approaches based on monitoring results. Be open to adjusting practices as needed to achieve desired outcomes.

Long-Term Planning: Develop a comprehensive management plan that outlines objectives, strategies, and responsibilities for the CD plantation site. Consider factors such as changing weather patterns, natural disturbances, and long-term sustainability.

Maintenance of CD Structures: Regularly inspect and maintain the CD structures to ensure they are functioning effectively and not causing unintended negative impacts on the ecosystem. By implementing these strategies, CD plantation sites can contribute to sustainable water management, erosion control, and habitat enhancement while promoting the health and resilience of the surrounding ecosystem

RIVER BANKS (RB) OR FILTE STRIP (FS) PLANTATION

RIVER BANKS (RB) OR FILTE STRIP (FS) PLANTATION:

Plant diversity and structural patterns in river bank (RB) plantations are critical for stabilizing riverbanks, preventing erosion, enhancing water quality, providing habitat for wildlife, and creating a healthy and functional riparian ecosystem. Here's how plant diversity and structural patterns can be approached in river bank plantations:

Plant Diversity: Native Species Selection: Choose a diverse range of native plant species that are well-suited to the specific conditions of the riverbank, such as soil type, moisture level, and flood frequency. Native plants are more likely to establish successfully and support local wildlife.

Hydrological Adaptation: Select plant species that can tolerate fluctuations in water levels and occasional flooding. A mix of species with different tolerance levels can ensure that the plantation remains resilient under changing conditions.

Riparian Specialists: Include plant species that are adapted to riparian environments, as they have unique traits that help stabilize riverbanks, trap sediment, and provide habitat. These species are well-equipped to thrive in the challenging conditions of riverbank zones.

Root System Diversity: Choose plants with varied root systems—deep-rooted trees and shrubs anchor the soil, while grasses and herbaceous plants stabilize the surface layer. This diversity helps prevent erosion and soil loss.

Structural Patterns: Layered Structure: Establish a layered structure with various plant heights, from ground cover and herbaceous plants to shrubs and trees. This mimics natural ecosystems and provides multiple niches for wildlife and insects.

Zonation: Plan the plantation in zones based on proximity to the water. These zones can include an aquatic zone (wetland or shallow water), a transitional zone (where plants tolerate occasional flooding), and an upland zone (flood-free area with more drought-tolerant plants).

Contour Planting: Arrange plants along the contour lines of the riverbank to slow down water flow and encourage water infiltration. Contour planting helps reduce erosion and sediment runoff.

Buffer Strips: Design buffer strips adjacent to the riverbank with dense vegetation to filter runoff, trap sediment, and prevent pollutants from entering the water.

Successional Planning: Implement a succession plan that starts with pioneer species to stabilize the soil, followed by mid-successional species that enhance ecological diversity, and potentially culminating in mature trees for long-term stability.

Wildlife Habitat Features: Incorporate features like snags (dead trees), fallen logs, and rock piles to provide habitat for aquatic and terrestrial wildlife.

Proper maintenance, including weed control and regular monitoring, is crucial for the success of river bank plantations. Structural complexity and plant diversity contribute to the overall health of the riparian ecosystem, promote stability, and enhance the ecological value of riverbank areas.

Filter Strip (FS) Plantations:

Filter strips are areas of vegetation, often consisting of trees, shrubs, and grasses, established along the edges of water bodies such as rivers, streams, and ponds. They serve as buffers to filter sediment, nutrients, and pollutants from surface runoff before it enters the water. Plant diversity and structure are important in filter strip plantations as well:

Pollution Reduction: A diverse mix of plants with varying root depths can effectively capture and filter pollutants from runoff, improving water quality in the adjacent water body.

Sediment Retention: Plants with sturdy root systems help trap sediment carried by runoff, preventing sediment from entering the water and causing sedimentation.

Biodiversity and Habitat: A mixture of trees, shrubs, and grasses can provide habitat for diverse species, enhance ecological interactions, and create corridors for wildlife movement.

Erosion Prevention: Well-established vegetation helps stabilize soil along water bodies, reducing the risk of erosion and bank collapse.

Microclimate Benefits: Trees in filter strip plantations can provide shade, reducing water temperature and creating a more suitable environment for aquatic life.

TABLE 25: STATUS OF TREE SPECIES DIVERSITY IN RIVER BANKS (RB) OR FILTE STRIP (FS) PLANTATION

Sl. No.	River Bank Plantation	Taxa_S	Individuals	Dominance_D	Shannon_H	Evenness_e^H/S	Menhinick	Fisher_alpha	Chao-1
1	RBP001G	19	139	0.43	1.43	0.22	1.61	5.95	52
2	RBP001SH	4	35	0.65	0.65	0.48	0.68	1.16	4
3	RBP002G	21	125	0.17	2.19	0.43	1.88	7.22	23.5

FIGURE 78: STUDY OF DIVERSITY ON FS PLANTATION SITES (SOUTH BAIHNABPUR JFMC)- A) MAP ALONG WITH GPS COORDINATES (B) STUDY SITE OF FILTER STRIPS (C) BAMBUSA BAMBOS (D) AMARANTHUS SPINOSUS (E) SOPARIA DULCIS (F) LEUCAS ASPERA.

FIGURE 79: STUDY OF DIVERSITY ON RIVERBANK PLANTATION SITES (HERBATALI JFMC)- A) MAP ALONG WITH GPS COORDINATES (B) SIGN BOARD OF THE STUDY SITE (C) STUDY ON PLANTATION SITE (D-F) BAMBUSA BAMBOS AND ITS FENCING SYSTEM (G) ASSOCIATED HERB SPECIES: DIPLAZIUM ESCULENTUM, MIKANIA CORDATA ETC.

FIGURE 80: STUDY OF DIVERSITY ON RBP009 BAMBOO (MARDHIRGHAT JFMC): (A) MAP ALONG WITH GPS COORDINATES. B) PLANTATION SITE (DUMBUR RIVER) (C) INTERROGATION WITH RANGE OFFICER, BEAT OFFICER, C.O. AND FFW (D) SAPLING OF BAMBUSA TULDA WITH PROPER INDIVIDUAL FENCING (E) HELMINTHOSTACHYS ZEYLANICA (F) FICUS HIRTA.

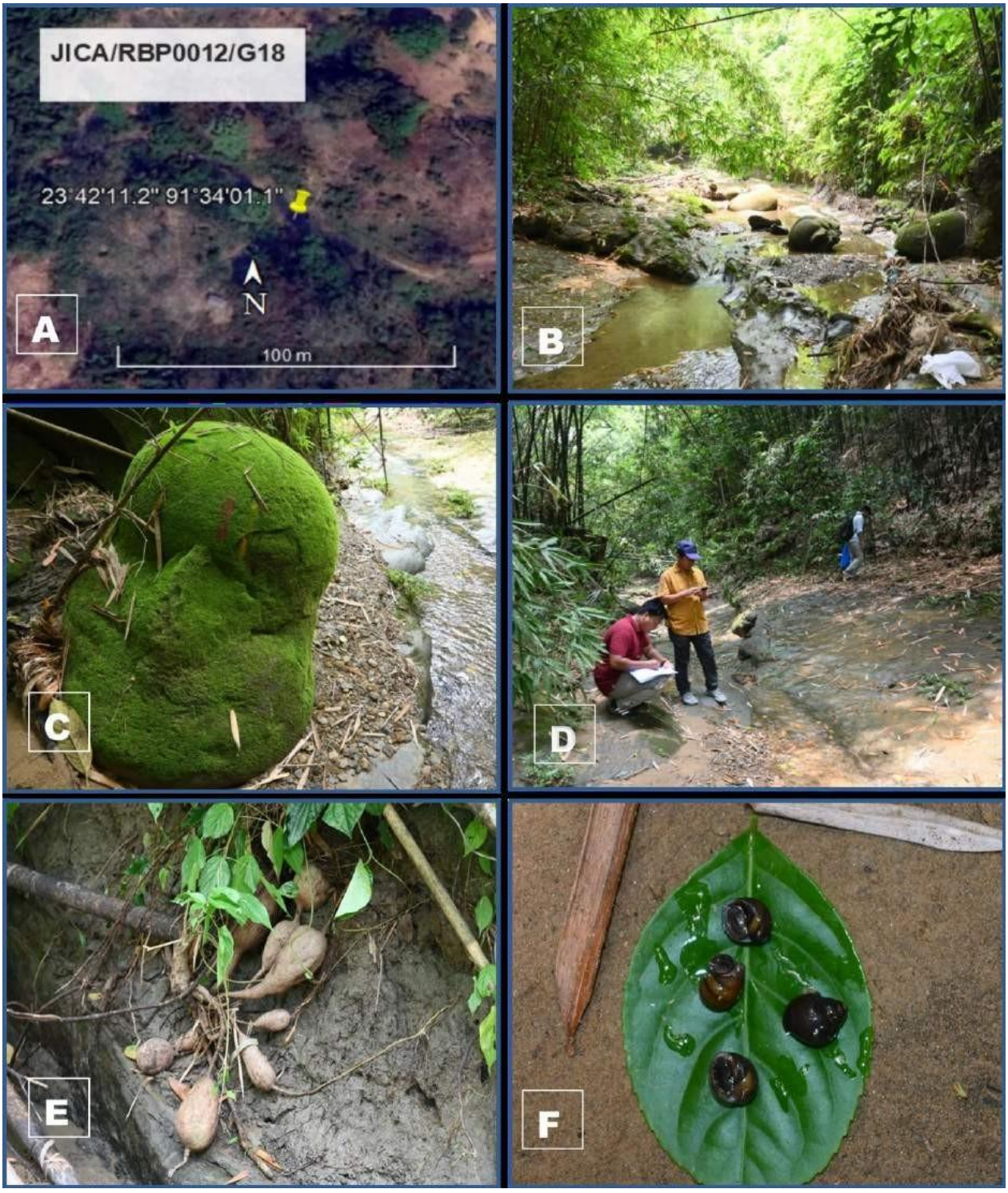


FIGURE 81: STUDY OF DIVERSITY ON RBP0012 BAMBOO (Y-GHATI JFMC): (A) MAP ALONG WITH GPS COORDINATES. B) PLANTATION AREA (C) UNUSUAL ROCK SKULL-LIKE SHAPED AND COVERED FULLY WITH GREEN MOSS (D) INTERROGATION WITH BEAT OFFICER (E) TUBER OF PUERARIA TUBEROSA (F) FRESH WATER EDIBLE SNAIL.

TABLE 26 : RELATIVE FREQUENCY (RFR), RELATIVE DENSITY (RDEN) AND IMPORTANT VALUE INDEX (IVI) OF TREE SPECIES IN RIVER BANKS (RB) OR FILTE STRIP (FS) PLANTATION

Sl. No.	Species	RFR	RDEN	RBA	IVI
1	Bambusa tulda Roxb.	42.81	42.81	3.72	89.34
2	Tectona grandis L.f.	5.35	5.35	33.56	44.26
3	Dendrocalamus longispathus (Kurz) Kurz	13.71	13.71	0.9	28.32
4	Melocanna baccifera (Roxb.) Kurz	9.03	9.03	1.49	19.55
5	Albizia procera (Roxb.) Benth.	1.67	1.67	11.06	14.41
6	Areca catechu L.	3.68	3.68	1.25	8.61
7	Toona ciliata M.Roem.	1	1	5.53	7.54
8	Stereospermum tetragonum DC.	1.34	1.34	4.19	6.86
9	Senna siamea (Lam.) H.S.Irwin & Barneby	1.34	1.34	4.13	6.81
10	Mallotus nudiflorus (L.) Kulju & Welzen	1.34	1.34	3.45	6.13
11	Brassaiopsis griffithii C.B.Clarke	2.34	2.34	1.31	5.99
12	Alangium chinense (Lour.) Harms	1.34	1.34	2.51	5.18
13	Callicarpa arborea Roxb.	1.34	1.34	2.33	5.01
14	Boehmeria macrophylla Hornem.	1.67	1.67	0.94	4.28
15	Duabanga grandiflora (Roxb. ex DC.) Walp.	1	1	1.7	3.7
16	Litsea monopetala (Roxb.) Pers.	1	1	1.45	3.46
17	Artocarpus chama Buch.Ham.	0.33	0.33	2.61	3.28
18	Macropanax undulatus (Wall. ex G.Don) Seem.	1	1	1.21	3.21
19	Balakata baccata (Roxb.) Esser	0.67	0.67	1.64	2.98
20	Trema orientalis (L.) Blume	0.67	0.67	1.59	2.93
21	Pterospermum acerifolium (L.) Willd.	0.67	0.67	1.41	2.75
22	Caryota urens L.	1	1	0.69	2.69
23	Elaeocarpus prunifolius Wall. |	0.67	0.67	1.16	2.5
24	Anogeissus acuminata (Roxb. ex DC.) Wall. ex Guill.	0.33	0.33	1.67	2.34
25	Heteropanax fragrans (Roxb.) Seem.	0.33	0.33	1.35	2.02
26	Ficus racemosa L.	0.33	0.33	1.21	1.88
27	Ficus semicordata Buch.Ham. ex Sm.	0.33	0.33	1.21	1.88
28	Mallotus tetracoccus (Roxb.) Kurz	0.33	0.33	1.21	1.88
29	Syzygium cumini (L.) Skeels	0.33	0.33	1.07	1.74
30	Caesalpinia bonduc (L.) Roxb.	0.67	0.67	0.24	1.57
31	Actinodaphne obovata (Nees) Blume	0.33	0.33	0.6	1.27
32	Alstonia scholaris (L.) R. Br.	0.33	0.33	0.6	1.27
33	Ficus hederacea Roxb.	0.33	0.33	0.29	0.96
34	Dillenia pentagyna Roxb.	0.33	0.33	0.2	0.87
35	Ficus mollis Vahl	0.33	0.33	0.2	0.87
36	Ficus hispida L.f.	0.33	0.33	0.17	0.84
37	Ficus hirta Vahl	0.33	0.33	0.15	0.82

Data arranged based on ascending order of IVI values for each studied species

TABLE 27: STATUS OF PLANT SPECIES DIVERSITY IN REGENERATION PLOTS OF RIVER BANKS (RB) OR FILTE STRIP (FS) PLANTATION

Sl. No.	Plantation	Taxa _S	Individuals	Dominance _D	Shannon _H	Evenness _e^H/S	Menhinick	Fisher _alpha	Chao -1
1	RBP001G	8	21	0.14	1.69	0.68	1.75	4.72	14
2	RBP001SH	9	18	0.14	1.69	0.60	2.12	7.16	16.5
3	RBP002G	6	10	0.11	1.45	0.71	1.90	6.33	7

TABLE 28 : RELATIVE FREQUENCY (RFR), RELATIVE DENSITY (RDEN) AND IMPORTANT VALUE INDEX (IVI) OF PLANT SPECIES IN REGENERATION PLOTS OF RIVER BANKS (RB) OR FILTE STRIP (FS) PLANTATION

Sl.No.	Species	RFR	RDEN	RBA	IVI
1	Chromolaena odorata (L.) R.M.King & H.Rob.	8.7	22.45	25.03	56.17
2	Urena lobata L.	8.7	10.2	8.16	27.06
3	Debregeasia orientalis C.J.Chen	4.35	8.16	13.13	25.64
4	Senna siamea (Lam.) H.S.Irwin & Barneby	4.35	10.2	7.02	21.57
5	Mussaenda roxburghii Hook.f.	4.35	6.12	6.62	17.09
6	Tectona grandis L.f.	4.35	6.12	5.58	16.05
7	Melocanna baccifera Kurz	8.7	4.08	2.65	15.43
8	Leea indica (Burm. f.) Merr	4.35	4.08	4.39	12.82
9	Pavetta indica L.	4.35	4.08	3.72	12.15
10	Clerodendrum infortunatum L.	4.35	4.08	2.58	11.01
11	Holarrhena pubescens Wall. & G.Don	4.35	2.04	2.9	9.29
12	Melastoma malabathricum L.	4.35	2.04	2.9	9.29
13	Boehmeria macrophylla Hornem.	4.35	2.04	2.53	8.92
14	Dracaena spicata Roxb.	4.35	2.04	2.53	8.92
15	Microcos paniculata L.	4.35	2.04	2.53	8.92
16	Solanum torvum Sw.	4.35	2.04	2.53	8.92
17	Combretum punctatum Blume	4.35	2.04	1.86	8.25
18	Uraria acuminata Kurz	4.35	2.04	1.86	8.25
19	Senna tora (L.) Roxb.	4.35	2.04	1.29	7.68
20	Thunbergia grandiflora (Roxb. ex Rottl.) Roxb.	4.35	2.04	0.21	6.6

Data arranged based on ascending order of RIV values for each studied species

STRATEGIES FOR MANAGEMENT OF RIVER BANK (RB) PLANTATIONS:

Management of river bank (RB) plantations is essential to ensure the health of the ecosystem, prevent erosion, enhance biodiversity, and provide various ecosystem services. Here are some strategies for effectively managing RB plantations:

Species Selection: Choose native plant species that are adapted to the local environment and can thrive along riverbanks. Select a mix of tree, shrub, and herbaceous species to create a diverse and resilient ecosystem.

Site Preparation: Assess the site conditions, including soil type, moisture levels, and slope, to determine suitable species and planting methods. Clear invasive species and debris to create space for new plantings. Consider the hydrology of the site to avoid flooding or soil erosion issues. Use appropriate planting methods, such as seedlings, cuttings, or direct seeding, based on site conditions and species characteristics. Ensure proper spacing to avoid overcrowding and competition among plants. Regularly monitor the RB plantations for signs of disease, pest infestations, or invasive species. Provide necessary water and nutrients during the establishment phase. Control weeds to reduce competition for resources.

Erosion Control: Plant deep-rooted species to stabilize the soil and prevent erosion along riverbanks. Implement erosion control measures such as installing erosion mats or retaining structures where needed. Introduce a variety of native plant species to promote biodiversity. Create habitat niches for various wildlife species by including different plant heights, layers, and types.

Habitat Restoration: Restore degraded riverbank areas by planting native species and allowing natural processes to regenerate the ecosystem. Enhance habitat connectivity by creating corridors that link RB plantations with adjacent habitats.

Community Engagement: Involve local communities, volunteers, and stakeholders in RB plantation management. Raise awareness about the importance of RB ecosystems and their benefits. Educate the public about the significance of RB plantations in maintaining water quality, biodiversity, and flood control.

Adaptive Management: Continuously assess the success of RB plantations and adapt management strategies based on monitoring results. Be flexible and open to adjusting approaches as needed to achieve desired outcomes.

Long-Term Planning: Develop a long-term management plan that outlines goals, strategies, and monitoring protocols for RB plantations. Consider factors such as changing climate conditions and potential natural disturbances. By implementing these strategies, RB plantations can contribute to healthier riverbank ecosystems, improved water quality, and enhanced biodiversity.

SOME IMPORTANT PLANT SPECIES IN PLANTATION SITES

Figure 82 : Common Tree species A) Neolitsea zeylanica (B) Bombax ceiba (C) Mangifera indica (D) Elaeocarpus sp.(E) Toona ciliate (F) Calamus tenuis (G) Ficus hispida (H) Castanopsis indica.

Figure 83: Common shrub/regeneration species A) Willughbeia edulis (B) Carallia brachiata (C) Markhamia stipulata (D) Allophylus serratus (E) Cinnamomum bejolghota (F) Neolitsea zeylanica (G) Jasminum Sp (H) Caesalpinia bonduc

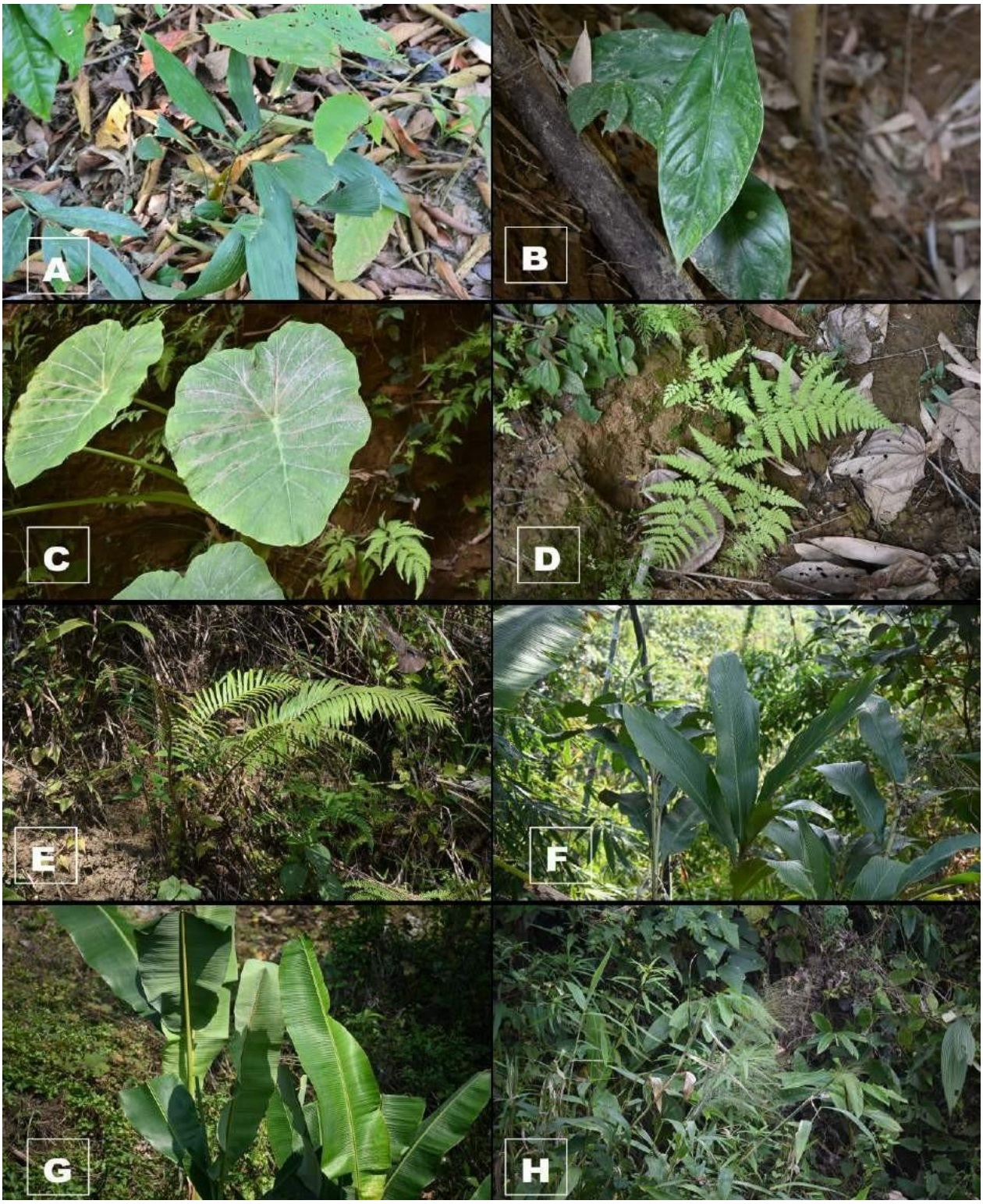


Figure 84: Common shrub species A) Peliosanthes teta (B) Steudnera assamica (C) Colocasia esculenta (D) Christella dentata (E) Blechnum orientale (F) Alpinia nigra (G) Musa acuminata (H) Thysanolaena latifolia

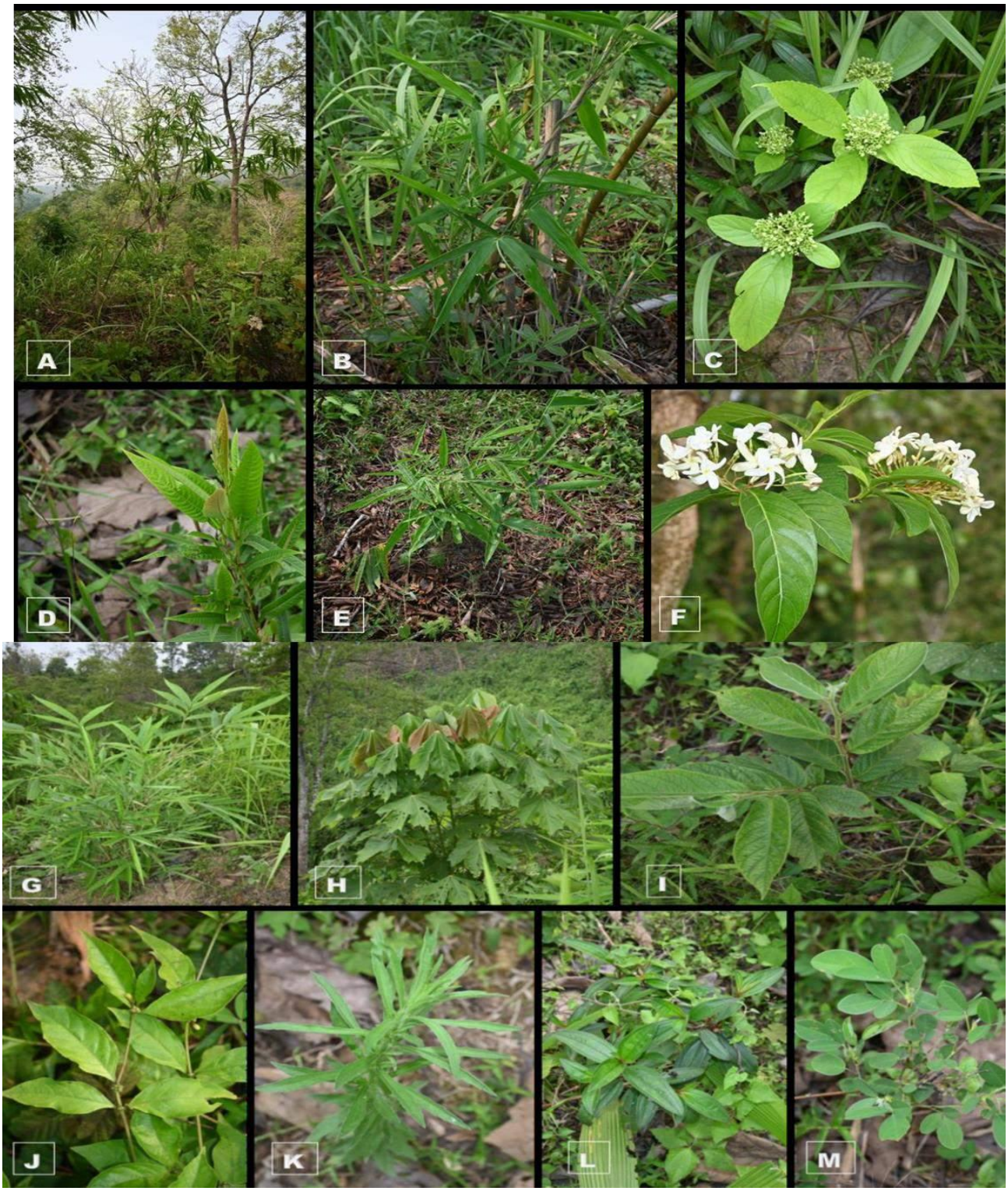


Figure 85: Some common species of AR001 (A, B, E, G) Sapling of D. longispathus (C) Premna esculenta (D) Desmodium gangeticum (F) Holarrhena pubescens (H) Sterculia villosa (I) Antidesma sp (J) Morinda sp (K) (L) Melastoma malabathricum (M) Crotalaria pallid.

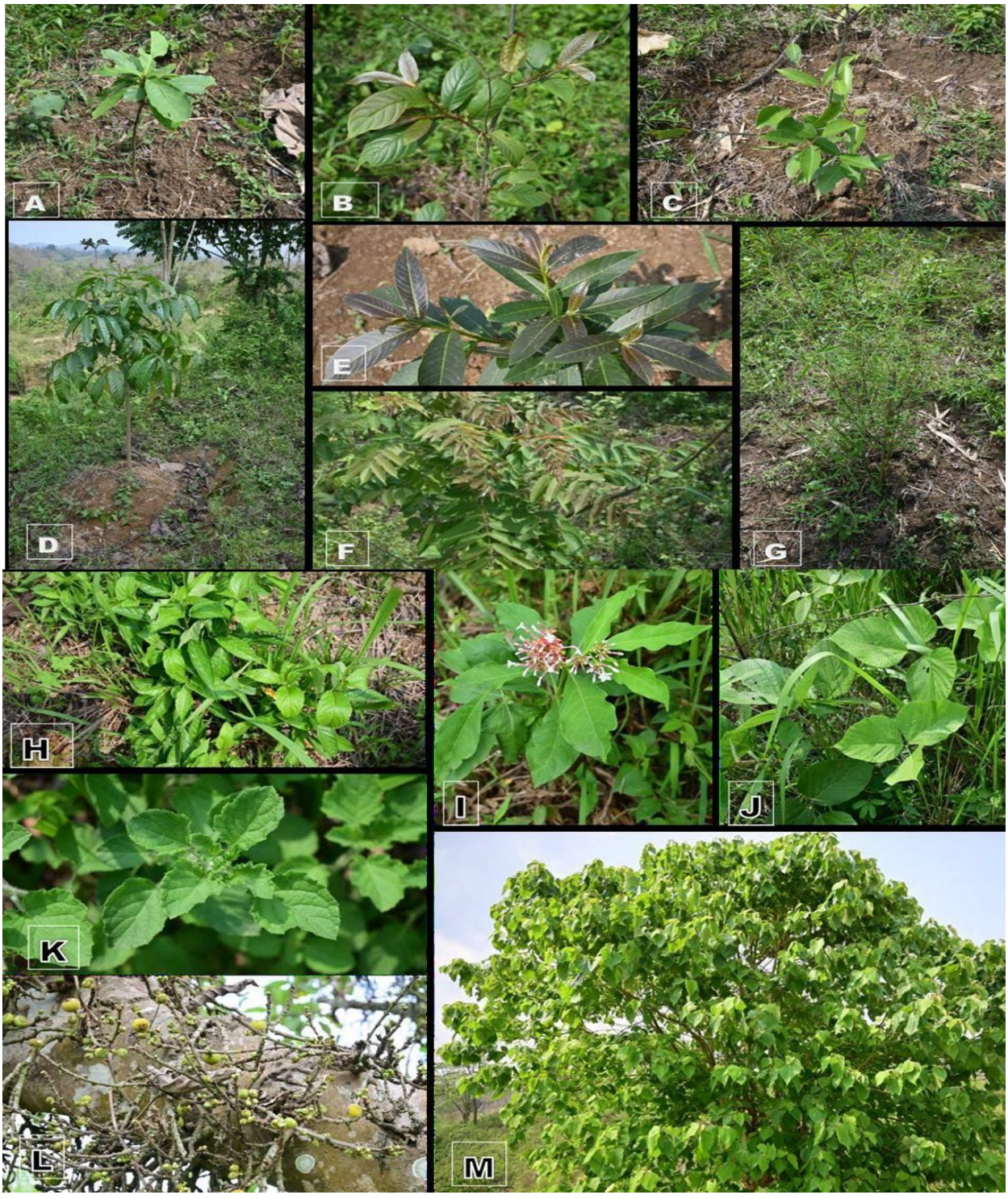


Figure 86: Some common species of AR002: (A) Terminalia bellirica (B) Terminalia chebula (C) Pongamia pinnata (D) Swietenia mahagoni (E) (F) Toona ciliate (G) Dendrocalamus longispathus (H) Maesa indica (I) Rauwolfia serpentine (J) Pueraria tuberose (K) Hyptis suaveolens (L) Ficus racemosa (M) Gmelina aroborea

Figure 87: Some common species of AR011Misc. (A) Alstonia scholaris (B) Mitragyna parvifolia (C) Artocarpus chama (D) Anogeissus acuminate (E) Tetrastigma bracteolatum (F) Callicarpa arborea (G) Litsea glutinosa (H) Holarrhena pubescens.

Figure 88: Some common species of ANR002 Misc. (A) Tetrastigma bracteolatum (B & H) Derris robusta (C) Alangium chinense (D) Artocarpus chama (E & G) Ficus racemosa (F) Piper sp (I) Debregeasia orientalis

Figure 89: Some common species recorded in AR006: (A) Sida rhombifolia (B) Pueraria tuberosa (C & D) Dioscorea sp (E) Neonauclea sessilifolia (F) Sterculia villosa (G) Pityrogramma calomelanos (H) Callicarpa arborea (I) Glochidion sp (J) Passiflora foetida.

Figure 90 : (A)-(B) Clumps of Bambusa tulda (C) Hoya parasitica (D) Drynaria sp (E) Aerides odorata (F) Cymbidium aloifolium (G) Rhyncostylis retusa (H) Dendrobium aphyllum

Figure 91 : Some parasitic plants on AR0011: (A) Alangium chinense (B) Mussaenda roxburghii (C) Onychium siliculosum (D) Citrus limon (E) Blechnum orientale

Figure 92 : Some parasitic plants on CD006: (A) Cyperus haspan (B) Persicaria hydropiper (C) Uvaria sp (D) Ficus sp (E) Dioscorea pentaphyla (F) Thunbergia grandiflora (G) Debregeasia orientalis (H) Dioscorea oppositifolia (I) Meremia umbellata.

Figure 93: Some parasitic plants on CD0012: (A) Neolamarckia cadamba (B) Polyalthia simiarum (C) Clausena heptaphylla (D) Mallotus tetracoccus (E) Amorphophallus bulbifer

Figure 94: Some common species of RBP0012: (A) Begonia roxburghii (B) Baccaurea ramiflora (C) Mallotus nudiflorus (D) Mussaenda roxburghii (E) Balakata baccata (F) Ficus auriculata.

Figure 95: Some common species of ANR011Misc. (A) Rhynchospora corymbosa (B) Dalbergia thomsonii (C) Ficus semicordata (D) Dillenia indica (E) Smilax zeylanica (F) Terminalia arjuna.

Figure 96: Some common species of ANR013 Misc. (A) Balakata baccata (B) Amomum Sp (C) Croton caudatus (D) Acronychia pedunculata (E) Ficus benjamina (F) Dalhousiea bracteata

MAJOR FINDINGS OF THE STUDY:

- **Floristic diversity**

We recorded a total of 526 species distributed in trees (35 %), regenerations (37 %) and herbs (28 %) across the different gradients in the study area. Overall 240 tree species under 127 genera and 58 families; 258 regenerations species under 175 genera and 74 families; 195 herb species under 170 genera and 69 families were recorded from the study sites.

- **Miscellaneous plantation**

The most preferable miscellaneous species occurred in AR and ANR plantation (31 species) were *Acacia auriculiformis, Aegle marmelos, Annona reticulata, Annona squamosa, Aquilaria malaccensis, Artocarpus chama, Artocarpus heterophyllus, Averrhoa carambola, Azadirachta indica, Baccaurea ramiflora, Bombax ceiba, Canarium strictum, Dillenia indica, Elaeocarpus floribundus, Flacourtia jangomas, Lagerstroemia speciosa, Litsea glutinosa, Mimusops elengi, Parkia javanica, Peltophorum pterocarpum, Phyllanthus emblica, Psidium guajava, Spondias mombin, Swietenia mahagoni, Syzygium cumini, Syzygium jambos, Tamarindus indica, Tectona grandis, Terminalia arjuna, Terminalia bellirica and Terminalia chebula*.

- **Bamboo plantation**

The most preferable bamboo species planted in RBP, AR and ANR treatments sites (10 species) were *Bambusa tulda, Dendrocalamus longispathus, Melocanna baccifera, Bambusa balcooa, Bambusa bambos, Bambusa cacharensis, Bambusa polymorpha, Bambusa vulgaris, Thyrsostachys oliveri and Schizostachyum dullooa* have been introduced or planted in the different plantation sites.

- **Occurance and utilization of NTFPs**

The richness of herb diversity indicates ecologically importance as well as for the purpose of food plant (NTFPs) and livelihoods. As these sites was abundant with wild edible plants. Most of the local people consumed food plants such as Bamboo shoots (Melocana bacifera, Bambusa tulda etc.), wild edible tubers (Dioscorea sp), edible ferns (Diplazium esculenta), edible inflorescence (Musa acuminata) and many more. Procurement of NTFPs was observed and also being harvested by local in their respective JFMC area, where most of the common species were- Bambusa tulda / Melocanna becifera (Muya), stem pith of Musa accuminata (laiphang), inflorescence of Musa accuminata (Muikhuin), young frond of Diplazium esculenta muikhunchak, stem pith of Alpinia nigra (therai) etc.

OTHER KEY FINDINGS:

- In first phase overall we have studied 22 proposed JFMC plantation sites of South Tripura which was categorized as AR (38%), ANR (37%), CD (17%) RBP (4%) and FS (4%).
- A total diversity of 232 species found in studied JFMC plantation area which are distributed in trees (44%), shrubs & saplings (26%) and herbs (31%) belongs to 35 Tree family, 18 Shrub family and 44 Herb family respectively.
- The highest Tree species was observed in ANR004 (36) followed by AR005 (28) and ANR007 (21).
- The highest Shrub species observed in ANR001 (18), ANR004 (13) and AR007 (12).
- The highest herb species was observed in CD002 (20), ANR004 (17) and AR001 (14).
- Most of the SCATFORM project has aided bamboo plantation from the seasonal year 2019-2020 to 2021-2022.
- The bamboo species selected for the plantation were *Bambusa tudla (Mritingya), Bambusa pallida (Makal), Dendrocalamus longispetus (Rupai) and Bambusa bambos (Kanta bas).*
- Other bamboo species such as Bambusa tulda and Melocanna baccifera was observed in the adjacent forest.
- These bamboo species was common in all the study sites which also they plays an important role to sustain livelihood for the local peoples; for example: dried bamboo sticks were used as fuel, young bamboo shoot used as food, fresh bamboo used for preparing certain dishes (used as bamboo utensil) and also trading of bamboo or using as timber such as fencing, house building etc.

- In second phase overall, field survey was conducted in 18 sites out of 22 assigned JFMC's plantation sites of Gomati district of Tripura which comprises AR (39%), ANR (17%), CD (33%) and RBP (11%).
- In terms of floral diversity, a total of 181 species found in studied JFMC plantation sites which are distributed in trees (45%), shrubs & saplings (20%) and herbs (35%).
- Comparatively higher tree species was observed in AR0011 (21 species) and RBP0012 (21 species). In case of shrub species, higher species were observed in AR (AR0011) (10 species) and CD003 (17 species). The highest herb species was observed in CD006 (18 species) and RBP0012 (19 species).
- The most preferable bamboo species viz., *Bambusa tudla (Mritingya), Dendrocalamus longispetus (Rupai) and Schizostachyum dullooa* (locally known as Assam bamboo) have been introduced/ planted in the different plantation sites in Gomati district of Tripura. However, during the survey, we have also recorded some locally abundant bamboo species namely Bambusa tulda and Melocanna baccifera in the adjoining part of the plantation sites growing naturally.

- In our previous study conducted in South Tripura district, we have studied 22 assigned plantation sites of which are categorized as AR (38%), ANR (37%), CD (17%) RBP (4%) and FS (4%). A total diversity of 232 species found in studied plantation area which are distributed in trees (44%), shrubs & saplings (26%) and herbs (31%).
- In both the districts (i.e. South and Gomoti), the study sites were well maintained and fencing was observed. Most of the plantation sites visited was established recently i.e. the plantation year of 2021-2022. In both the districts i.e., South and Gomoti district 5 bamboo species namely *Bambusa tudla (Mritingya), Bambusa pallida (Makal), Dendrocalamus longispetus (Rupai), Bambusa bambos (Kanta bas) and Schizostachyum dullooa (Assam bamboo)* was observed.
- For livelihood options both plantations sites and adjacent forest area plays an important role for the local inhabitants in terms of bamboo and NTFPs collection. Most preferable and commonly available NTFPs were Muya (Bambusa tulda & Melocanna baciffera) muikhunchak (Diplazium esculenta), Thalik muikhun (inflorescence of Musa acuminata) etc.

- In third phase, overall field survey was conducted in 23 sites of North Tripura out of 29 assigned sites which are categorized into Artificial Regeneration (AR-10 sites), Aided Natural Regenerations (ANR-7 sites) and Check dams (CD-6 sites).
- 2. Study shows a total floral diversity of 226 species distributed in trees (37 %), shrubs (13 %), saplings (15 %) and herbs (35 %). Overall, 97 tree species under 74 genera and 45 family; 34 shrubs species under 29 genera and 20 family; 92 herb species under 82 genera and 48 family were recorded from the study sites.
- 3. Comparatively higher tree species was observed in ANR and AR study sites whereas the lowest was observed in CD. Herbs are basically predominant in the Check dams and least observed in the plantation sites (AR, ANR).
- 4. The most preferable miscellaneous species occurred in AR and ANR plantation (15 species) were Parkia javanica, *Aquilaria malaccensis, Artocarpus heterophyllus, Terminalia arjuna, Dillenia indica, Phyllanthus emblica, Tamarindus indica, Swietenia mahagoni, Terminalia bellirica, Aegle marmelos, Oroxylum indicum, Elaeocarpus floribundus, Syzygium cumini, Spondias mombin and Averrhoa carambola*.
- 5. Common bamboo species associated with AR and ANR plantation are Bambusa pallida, Bambusa tulda and Schizostachyum dullooa have been introduced/ planted in the different plantation sites.
- 6. Data analysis of transect oriented data revealed maximum number of tree species encountered in AR011 (28 species) whereas, diversity index estimated maximum in AR005 (3.02). However, dominance index of species association show maximum in CD-MII004 (1.00). In case of natural regeneration, maximum number of taxa recorded in ANR010, AR001 & AR008 (14 species) and whereas, maximum diversity and dominance index estimated in ANR010 (2.41) CD-MII007 (1.00) respectively. Maximum

number of herb species and diversity index was recorded in AR001 whereas; maximum dominance index of herb species across the study sites was recorded in CD-MII 007.

- In Fourth phase, overall field surveys were conducted in 17 sites of Unakoti District of Tripura out of 28 assigned sites which are categorized into Artificial Regeneration (AR-6 sites), Aided Natural Regenerations (ANR-6 sites) and Check dams (CD-5 sites).
- Study shows a total of 194 species distributed in trees (30%), shrubs (14 %), saplings (16%) and herbs (40%). Overall 67 tree species under 54 genera and 27 family; 32 shrubs species under 29 genera and 16 family; 35 tree sapling species under 33 genera and 22 family; 88 herb species under 79 genera and 36 family were recorded from the study sites.
- Comparatively higher Tree species was observed in AR 014 (31 species) and AR 018 (24 species). The highest Shrub species observed in AR 014 (8 species) and AR 021 (7 species). The highest tree sapling observed in AR 017 (17 species) and AR 020 (12 species). The highest herb species was observed in C-II 021 (26 species) and C-II 017 (25 species)
- The most preferable miscellaneous species occurred in AR and ANR plantation (13 species) were *Syzygium jambos, Acacia auriculiformis, Parkia javanica, Aquilaria malaccensis, Tamarindus indica, Terminalia bellirica, Phyllanthus emblica, Dillenia indica, Azadirachta indica, Elaeocarpus floribundus, Aegle marmelos, Syzygium cumini and Artocarpus heterophyllus.*
- Common bamboo species associated with AR and ANR plantation are Bambusa tulda and Dendrocalamus longispathus have been introduced/ planted in the different plantation sites
- Statistical analysis shows the following results:
- Tree- Highest taxa occurred in AR014 (27) and Shannon diversity index occurred in AR014 (2.968). The Simpson dominance index of the studied diversity shows highest in CD MI-016 (0.2266).
- b. Regeneration- Highest taxa occurred in AR017 (26) and Shannon diversity index occurred in AR017 (3.206). The Simpson dominance index of the studied diversity shows highest in CD-MI015 (0.3333).
- c. Herbs- Highest taxa occurred in CD-MII021 (26) and Shannon diversity index of herb species occurred in CD-MII021 (3.258). The Simpson dominance index of the studied diversity shows highest in CD- MI015 (0.2).

SPECIFIC RECOMMENDATIONS:

A. **SPECIFIC RECOMMENDATIONS FOR MANAGEMENT AIDED NATURAL REGENERATION (ANR) PLANTATION SITES:** Managing aided natural regeneration (ANR) plantation sites that are 1-3 years old involves several key tasks to ensure the successful establishment and growth of the regenerated vegetation. ANR is a technique that involves assisting the natural recovery of a degraded area by protecting and enhancing the growth of existing vegetation. Here are some specific recommendations for managing ANR plantation sites in the 1-3 year age range:

- **Weed Control:** Regularly monitor the site for invasive weeds that can compete with the regenerating plants. Control weeds manually by removing them by hand or using appropriate tools to prevent them from outcompeting the desired vegetation.
- **Protection from Grazing:** Erect temporary fencing or install natural barriers to prevent grazing by livestock or browsing by herbivores that could damage the regenerating plants.
- **Soil Erosion Control:** Implement erosion control measures such as mulching, establishing cover crops, or installing erosion control structures to prevent soil erosion and retain moisture in the soil.
- **Watering and Irrigation:** If the site is in a dry area, provide supplementary watering during dry spells to ensure the survival and growth of young plants.
- **Pruning and Thinning:** Prune or thin out competing vegetation that might be shading the young plants and hindering their growth.
- **Disease and Pest Management:** Monitor for any signs of plant diseases or pest infestations and take appropriate measures to manage them if necessary.
- **Regular Monitoring:** Regularly visit the site to assess the progress of natural regeneration, the health of the plants, and any issues that need attention.
- **Education and Community Involvement:** Involve local communities and stakeholders in the management of ANR sites to ensure their continued protection and success. Conduct workshops or awareness programs to educate the community about the importance of ANR and the role they can play in maintaining these sites.
- **Documentation and Reporting:** Maintain records of site visits, activities performed, and observations regarding the progress of the regeneration process. Prepare periodic reports to track the success of the ANR initiative and identify any challenges that need to be addressed.
- **Longterm Management:** Be flexible in your approach and adapt management strategies based on the changing needs of the site and the response of the regenerated vegetation. Remember that ANR is a long-term process, and the success of the project depends on consistent and dedicated management efforts. Collaborate with local experts, conservation organizations, and relevant authorities to ensure the best possible outcomes for the ANR plantation sites.

B. SPECIFIC RECOMMENDATIONS FOR MANAGEMENT ARTIFICIAL REGENERATION (AR) PLANTATION SITES:

Managing artificial regeneration (AR) plantation sites that are 1-3 years old is crucial for ensuring the successful establishment and growth of the planted trees. Artificial regeneration involves planting tree seedlings or saplings in a degraded area to restore the vegetation cover. Here are some specific recommendations for managing AR plantation sites in the 1-3 year age range:

- **Watering and Irrigation:** Provide regular watering to young seedlings, especially during dry periods, to support their establishment and growth.
- **Weed Control:** Monitor the site for weeds that can compete with the planted seedlings for water, nutrients, and sunlight. Implement effective weed control measures such as manual removal or mulching to reduce competition.
- **Protection from Herbivores:** Protect young seedlings from browsing by herbivores (such as Cow and Goat) by installing temporary fencing or other barriers.
- **Pruning and Thinning:** If seedlings are overcrowded, selectively prune or thin them to promote healthy growth and reduce competition among plants.
- **Disease and Pest Management:** Regularly inspect seedlings for signs of diseases or pest infestations and take appropriate measures to control them.
- **Support Structures:** Use support structures like stakes to help young seedlings grow upright and prevent wind-induced damage.
- **Soil Erosion Control:** Implement erosion control measures such as mulching or establishing cover crops to prevent soil erosion and protect seedling roots.
- **Fertilization:** Apply appropriate fertilizers to promote healthy growth if soil tests indicate nutrient deficiencies.
- **Regular Monitoring:** Regularly visit the site to assess the health and growth of the planted seedlings, as well as the overall condition of the site.
- **Education and Community Involvement:** Involve local communities and stakeholders in the management of AR sites to foster a sense of ownership and responsibility. Conduct workshops or training sessions to educate local communities about the importance of AR and their role in site management.
- **Adaptive Management:** Adapt management strategies based on the site's response and changing conditions. Learn from successes and challenges and adjust management practices accordingly.
- **Documentation and Reporting:** Maintain detailed records of planting dates, species, and other relevant information. Prepare periodic reports to track the progress of the AR initiative and share the outcomes with relevant stakeholders.
- **Long-Term Planning:** Consider the long-term goals for the site beyond the 1-3 year range, including plans for thinning, stand management, and eventual canopy closure. Successful management of AR plantation sites requires consistent effort and careful attention to the needs of the young seedlings. Collaborate with forestry experts,

conservation organizations, and local authorities to ensure effective management practices and the long-term success of the restoration project.

C. SPECIFIC RECOMMENDATIONS FOR MANAGEMENT CHEKDAMS (CD) PLANTATION SITES:

Managing chekdam (CD) plantation sites that are 1-3 years old is essential to ensure the successful establishment of vegetation and the overall functionality of the chekdam structure. Chekdams are small check dams built across streams or gullies to control soil erosion and retain water. Here are some specific recommendations for managing chekdam plantation sites in the 1-3 year age range:

- **Weed Control:** Regularly monitor the site for invasive weeds that can compete with planted vegetation. Implement weed control measures such as manual removal or mulching to reduce competition.
- **Vegetation Establishment:** Plant native vegetation, such as grasses, shrubs, and trees, on the chekdam structure and surrounding areas. Ensure proper spacing and adequate coverage of vegetation to stabilize the soil and prevent erosion.
- **Watering and Irrigation:** Provide sufficient watering and irrigation during dry periods to support the establishment of planted vegetation.
- **Soil Erosion Control:** Mulch the area with organic materials to protect the soil surface from erosion and promote water retention.
- **Protection from Grazing Animals:** Erect temporary fencing or barriers to prevent grazing animals from damaging the newly planted vegetation.
- **Pruning and Maintenance:** Prune or trim vegetation as needed to encourage healthy growth and prevent overcrowding.
- **Regular Monitoring:** Regularly visit the site to assess the growth of planted vegetation, the condition of the chekdam structure, and any signs of erosion.
- **Sediment Management:** Monitor the chekdam structure for sediment accumulation and clear it periodically to maintain its effectiveness.
- **Community Involvement:** Engage local communities in the management of chekdam sites to ensure their long-term care and maintenance.
- **Educational Workshops:** Conduct workshops or training sessions for local communities to raise awareness about the importance of chekdams and their role in soil conservation.
- **Adaptive Management:** Modify management strategies based on the site's response and changing conditions. Continuously learn from experiences and adjust practices accordingly.

- **Reporting and Documentation:** Keep detailed records of planting dates, species used, and maintenance activities. Prepare periodic reports to track the progress of vegetation establishment and chekdam functionality.
- **Long-Term Planning:** Consider the long-term goals for the chekdam site, including plans for vegetation maintenance and possible expansion of the structure.
- **Coordinated Efforts**: Coordinate with relevant government agencies, conservation organizations, and local communities to ensure effective management and maintenance. By following these recommendations, you can help ensure the successful establishment of vegetation on chekdam structures, contribute to soil conservation efforts, and enhance the overall effectiveness of the chekdams in controlling erosion and retaining water.

D. SPECIFIC RECOMMENDATIONS FOR MANAGEMENT RIVER BANKS (RB) OR FILTE STRIP (FS) PLANTATION SITES:

Managing river banks (RB) or filter strip (FS) plantation sites that are 1-3 years old is crucial for stabilizing river banks, controlling erosion, and enhancing the ecological health of water bodies. River banks and filter strips are vegetated areas along the edges of rivers or water bodies that help filter pollutants and reduce soil runoff. Here are specific recommendations for managing such sites:

- **Weed Control:** Regularly monitor the site for invasive weeds and promptly remove them to reduce competition with planted vegetation. Mulch the area to suppress weed growth and retain soil moisture.
- **Plant Selection:** Choose native plant species that are well-suited for the site's soil and hydrological conditions. Select a mix of grasses, shrubs, and trees to provide diverse vegetation cover.
- **Spacing and Density:** Ensure proper spacing and planting density to achieve effective soil stabilization and erosion control. Plant densely in areas prone to erosion to enhance root binding and prevent bank collapse.
- **Watering and Irrigation:** Provide supplemental watering during dry periods to support establishment. Consider using drip irrigation or soaker hoses for efficient water delivery.
- **Soil Erosion Prevention:** Plant species with deep root systems to stabilize the soil and prevent erosion. Incorporate erosion-control mats or jute netting in vulnerable areas.
- **Mulching:** Apply organic mulch around newly planted vegetation to protect the soil from erosion, retain moisture, and reduce weed growth.
- **Protection from Erosion:** Erect temporary fencing or bio-logs to shield newly planted areas from strong currents and wave action.
- **Habitat Enhancement:** Include plant species that provide habitat and food sources for local wildlife, birds, and aquatic organisms.

- **Regular Maintenance:** Prune and trim vegetation as needed to promote healthy growth and prevent overgrowth. Monitoring: Regularly monitor the site to assess plant growth, erosion rates, and changes in hydrological conditions.
- **Sediment Management:** Clear sediment buildup in the river channel to maintain water flow and prevent excess sedimentation.
- **Community Involvement:** Involve local communities in the care and maintenance of river banks and filter strips.
- **Educational Initiatives:** Organize workshops, training, and awareness programs for local communities on the importance of river bank vegetation and water quality.
- **Adaptive Management:** Adjust management practices based on site feedback and changing conditions. Learn from successes and challenges and refine strategies accordingly.
- **Record Keeping**: Document planting dates, species used, and maintenance activities for future reference. Prepare periodic reports on vegetation growth and site condition.
- **Coordination:** Collaborate with environmental agencies, conservation organizations, and community groups to ensure coordinated management efforts. By implementing these recommendations, you can help establish resilient vegetation on river banks and filter strips, promote soil conservation, enhance water quality, and contribute to the overall health of river ecosystems.

Annexure-I

CHECKLIST OF TREE SPECIES IN ALL PLANTATION SITES

TREE SPECIES	Family	Plantation Type	District
Acacia auriculiformis A.Cunn. ex Benth.	Fabaceae	ANR AR	Khowai Sepahijala Unakoti West
Acacia sp	Fabaceae	ANR AR	Gomati West
Acronychia pedunculata Miq.	Rutaceae	AR	North
Actinodaphne obovata (Nees) Blume	Lauraceae	AR RBP	Gomati Unakoti
Adenanthera pavonina L.	Fabaceae	ANR	South
Aegle marmelos (L.) Corrêa	Rutaceae	ANR AR	North South Unakoti
Aglaia spectabilis (Miq.) S.S.Jain & Bennet	Meliaceae	AR CD	Khowai North Sepahijala
Alangium chinense (Lour.) Harms	Cornaceae	ANR AR CD RBP	Gomati Khowai North Sepahijala South Unakoti
Albizia chinensis (Osbeck) Merr.	Fabaceae	ANR AR CD	Gomati Khowai North Sepahijala
Albizia julibrissin Durazz.	Fabaceae	ANR AR	Gomati Unakoti
Albizia lebbeck (L.) Benth.	Fabaceae	ANR AR CD	South Unakoti West
Albizia procera (Roxb.) Benth.	Fabaceae	ANR AR CD CD RBP	Gomati Khowai North Sepahijala South Unakoti West
Albizia umbrosa (Wall.) Benth.	Fabaceae	ANR	South
Allophylus serratus (Hiern) Kurz	Sapindaceae	ANR	South
Alstonia scholaris (L.) R. Br.	Apocynaceae	ANR AR RBP	Gomati Khowai Sepahijala South
Angiopteris evecta (G.Forst.) Hoffm.	-	CD	North
Annona reticulata L.	Annonaceae	AR	Khowai
Annona squamosa L.	Annonaceae	AR	West
Aphanamixis polystachya (Wall.) R.Parker	Meliaceae	ANR	Khowai South
Aporosa octandra (Buch.-Ham. ex D.Don)	Phyllanthaceae	ANR	South
Aquilaria malaccensis Lam.	Thymelaeaceae	ANR AR	Gomati North Sepahijala Unakoti West
Areca catechu L.	Arecaceae	ANR AR CD RBP	Gomati North South Unakoti
Artocarpus chama Buch.-Ham.	Moraceae	ANR AR CD RBP	Gomati Khowai North Sepahijala Unakoti
Artocarpus heterophyllus Lam.	Moraceae	ANR AR CD	Gomati Khowai North Sepahijala South Unakoti West
Artocarpus lacucha Buch.-Ham.	Moraceae	ANR AR CD	Gomati Khowai North Sepahijala South Unakoti
Averrhoa carambola L.	Oxalidaceae	AR CD	Khowai North
Azadirachta indica A.Juss.	Meliaceae	ANR AR	Unakoti
Baccaurea ramiflora Lour.	Phyllanthaceae	AR	Khowai North
Balakata baccata (Roxb.) Esser	Euphorbiaceae	ANR AR	North Sepahijala Unakoti
Bambusa balcooa Roxb.	Poaceae	ANR AR CD	North Sepahijala
Bambusa cacharensis R.B.Majumdar	Poaceae	AR CD	Sepahijala
Bambusa nutans Wall. ex Munro	Poaceae	ANR AR	Khowai North Sepahijala South
Bambusa polymorpha Munro	Poaceae	ANR AR CD	Sepahijala
Bambusa sp	Poaceae	AR	Gomati

Bambusa tulda Roxb.	Poaceae	ANR AR CD CD CD RBP	Gomati Khowai North Sepahijala South Unakoti West
Bambusa vulgaris Nees	Poaceae	ANR AR CD CD	Khowai North Sepahijala South
Bauhinia acuminata L.	Fabaceae	ANR AR CD	Khowai Sepahijala West
Bauhinia variegata L.	Fabaceae	ANR	Sepahijala
Bischofia javanica Blume	Phyllanthaceae	ANR AR	North Sepahijala Unakoti
Boehmeria macrophylla Hornem.	Urticaceae	RBP	Gomati
Bombax ceiba L.	Malvaceae	ANR AR CD	Gomati Khowai North South Unakoti
Borassus flabellifer L.	Arecaceae	ANR	West
Brachypterum robustum (Roxb. ex DC.) Dalzell & A.Gibson	Fabaceae	ANR AR CD	Gomati Khowai North South Unakoti West
Brassaiopsis glomerulata (Blume) Regel	Araliaceae	AR	Khowai
Brassaiopsis griffithii C.B.Clarke	Araliaceae	AR CD CD RBP	Gomati Khowai North South
Bridelia assamica Hook.f.	Phyllanthaceae	ANR AR	Khowai West
Bridelia retusa (L.) A.Juss.	Phyllanthaceae	ANR AR	North Sepahijala South Unakoti
Bridelia tomentosa Blume	Phyllanthaceae	ANR AR	Gomati Khowai Sepahijala South West
Butea monosperma (Lam.) Kuntze	Fabaceae	ANR AR	Unakoti
Caesalpinia bonduc (L.) Roxb.	Fabaceae	ANR RBP	Gomati South
Callicarpa arborea Roxb.	Lamiaceae	ANR AR CD CD CD RBP	Gomati Khowai North Sepahijala South Unakoti West
Callicarpa longifolia Lam.	Lamiaceae	ANR	West
Carallia brachiata (Lour.) Merr.	Lamiaceae	ANR	South
Careya arborea Roxb.	Rhizophoraceae	ANR AR CD	Khowai Sepahijala West
Carica papaya L.	Lecythidaceae	ANR	South
Caryota urens L.	Caricaceae	ANR AR RBP	Gomati Khowai North Sepahijala South Unakoti
Cassia fistula L.	Arecaceae	ANR AR	North Sepahijala West
Cassia javanica subsp. renigera (Wall. ex Baker) K.Larsen	Fabaceae	AR	Unakoti
Castanopsis indica (Roxb. ex Lindl.) A.DC.	Fabaceae	ANR AR	North Sepahijala South
Ceiba pentandra (L.) Gaertn.	Fagaceae	ANR AR	Gomati Khowai North Unakoti
Celastrus paniculatus Willd.	Malvaceae	ANR	Sepahijala
Chaetocarpus castanicarpus (Roxb.) Thwaites	-	ANR AR CD	Khowai North Sepahijala South West
Citrus maxima (Burm.) Merr.	Peraceae	AR	Gomati South
Cordia dichotoma G.Forst.	Rutaceae	AR	Sepahijala
Cynometra polyandra Roxb.	Boraginaceae	AR	Khowai
Dalbergia sissoo Roxb. ex DC.	Fabaceae	ANR	North
Dalbergia volubilis Roxb.	Fabaceae	AR	Sepahijala
Dalhousiea bracteata (Roxb.) Graham ex Benth.	Fabaceae	AR	North Unakoti
Delonix regia (Bojer ex Hook.) Raf.	Fabaceae	ANR	Sepahijala
Dendrocalamus longispathus (Kurz) Kurz	Fabaceae	ANR AR RBP	Gomati North Sepahijala South Unakoti
Dillenia indica L.	Poaceae	ANR AR CD	Gomati North Sepahijala South Unakoti West
Dillenia pentagyna Roxb.	Dilleniaceae	ANR AR CD	Gomati Khowai North

		RBP	Sepahijala South Unakoti West
Dillenia scabrella Roxb.	Dilleniaceae	AR	Unakoti
Dipterocarpus turbinatus C.F.Gaertn.	Dilleniaceae	ANR AR	Khowai North Sepahijala
Duabanga grandiflora (Roxb. ex DC.) Walp.	Dipterocarpaceae	ANR AR RBP	Gomati South
Elaeocarpus floribundus Blume	-	ANR AR CD	Khowai North Sepahijala South Unakoti
Elaeocarpus robustus Roxb.	Elaeocarpaceae	AR	Unakoti
Elaeocarpus sp	Elaeocarpaceae	ANR	Sepahijala South
Engelhardia spicata Lechen ex Blume	Elaeocarpaceae	ANR	North
Entada phaseoloides (L.) Merr.	Juglandaceae	AR	South
Erythrina sp	Fabaceae	ANR AR	Gomati North West
Erythrina variegata L.	Fabaceae	ANR AR	Khowai
Eurya acuminata DC.	Fabaceae	ANR	North
Ficus auriculata Lour.	Pentaphylacaceae	ANR AR CD CD	Gomati Khowai North Sepahijala South
Ficus benjamina L.	Moraceae	AR	Khowai Sepahijala
Ficus geniculata Kurz	Moraceae	AR	Khowai
Ficus glandulifera (Wall. ex Miq.) King	Moraceae	CD	North
Ficus heteropleura Blume	Moraceae	AR	Sepahijala
Ficus hirta Vahl	Moraceae	CD CD RBP	Gomati Unakoti
Ficus hispida L.f.	Moraceae	ANR AR CD CD CD RBP	Gomati Khowai North Sepahijala South Unakoti West
Ficus lamponga Miq.	Moraceae	AR CD	Sepahijala
Ficus microcarpa L.f.	Moraceae	AR CD	Khowai North Sepahijala
Ficus nervosa Roth	Moraceae	ANR AR CD	Khowai North Unakoti
Ficus prostrata (Wall. ex Miq.) Buch.-Ham. ex Miq	Moraceae	AR CD	Gomati Khowai
Ficus racemosa L.	Moraceae	ANR AR CD CD RBP	Gomati Khowai North Sepahijala South
Ficus religiosa L.	Moraceae	AR	West
Ficus rumphii Blume	Moraceae	AR	Khowai
Ficus semicordata Buch.-Ham. ex Sm.	Moraceae	ANR AR CD CD CD RBP	Gomati Khowai North Sepahijala South Unakoti
Ficus variegata Blume	Moraceae	AR CD	Khowai Sepahijala
Firmiana colorata (Roxb.) R.Br.	Moraceae	ANR AR CD	Khowai North Sepahijala South West
Flacourtia jangomas (Lour.) Raeusch.	Malvaceae	AR	Khowai
Garcinia cowa Roxb.	-	ANR AR	Khowai Sepahijala South
Gardenia resinifera Roth	Clusiaceae	ANR AR CD	Khowai Sepahijala South West
Garuga pinnata Roxb.	Rubiaceae	ANR CD	North South
Glochidion multiloculare (Roxb. ex Willd.) Voigt	Burseraceae	ANR AR	Sepahijala South
Glochidion sp	Phyllanthaceae	ANR AR	West
Glochidion zeylanicum (Gaertn.) A.Juss.	Phyllanthaceae	ANR CD	Khowai Sepahijala
Gmelina arborea Roxb.	Phyllanthaceae	ANR AR CD CD	Gomati Khowai North Sepahijala South Unakoti West
Grewia acuminata Juss.	-	ANR	Unakoti
Grewia serratula Baill.	Malvaceae	AR	Unakoti
Grewia sp	Malvaceae	ANR	West

Gymnosphaera gigantea (Wall. ex Hook.) S.Y.Dong	Cyatheaceae	AR CD	Khowai Unakoti
Hevea brasiliensis (Willd. ex A.Juss.) Müll.Arg.	Moraceae	ANR CD	Gomati West
Holarrhena pubescens Wall. ex G.Don	Apocynaceae	ANR AR CD CD CD	Gomati Khowai North Sepahijala South Unakoti West
Horsfieldia amygdalina (Wall.) Warb.	Myristicaceae	ANR	North
Hymenodictyon orixense (Roxb.) Mabb.	Rubiaceae	ANR AR	Khowai North Sepahijala Unakoti West
Knema malayana Warb.	-	ANR AR	South
Lagerstroemia parviflora Roxb.	Lythraceae	ANR AR CD CD	Khowai North Sepahijala South West
Lagerstroemia speciosa Pers.	Lythraceae	AR	North
Lannea coromandelica (Houtt.) Merr.	Anacardiaceae	ANR AR CD CD	Gomati Khowai North Sepahijala Unakoti
Lepisanthes rubiginosa (Roxb.) Leenh.	Sapindaceae	ANR AR	Khowai Sepahijala
Litsea glutinosa (Lour.) C.B.Rob.	Lauraceae	ANR AR CD	Gomati Khowai North Sepahijala South Unakoti West
Litsea monopetala (Roxb.) Pers.	Lauraceae	ANR AR CD CD RBP	Gomati Khowai North Sepahijala South Unakoti West
Macaranga denticulata (Blume) Müll.Arg.	Euphorbiaceae	ANR AR CD CD CD	Gomati Khowai North Sepahijala South Unakoti
Macropanax undulatus (Wall. ex G.Don) Seem.	Araliaceae	RBP	Gomati
Maesa indica (Roxb.) Sweet	Primulaceae	ANR AR	North West
Maesa ramentacea (Roxb.) A.DC.	Primulaceae	AR	Sepahijala
Magnolia champaca (L.) Baill. ex Pierre	Magnoliaceae	CD	Gomati
Magnolia pterocarpa Roxb.	Magnoliaceae	CD	North
Mallotus nudiflorus (L.) Kulju & Welzen	Euphorbiaceae	ANR AR RBP	Gomati Sepahijala South
Mallotus philippensis (Lam.) Müll.Arg	Euphorbiaceae	ANR AR CD	Khowai Sepahijala South Unakoti West
Mallotus roxburghianus Müll.Arg.	Euphorbiaceae	ANR AR	North
Mallotus tetracoccus (Roxb.) Kurz	Euphorbiaceae	ANR AR CD CD RBP	Gomati Khowai North Sepahijala South Unakoti
Mangifera indica L.	Anacardiaceae	ANR AR	Gomati Sepahijala South
Mangifera sylvatica Roxb.	Anacardiaceae	CD	Khowai Sepahijala
Markhamia stipulata (Wall.) Seem.	Bignoniaceae	ANR CD	Sepahijala South
Melia azadirachta L.	Meliaceae	ANR AR CD	Khowai Sepahijala West
Melocanna baccifera (Roxb.) Kurz	Poaceae	ANR AR CD CD CD RBP	Gomati Khowai North Sepahijala South Unakoti West
Microcos paniculata L.	Malvaceae	ANR AR CD CD	Khowai North Sepahijala South West
Micromelum integerrimum (Buch.-Ham. ex DC.) Wight & Arn. ex M. Roem.	Rutaceae	CD	Gomati
Mimusops elengi Bojer	Sapotaceae	ANR AR	South
Mitragyna rotundifolia (Roxb.) Kuntze	Rubiaceae	ANR AR CD CD	Gomati Khowai North Sepahijala South Unakoti West
Moringa oleifera Lam.	Moringaceae	AR	Unakoti
Neolamarckia cadamba (Roxb.) Bosser	Rubiaceae	AR CD	Gomati North
Neolitsea zeylanica (Nees & T. Nees) Merr.	Lauraceae	ANR	South
Olax acuminata Wall. ex Benth.	Olacaceae	CD	Sepahijala
Oreocnide integrifolia (Gaudich.) Miq.	Urticaceae	AR CD CD	Khowai North Sepahijala South

			Unakoti
Oroxylum indicum (L.) Kurz	Bignoniaceae	ANR AR CD CD CD	Gomati Khowai North Sepahijala South Unakoti
Parkia javanica (Lam.) Merr.	Fabaceae	ANR AR	North Unakoti West
Peltophorum pterocarpum (DC.) Backer ex K.Heyne	Fabaceae	ANR	Sepahijala
Phyllanthus emblica L.	Phyllanthaceae	ANR AR CD	Khowai North Sepahijala South Unakoti West
Pongamia pinnata (L.) Pierre	Fabaceae	ANR AR	Gomati South
Protium serratum Engl.	Burseraceae	ANR AR	Khowai North Sepahijala
Psidium guajava L.	Myrtaceae	AR	West
Psidium guineense Sw.	Myrtaceae	AR	South
Pterospermum acerifolium (L.) Willd.	Malvaceae	ANR AR CD CD RBP	Gomati Khowai North Sepahijala South Unakoti
Pterospermum lanceifolium Roxb.	Malvaceae	ANR	Khowai South West
Pterospermum paniculatum Roxb.	Malvaceae	CD	Gomati
Sapium baccatum Roxb.	Euphorbiaceae	ANR	West
Saraca asoca (Roxb.) Willd.	Fabaceae	ANR AR CD CD	Khowai Sepahijala South Unakoti
Saurauia roxburghii Wall.	-	CD	North
Schima wallichii (DC.) Choisy	Theaceae	ANR AR CD	Gomati Khowai North Sepahijala South Unakoti
Schizostachyum dullooa (Gamble) R.B.Majumdar	Poaceae	AR	North
Senna siamea (Lam.) H.S.Irwin & Barneby	Fabaceae	ANR AR CD RBP	Gomati Khowai North Sepahijala West
Shorea robusta C.F.Gaertn.	Dipterocarpaceae	ANR AR CD	Khowai Sepahijala South West
Spatholobus parviflorus (Roxb. ex G.Don) Kuntze	Fabaceae	ANR AR CD	Gomati Khowai Sepahijala South Unakoti
Spondias mombin L.	Anacardiaceae	AR	North
Spondias pinnata (L.f.) Kurz	Anacardiaceae	ANR AR	North Sepahijala Unakoti
Sterculia lanceolata Cav.	Malvaceae	AR CD	Gomati Unakoti
Sterculia villosa Roxb.	Malvaceae	ANR AR CD CD CD	Gomati Khowai North Sepahijala South Unakoti West
Stereospermum tetragonum DC.	Bignoniaceae	ANR AR CD CD CD RBP	Gomati Khowai North Sepahijala South Unakoti West
Streblus asper Lour.	Moraceae	ANR AR CD	Khowai Sepahijala South Unakoti West
Suregada multiflora (A.Juss.) Baill.	Euphorbiaceae	ANR AR	Khowai North Sepahijala
Swietenia mahagoni (L.) Jacq.	Meliaceae	ANR AR	Gomati North Sepahijala Unakoti West
Syzygium cumini (L.) Skeels	Myrtaceae	ANR AR CD CD RBP	Gomati Khowai North Sepahijala South Unakoti West
Syzygium jambos (L.) Alston	Myrtaceae	ANR AR	Gomati Sepahijala Unakoti
Syzygium nervosum A.Cunn. ex DC.	Myrtaceae	ANR AR CD	Gomati Khowai North Sepahijala South West
Tamarindus indica L.	Fabaceae	ANR AR	Gomati North South Unakoti
Tectona grandis L.f.	Lamiaceae	ANR AR CD CD CD RBP	Gomati Khowai North Sepahijala South Unakoti West
Terminalia arjuna (Roxb. ex DC.) Wight & Arn.	Combretaceae	ANR AR	Khowai North Sepahijala South Unakoti West
Terminalia belirica Wall.	Combretaceae	ANR AR CD	Gomati Khowai North

			Sepahijala South Unakoti West
Terminalia chebula Retz.	Combretaceae	ANR AR CD	Gomati North Sepahijala West
Terminalia phillyreifolia (Van Heurck & Müll.Arg.) Gere & Boatwr.	Combretaceae	ANR AR CD CD CD RBP	Gomati Khowai North Sepahijala South Unakoti West
Tetrameles nudiflora R.Br.	-	ANR	Sepahijala
Thyrsostachys oliveri Gamble	Poaceae	ANR AR CD	Khowai Sepahijala West
Toona ciliata M.Roem.	Meliaceae	ANR AR CD CD CD RBP	Gomati Khowai North South Unakoti West
Trema orientalis (L.) Blume	Cannabaceae	ANR AR CD CD CD RBP	Gomati Khowai North Sepahijala South Unakoti West
Vitex altissima L.f.	Lamiaceae	AR	North
Vitex peduncularis Wall.	Lamiaceae	ANR AR CD	Gomati Khowai North Sepahijala Unakoti West
Zanthoxylum rhetsa (Roxb.) DC.	Rutaceae	ANR AR	Sepahijala West
Ziziphus jujuba Mill.	Rhamnaceae	ANR	West
Ziziphus mauritiana Lam.	Rhamnaceae	AR	Khowai
Ziziphus oenopolia (L.) Mill.	Rhamnaceae	ANR	Sepahijala
Ziziphus rugosa Lam.	Rhamnaceae	ANR AR	Khowai South
Ziziphus xylopyrus (Retz.) Willd.	Rhamnaceae	ANR AR	Khowai West

Annexure-II

CHECKLIST OF PLANTS (SEEDLINGS, SHRUBS, CLIMBERS) IN REGENERATION PLOTS:

REGENERATION SPECIES	Family	Plantation Type	District	Habit
Abelmoschus moschatus Medik.	Malvaceae	ANR AR CD	Khowai South	Shrub
Acacia auriculiformis A.Cunn. ex Benth.	Fabaceae	ANR AR	Khowai Sepahijala Unakoti	Bamb/Misc Sapling
Achyranthes aspera L.	Amaranthaceae	ANR AR	Khowai Unakoti	Shrub
Acmella paniculata (Wall. ex DC.) R.K.Jansen	Compositae	CD	Gomati	Shrub
Adenanthera pavonina L.	fabaceae	ANR	South	Bamb/Misc
Aegle marmelos (L.) Corrêa	Rutaceae	ANR AR	North Unakoti	Bamb/Misc
Alangium chinense (Lour.) Harms	Cornaceae	ANR AR	North Unakoti	Sapling
Albizia julibrissin Durazz.	Fabaceae	ANR	North	Sapling
Albizia procera (Roxb.) Benth.	Fabaceae	ANR AR	North South Unakoti	Sapling
Allophylus serratus (Hiern) Kurz	Sapindaceae	ANR AR CD	Khowai Sepahijala South	Shrub Sapling
Alstonia scholaris (L.) R.Br.	Apocynaceae	ANR CD	North Sepahijala West	Sapling
Ampelocissus barbata Planch.	Vitaceae	ANR AR	North Sepahijala Unakoti	climb
Anisomeles indica (L.) Kuntze	-	AR	Khowai	Shrub
Annona reticulata L.	Annonaceae	ANR AR	Khowai	Bamb/Misc Sapling
Annona squamosa L.	Annonaceae	AR	West	Bamb/Misc
Anogeissus acuminata (Roxb. ex DC	Combretaceae	ANR AR CD CD	Gomati Khowai South Unakoti	Sapling
Antidesma bunius (L.) Spreng.	Phyllanthaceae	AR	North	Sapling
Antidesma montanum Blume	Phyllanthaceae	ANR	North	Sapling
Antidesma roxburghii Wall. ex Tul.	Phyllanthaceae	ANR	North	Sapling
Aphanamixis polystachya (Wall.)	Meliaceae	AR	South	Sapling
Aquilaria malaccensis Lam.	Thymelaeaceae	ANR AR	Khowai North Sepahijala Unakoti West	Bamb/Misc Sapling
Ardisia colorata G.Lodd.	Primulaceae	AR	Khowai	Sapling
Ardisia paniculata Roxb	Primulaceae	ANR	Gomati South	Shrub Sapling
Argyreia cymosa Sweet	Convolvulaceae	ANR	Sepahijala	climb
Argyreia nervosa (Burm.f.) Bojer	Convolvulaceae	ANR AR	Gomati Sepahijala	climb
Aristolochia acuminata L.	Aristolochiaceae	ANR	Unakoti	climb
Artocarpus chama Buch.-Ham.	Moraceae	ANR AR CD	Khowai North West	Bamb/Misc Sapling
Artocarpus heterophyllus Lam.	Moraceae	ANR AR	Khowai North Sepahijala Unakoti West	Bamb/Misc Sapling
Artocarpus lacucha Buch.-Ham.	Moraceae	ANR AR	Khowai Sepahijala	Bamb/Misc Sapling
Azadirachta indica A.Juss.	Meliaceae	AR	Unakoti	Bamb/Misc
Baccaurea ramiflora Lour.	Phyllanthaceae	ANR AR	Khowai North West	Bamb/Misc

Balakata baccata (Roxb.) Esser	Euphorbiaceae	AR	Khowai	Sapling
Bambusa balcooa Roxb.	Poaceae	ANR	North Sepahijala	Bamb/Misc
Bambusa bambos (L.) Voss	Poaceae	ANR AR	Khowai	Bamb/Misc
Bambusa nutans Wall. ex Munro	Poaceae	ANR AR	North Sepahijala South	Bamb/Misc
Bambusa pallida Munro	Poaceae	ANR	South	Bamb/Misc
Bambusa polymorpha Munro	Poaceae	ANR AR	Khowai Sepahijala	Bamb/Misc
Bambusa tulda Roxb.	Poaceae	ANR AR	Gomati Khowai North Sepahijala South Unakoti West	Bamb/Misc Sapling
Bauhinia acuminata L.	Fabaceae	ANR AR	Khowai South	Sapling
Bauhinia variegata L.	Fabaceae	ANR AR	North Sepahijala	Sapling
Blumea lacera (Burm.f.) DC.	Asteraceae	ANR	South	Shrub
Boehmeria holosericea Blume	Urticaceae	AR	Khowai	Shrub
Boehmeria macrophylla Hornem.	Urticaceae	CD RBP	Gomati	Shrub
Boehmeria penduliflora Wedd. ex	Urticaceae	ANR AR CD	Khowai North Sepahijala	Shrub
Boehmeria virgata (G.Forst.) Guill.	Urticaceae	ANR CD	North Unakoti	Shrub
Bombax ceiba L.	Malvaceae	ANR AR	Unakoti West	Bamb/Misc Sapling
Brassaiopsis griffithii C.B.Clarke	Araliaceae	AR CD	Gomati Khowai North	Sapling
Breynia fruticosa (L.) Müll.Arg.	Phyllanthaceae	ANR	North Sepahijala	Shrub Sapling
Breynia retusa (Dennst.) Alston	Phyllanthaceae	ANR AR	North Sepahijala South	Sapling
Bridelia ferruginea Benth.	Phyllanthaceae	ANR	West	Sapling
Bridelia micrantha (Hochst.) Baill.	Phyllanthaceae	AR	West	Sapling
Bridelia montana (Roxb.) Willd.	Phyllanthaceae	ANR AR CD	Khowai North Sepahijala	Shrub Sapling
Bridelia retusa (L.) A.Juss	Phyllanthaceae	ANR AR CD	Khowai North Sepahijala Unakoti West	Sapling
Bridelia sp	-	AR	West	Sapling
Bridelia stipularis (L.) Blume	-	ANR	South	Sapling
Byttneria pilosa Roxb.	Malvaceae	ANR AR	North Sepahijala South West	Bamb/Misc climb
Calamus erectus Roxb.	Arecaceae	ANR	Khowai	Sapling
Calamus rotang L.	Arecaceae	ANR AR	North	Sapling
Callicarpa arborea Roxb.	Lamiaceae	ANR AR CD	Khowai North South Unakoti West	Shrub Sapling
Callicarpa longifolia Lam.	Lamiaceae	ANR	West	Sapling
Calotropis gigantea (L.) W.T.Aiton	Apocynaceae	CD	Gomati	Shrub
Camellia sinensis (L.) Kuntze	Theaceae	AR	Unakoti	Shrub
Camonea umbellata (L.) A.R.Simões	Convolvulaceae	AR	Sepahijala	climb
Canarium strictum Roxb.	Burseraceae	AR	Khowai	Bamb/Misc
Carallia brachiata Merr.	Rhizophoraceae	ANR AR CD	Khowai North Sepahijala South Unakoti	Sapling
Careya arborea Roxb.	Lecythidaceae	ANR AR	Khowai Sepahijala	Sapling
Caryota urens L.	Arecaceae	ANR AR	Khowai North South	Sapling
Cassia fistula L.	Fabaceae	ANR AR CD	Khowai Sepahijala	Shrub Sapling

Ceiba pentandra (L.) Gaertn.	Malvaceae	ANR AR	Khowai Unakoti	Bamb/Misc Sapling
Chaetocarpus castanicarpus (Roxb.)	Peraceae	ANR AR	Khowai South West	Sapling
Chromolaena odorata (L.) R.M.King	Compositae	ANRANR ARAR CD CD CD RBP	Gomati Khowai North Sepahijala South Unakoti West	Shrub Sapling
Cinnamomum bejolghota (Buch.-	Lauraceae	ANR	South	Sapling
Clausena anisata (Willd.) Hook.f.	Rutaceae	ANR AR	West	Shrub
Clausena heptaphylla (Roxb.) Wight	Rutaceae	ANR AR CD CD	Khowai North Sepahijala South Unakoti West	Shrub
Clerodendrum bracteatum Wall.	Lamiaceae	ANR AR CD	North Sepahijala	Shrub
Clerodendrum indicum Kuntze	Lamiaceae	ANR AR	Khowai West	Shrub
Clerodendrum infortunatum L.	Lamiaceae	ANR AR CD CD CD RBP	Gomati Khowai North Sepahijala South Unakoti West	Shrub Sapling
Combretum acuminatum Roxb.	Combretaceae	ANR	Unakoti	Shrub
Combretum punctatum Blume	Combretaceae	ANR AR CD CD RBP	Gomati Khowai North Sepahijala South Unakoti	climb Shrub
Crotalaria pallida Aiton	Fabaceae	ANR CD	Khowai Sepahijala	Shrub
Crotalaria tetragona Roxb. ex	Fabaceae	ANR	Khowai	Shrub
Croton caudatus Geiseler	Euphorbiaceae	ANR AR	Khowai North	Shrub
Cynanchum corymbosum Wight	-	ANR	Khowai	Shrub
Dalbergia rimosa Roxb.	Fabaceae	AR	Khowai	Sapling
Dalbergia thomsonii Benth.	Fabaceae	AR	North	Sapling
Dalbergia volubilis Roxb.	Fabaceae	ANR AR CD	Sepahijala	Sapling
Debregeasia longifolia (Burm.f.)	Urticaceae	AR CD	Gomati Unakoti	Shrub
Debregeasia orientalis C.J.Chen	Urticaceae	CD CD RBP	Gomati	Shrub
Delonix regia (Bojer ex Hook.) Raf.	Fabaceae	ANR	Sepahijala	Bamb/Misc
Dendrocalamus longispathus (Kurz)	Poaceae	ANR AR	Gomati Khowai Sepahijala South Unakoti West	Bamb/Misc Shrub Sapling
Derris robusta (Roxb. ex DC.) Benth.	Fabaceae	ANR AR CD	Khowai North South	Sapling
Desmodium gangeticum (L.) DC.	Fabaceae	ANR AR	Gomati Khowai Sepahijala South Unakoti West	Shrub
Desmodium sp	-	CD	South	Shrub
Desmodium velutinum (Willd.) DC.	Fabaceae	ANR AR	Khowai West	Shrub
Digitaria sp	Poaceae	CD	Gomati	Shrub
Dillenia indica L.	Dilleniaceae	ANR AR	Khowai North Sepahijala Unakoti West	Bamb/Misc Sapling
Dillenia pentagyna Roxb.	Dilleniaceae	ANR AR	Khowai Sepahijala	Sapling
Dioscorea bulbifera L.	Dioscoreaceae	ANR AR	North Sepahijala South	climb
Dioscorea hamiltonii Hook.f.	Dioscoreaceae	ANR AR	Gomati North Sepahijala Unakoti	climb
Dioscorea oppositifolia L.	Dioscoreaceae	AR	North	Bamb/Misc climb
Dioscorea pentaphylla L.	Dioscoreaceae	ANR AR	North Unakoti	climb
Diospyros malabarica (Desr.) Kostel.	-	AR	Khowai	Bamb/Misc

Diplazium peruvianum	Aspleniaceae	CD	Gomati	Shrub
Dracaena reflexa Lam.	Asparagaceae	RBP	Gomati	Shrub
Elaeocarpus floribundus Blume	Elaeocarpaceae	ANR AR	Khowai North Sepahijala South Unakoti West	Bamb/Misc Sapling
Engelhardia spicata Lechen ex	Juglandaceae	AR	North	Sapling
Eranthemum sp	-	ANR	Khowai	Shrub
Erythrina variegata L.	Fabaceae	AR	Khowai	Sapling
Eurya acuminata DC.	Pentaphylacaceae	ANR	Unakoti	Sapling
Ficus auriculata Lour.	Moraceae	AR	Gomati	Sapling
Ficus hirta Vahl	Moraceae	CD	Khowai	Sapling
Ficus hispida L.f.	Moraceae	ANR AR CD CD	Gomati Khowai North Sepahijala South Unakoti	Bamb/Misc Sapling
Ficus rumphii Blume	Moraceae	AR	Khowai	Sapling
Ficus sarmentosa Buch.-Ham. ex	Moraceae	ANR	North	Sapling
Ficus semicordata Buch.-Ham. ex	Moraceae	ANR AR CD	North Sepahijala Unakoti	Sapling
Firmiana colorata (Roxb.) R.Br.	Malvaceae	ANR AR	Khowai Unakoti West	Shrub Sapling
Flacourtia jangomas (Lour.)	-	AR	Khowai	Bamb/Misc
Flemingia stricta Roxb.	Fabaceae	ANR AR CD	Khowai Sepahijala	Shrub
Garcinia cowa Roxb.	Clusiaceae	ANR	West	Bamb/Misc
Gardenia resinifera Roth	Rubiaceae	CD	Sepahijala	Sapling
Glochidion zeylanicum (Gaertn.)	Phyllanthaceae	ANR AR	Khowai North	Shrub Sapling
Gmelina arborea Roxb.	Lamiaceae	AR	North Sepahijala	Sapling
Grona heterocarpos (L.) H.Ohashi &	Fabaceae	ANR AR	Khowai Sepahijala Unakoti	Shrub
Guilandina bonduc L.	Fabaceae	ANR AR	Khowai Sepahijala South	Shrub Sapling
Hibiscus surattensis L.	Malvaceae	ANR AR CD	Khowai South West	Shrub
Holarrhena pubescens Wall. ex	Apocynaceae	ANR AR CD RBP	Gomati Khowai North Sepahijala South Unakoti West	Shrub Sapling
Hymenodictyon orixense (Roxb.)	Rubiaceae	ANR AR CD	Khowai North Sepahijala Unakoti West	Sapling
Hyptis suaveolens (L.) Poit.	Lamiaceae	ANR AR CD CD CD	Gomati Khowai North Sepahijala South Unakoti West	Shrub
Ichnocarpus frutescens (L.)	Apocynaceae	ANR AR	North Sepahijala South Unakoti West	climb
Ipomoea aquatica Forssk.	Convolvulaceae	CD	Gomati	climb
Jatropha gossypiifolia L.	Euphorbiaceae	ANR CD	Sepahijala Unakoti	Shrub
Justicia adhatoda L.	Acanthaceae	ANR	North	Shrub
Justicia gendarussa Burm.f.	Acanthaceae	AR	South	Shrub
Lagerstroemia parviflora Roxb.	Lythraceae	ANR AR CD	Khowai Sepahijala South	Sapling
Lagerstroemia speciosa Pers.	Lythraceae	ANR AR	West	Sapling
Lannea coromandelica (Houtt.)	Anacardiaceae	ANR	Khowai	Sapling
Lantana camara L.	Verbenaceae	ANR AR CD	Khowai North Sepahijala South Unakoti West	Shrub

Leea indica (Burm. f.) Merr	Vitaceae	ANR AR RBP	Gomati Khowai North	Shrub
Leea macrophylla Roxb.	Vitaceae	ANR	North	Shrub
Lepisanthes rubiginosa (Roxb.) Leenh.	Sapindaceae	ANR AR	Khowai	Sapling
Leucas lavandulifolia Sm.	Lamiaceae	ANR	Khowai	Shrub
Litsea glutinosa (Lour.) C.B.Rob.	Lauraceae	ANR AR CD	Gomati Khowai North Sepahijala South Unakoti West	Sapling
Ludwigia adscendens (L.) H.Hara	Onagraceae	CD	Sepahijala	Shrub
Ludwigia octovalvis (Jacq.) P.H.Raven	Onagraceae	CD	Unakoti	Shrub
Lygodium flexuosum (L.) Sw.	Lygodiaceae	ANR AR	Sepahijala	climb
Lygodium japonicum (Thunb.) Sw.	Schizaeaceae	CD	Gomati	Shrub
Macaranga denticulata Müll.Arg.	Euphorbiaceae	ANR AR CD	North Sepahijala South Unakoti West	Sapling
Maesa indica (Roxb.) Sweet	Primulaceae	ANR AR CD	Gomati Khowai North Sepahijala South Unakoti	Shrub Sapling
Maesa ramentacea (Roxb.) A.DC.	Primulaceae	ANR AR	Khowai South	Sapling
Mallotus philippensis (Lam.)	Euphorbiaceae	ANR	Unakoti	Sapling
Mallotus roxburghianus Müll.Arg.	Euphorbiaceae	ANR AR CD	Khowai North Sepahijala	Shrub Sapling
Mallotus tetracoccus Kurz	Euphorbiaceae	ANR AR	North Sepahijala South Unakoti West	Shrub Sapling
Manihot esculenta Crantz	Euphorbiaceae	AR CD CD	Gomati North Unakoti	Shrub
Markhamia stipulata Seem.	Bignoniaceae	CD	Sepahijala	Sapling
Melastoma malabathricum L.	Melastomataceae	ANR AR CD CD RBP	Gomati Khowai North Sepahijala South Unakoti	Shrub Sapling
Melocanna baccifera Kurz	Poaceae	ANR	West	Bamb/Misc
Melochia corchorifolia L.	Malvaceae	AR	Khowai Sepahijala Unakoti	Shrub
Merremia umbellata (L.) Hallier f.	Convolvulaceae	AR CD	South Unakoti	climb
Meyna spinosa Roxb. ex Link	Rubiaceae	ANR AR	Sepahijala Unakoti	Sapling
Microcos hirsuta (Korth.) Burret	Malvaceae	ANR AR	Khowai	Shrub Sapling
Microcos paniculata L.	Malvaceae	ANR AR CD CD RBP	Gomati Khowai North Sepahijala South Unakoti West	Shrub Sapling
Micromelum integerrimum (Roxb. ex DC.)	Rutaceae	ANR AR CD	Khowai North Sepahijala	Shrub
Mikania micrantha Kunth	Asteraceae	CD	Gomati	climb
Mimosa pudica L.	Fabaceae	CD	Gomati	Shrub
Mimosa rubicaulis subsp. himalayana (Gamble) H.Ohashi	Fabaceae	ANR AR CD CD	Khowai North Sepahijala Unakoti	Shrub
Mimusops elengi L.	Sapotaceae	ANR AR	Khowai South	Bamb/Misc
Mitragyna rotundifolia (Roxb.) Kuntze	Rubiaceae	ANR AR CD CD	Gomati Khowai North Sepahijala South Unakoti West	Shrub Sapling
Morinda sp	-	AR	Gomati	Shrub
Mucuna bracteata DC. ex Kurz	Fabaceae	ANR AR	West	climb
Mucuna monosperma Roxb. ex Wight	Fabaceae	ANR	South	climb
Mucuna pruriens (L.) DC.	Fabaceae	ANR AR CD	Gomati North Sepahijala	climb

				Sapling
Mussaenda roxburghii Hook.f.	Rubiaceae	ANR AR CD RBP	Gomati Khowai North South Unakoti	Shrub
Olax acuminata Wall. ex Benth.	Olacaceae	ANR	Sepahijala	Sapling
Oreocnide integrifolia (Gaudich.) Miq.	Urticaceae	ANR CD CD CD	North South	Shrub Sapling
Oroxylum indicum (L.) Benth. ex Kurz	Bignoniaceae	ANR AR CD	Khowai North Sepahijala South Unakoti West	Bamb/Misc Sapling
Parkia javanica (Lam.) Merr.	Fabaceae	ANR AR	Khowai North Sepahijala Unakoti West	Bamb/Misc Sapling
Passiflora foetida L.	Passifloraceae	AR	Sepahijala	climb
Pavetta indica L.	Rubiaceae	ANR AR CD RBP	Gomati Khowai Sepahijala South West	Shrub Sapling
Peltophorum pterocarpum (DC.) Backer ex K.Heyne	Fabaceae	ANR AR	Sepahijala West	Bamb/Misc
Phyllanthus emblica L.	Phyllanthaceae	ANR AR	Khowai North Sepahijala Unakoti West	Bamb/Misc Sapling
Phyllodium pulchellum (L.) Desv.	Fabaceae	ANR AR	Khowai North Sepahijala West	Shrub
Physalis minima L.	Solanaceae	AR CD CD	Khowai North Unakoti	Shrub
Pilea scripta (Buch.-Ham. ex D.Don) Wedd.	Urticaceae	ANR	Unakoti	Shrub
Pleurolobus gangeticus (L.) J.St.-Hil. ex H.Ohashi & K.Ohashi	Fabaceae	AR	Sepahijala Unakoti	Shrub
Pongamia pinnata (L.) Pierre	fabaceae	ANR	South	Bamb/Misc
Premna esculenta Roxb.	Rutaceae	ANR AR CD	Khowai Sepahijala Unakoti	Shrub
Protium serratum Engl.	Burseraceae	AR	North	Sapling
Psidium guajava L.	Myrtaceae	ANR AR	West	Bamb/Misc
Pterospermum acerifolium (L.) Willd.	Malvaceae	ANR AR	Sepahijala South	Sapling
Pterospermum lanceifolium Roxb.	Malvaceae	AR	Khowai	Sapling
Pueraria phaseoloides (Roxb.) Benth.	Fabaceae	AR CD	Gomati Sepahijala	climb
Pueraria tuberosa (Roxb. ex Willd.) DC.	Fabaceae	ANR AR	Gomati North Sepahijala South Unakoti	climb Shrub
Rauvolfia serpentina Benth. ex Kurz	Apocynaceae	ANR AR	Khowai West	Shrub
Ricinus communis L.	Euphorbiaceae	AR CD	Gomati Unakoti	Shrub Sapling
Saraca asoca (Roxb.) Willd.	Fabaceae	ANR AR	Khowai South	Bamb/Misc Sapling
Sarcochlamys pulcherrima (Roxb.) Gaudich.	-	CD	South	Shrub
Saurauia roxburghii Wall.	-	AR	Khowai	Sapling
Schima wallichii (DC.) Choisy	Theaceae	ANR AR	Khowai Sepahijala South Unakoti	Sapling
Schizostachyum dullooa (Gamble) R.B.Majumdar	Poaceae	AR	Khowai North	Bamb/Misc
Senegalia pennata (L.) Maslin	Fabaceae	ANR AR	Khowai Sepahijala	Shrub
Senna alata (L.) Roxb.	Fabaceae	AR	Khowai	Shrub
Senna hirsuta (L.) H.S.Irwin & Barneby	Fabaceae	AR	Khowai	Shrub
Senna siamea (Lam.) H.S.Irwin & Barneby	Fabaceae	RBP	Gomati	Sapling

Senna sophera (L.) Roxb.	Fabaceae	ANR AR	West	Shrub
Senna tora (L.) Roxb.	Fabaceae	ANR AR RBP	Khowai Sepahijala South	Shrub
Shorea robusta C.F.Gaertn.	Dipterocarpaceae	ANR AR	Khowai Sepahijala	Sapling
Sida acuta Burm.f.	Malvaceae	AR	North	Shrub
Sida cordata (Burm.f.) Borss.Waalk.	Malvaceae	ANR AR	Khowai South	Shrub
Sida cordifolia L.	Malvaceae	ANR AR	Khowai Unakoti West	Shrub
Sida mysorensis Wight & Arn.	Malvaceae	AR	South	Shrub
Sida rhombifolia L.	-	ANR AR CD	Khowai North Sepahijala South Unakoti West	Shrub
Smilax glabra Roxb.	Smilacaceae	AR	Sepahijala Unakoti	climb
Smilax zeylanica L.	Smilacaceae	ANR AR	North Sepahijala South Unakoti West	climb
Solanum ferrugineum Jacq.	Solanaceae	CD	Gomati	Shrub
Solanum torvum Sw.	Solanaceae	ANR AR CD CD CD RBP	Gomati Khowai North Sepahijala South Unakoti West	Shrub Sapling
Spatholobus parviflorus (Roxb. ex G.Don) Kuntze	Fabaceae	AR	Khowai Unakoti	Sapling
Spondias pinnata (L.f.) Kurz	Anacardiaceae	ANR AR	North Unakoti	Sapling
Sterculia villosa Roxb.	Malvaceae	ANR AR CD CD	Khowai North Sepahijala Unakoti West	Sapling
Stereospermum tetragonum DC.	Bignoniaceae	ANR AR	Khowai North Unakoti	Sapling
Streblus asper Lour.	Moraceae	ANR AR	Khowai Sepahijala South West	Sapling
Suregada multiflora (A.Juss.) Baill.	Euphorbiaceae	ANR AR CD	Khowai Sepahijala South West	Sapling
Swietenia mahagoni (L.) Jacq.	Meliaceae	ANR AR	Khowai North Unakoti West	Bamb/Misc
Syzygium cumini (L.) Skeels	Myrtaceae	ANR AR	Khowai North Sepahijala South Unakoti West	Bamb/Misc Sapling
Syzygium jambos (L.) Alston	Myrtaceae	ANR AR	Khowai Unakoti	Bamb/Misc
Syzygium nervosum DC.	Myrtaceae	AR	Khowai Sepahijala	Sapling
Syzygium syzygioides (Miq.) Merr. & L.M.Perry	Myrtaceae	ANR	West	Sapling
Tabernaemontana divaricata (L.) R.Br. ex Roem. & Schult.	Apocynaceae	ANR	Sepahijala South	Shrub
Tadehagi triquetrum (L.) H.Ohashi	-	ANR AR	Khowai South	Shrub
Tamarindus indica L.	Fabaceae	ANR AR	Khowai North Unakoti West	Bamb/Misc
Tectona grandis L.f.	Lamiaceae	ANR AR CD CD RBP	Gomati Khowai North Sepahijala South Unakoti West	Sapling
Terminalia arjuna (Roxb. ex DC.) Wight & Arn.	Combretaceae	ANR AR	Khowai North South Unakoti West	Bamb/Misc Sapling
Terminalia bellirica (Gaertn.) Roxb.	Combretaceae	ANR AR	Khowai North Sepahijala South Unakoti West	Bamb/Misc Sapling
Terminalia chebula Retz.	Combretaceae	ANR AR	Khowai North Sepahijala West	Bamb/Misc Sapling
Terminalia phillyreifolia (Van Heurck & Müll.Arg.) Gere & Boatwr.	combretaceae	ANR	Sepahijala	Sapling
Tetrastigma bracteolatum (Wall.)	Vitaceae	AR	Sepahijala	climb

Planch.				
Thunbergia grandiflora (Roxb. ex Rottl.) Roxb.	Acanthaceae	ANR AR CD CD RBP	Gomati North Sepahijala South Unakoti	climb Shrub
Thyrsostachys oliveri Gamble	Poaceae	ANR AR	Khowai Sepahijala	Bamb/Misc
Thysanolaena latifolia Honda	Poaceae	AR	Khowai	Shrub
Tinospora cordifolia (Willd.) Miers ex Hook.f. & Thomson	Menispermaceae	AR	North Unakoti	climb
Tinospora sinensis (Lour.) Merr.	Menispermaceae	ANR CD	Gomati South	climb
Toona ciliata M.Roem.	Meliaceae	ANR AR	Gomati Khowai North South Unakoti	Sapling
Trema orientalis (L.) Blume	Cannabaceae	AR CD	Khowai Unakoti	Sapling
Trichosanthes costata Blume	-	AR	Khowai	Shrub
Triumfetta pilosa Roth	Malvaceae	AR CD	Unakoti	Shrub
Triumfetta rhomboidea Jacq.	Malvaceae	ANR AR CD CD	Gomati Khowai North Sepahijala Unakoti West	Shrub
Uraria acuminata Kurz	Fabaceae	ANR AR	Sepahijala	Shrub
Urena lobata L.	Malvaceae	ANR AR CD CD CD RBP	Gomati Khowai North Sepahijala South Unakoti West	Shrub
Urena lobata var. glauca (Blume) Borss. Waalk.	Malvaceae	AR	South	Shrub
Uvaria hamiltonii Hook.f. & Thomson	Annonaceae	CD	Gomati	climb
Vitex altissima L.f.	Lamiaceae	ANR AR	Gomati Khowai North South	Shrub Sapling
Vitex negundo L.	Lamiaceae	AR	Unakoti	Sapling
Vitex peduncularis Wall.	Lamiaceae	ANR AR CD	Khowai Sepahijala Unakoti	Shrub Sapling
Zanthoxylum rhetsa (Roxb.) DC.	Rutaceae	ANR	West	Sapling
Ziziphus funiculosa Buch.-Ham. ex Wall.	Rhamnaceae	ANR	Sepahijala	Sapling
Ziziphus oenopolia (L.) Mill.	Rhamnaceae	ANR AR	Khowai Sepahijala Unakoti West	Sapling
Ziziphus rugosa Lam.	Rhamnaceae	ANR	Khowai	Sapling
Ziziphus sp	Rhamnaceae	ANR CD	Khowai Sepahijala	Sapling
Ziziphus xylopyrus (Retz.) Willd.	Rhamnaceae	AR	West	Sapling

Annexure-III

CHECKLIST OF HERBECEOUS PLANT SPECIES IN ALL PLANTATION SITES:

HERBS	Family	Plantation Type	District
Achyranthes aspera L.	Amaranthaceae	ANR AR	Khowai Sepahijala South
Acmella paniculata (Wall. ex DC.) R.K.Jansen	Compositae	ANR AR CD RBP	Gomoti Khowai North Sepahijala South Unakoti West
Acmella radicans (Jacq.) R.K.Jansen	Compositae	AR	Khowai
Adenosma indianum (Lour.) Merr.		AR	Khowai
Adiantum caudatum L.	Pteridaceae	RBP	Gomoti
Adiantum philippense L.	Pteridaceae	ANR	North
Ageratum conyzoides L.	Compositae	ANR AR CD RBP	Gomoti Khowai North Sepahijala South Unakoti West
Aglaonema hookerianum Schott	Araceae	AR CD RBP	Gomoti South Unakoti
Alocasia fornicata Schott	Araceae	CD	Unakoti
Alpinia galanga (L.) Willd.	Zingiberaceae	ANR	South
Alpinia malaccensis (Burm.f.) Roscoe	Zingiberaceae	CD RBP	Gomoti Khowai
Alpinia nigra (Gaertn.) B.L.Burtt	Zingiberaceae	ANR AR CD	Khowai North South Unakoti
Alternanthera sessilis (L.) DC.	Amaranthaceae	AR CD	Khowai Unakoti
Amaranthus spinosus L.	Amaranthaceae	AR RBP	Khowai South
Amomum dealbatum Roxb.	Zingiberaceae	ANR AR CD RBP	Gomoti Khowai North Unakoti
Amomum sp	Zingiberaceae	RBP	Gomoti
Amorphophallus bulbifer (Roxb.) Blume	Araceae	ANR AR CD	Gomoti Khowai North Sepahijala Unakoti
Ampelocissus barbata (Wall.) Planch.	Vitaceae	ANR AR CD	Khowai North Sepahijala Unakoti West
Ananas comosus (L.) Merr.	Bromeliaceae	AR	South Unakoti
Angiopteris evecta (G.Forst.) Hoffm.	Marattiaceae	AR CD	Gomoti Khowai North South Unakoti
Argyreia capitiformis (Poir.) Ooststr.	Convolvulaceae	ANR AR	West
Argyreia cymosa Sweet	Convolvulaceae	AR CD	Sepahijala Unakoti
Argyreia nervosa (Burm. f.) Bojer	Convolvulaceae	ANR AR	Gomoti Khowai Sepahijala
Aristolochia acuminata L.	Aristolochiaceae	ANR AR CD	Khowai South Unakoti
Arundinella bengalensis Druce	Poaceae	AR	North
Axonopus compressus (Sw.) P.Beauv.	Poaceae	ANR AR CD RBP	Khowai North Sepahijala South
Axonopus fissifolius (Raddi) Kuhlm.	Poaceae	AR	Sepahijala
Begonia roxburghii A.DC.	Begoniaceae	RBP	Gomoti
Bidens pilosa L.	Asteraceae	AR	West
Biophytum reinwardtii (Zucc.) Klotzsch		AR	Khowai
Blechnum orientale L.	Blechnaceae	ANR AR	Gomoti Khowai North Sepahijala

		CD	
Blumea lacera (Burm.f.) DC.	Asteraceae	ANR AR	South West
Blumea laciniata (Wall. ex Roxb.) DC.	Compositae	ANR AR	South
Blumea lanceolaria Druce	Compositae	AR	Khowai
Breynia retusa (Dennst.) Alston	Phyllanthaceae	ANR	Unakoti
Bridelia tomentosa Blume	Phyllanthaceae	ANR	South
Byttneria pilosa Roxb.	Malvaceae	ANR AR CD	Khowai North Sepahijala South Unakoti
Cajanus scarabaeoides (L.) F.Muell.	Fabaceae	ANR AR CD	Khowai Sepahijala West
Camonea umbellata (L.) A.R.Simões & Staples	Convolvulaceae	ANR AR CD	Khowai Sepahijala South Unakoti West
Canavalia gladiata (Jacq.) DC.	Fabaceae	ANR	West
Caryota urens L.	Arecaceae	ANR	South
Cayratia japonica Gagnep.	Vitaceae	ANR	North
Centotheca lappacea Desv.	Poaceae	ANR AR CD	Khowai Sepahijala
Centrosema pubescens Benth.		AR	Khowai
Cheilocostus speciosus (J.Koenig) C.D.Specht	Costaceae	ANR AR CD	Gomoti South
Christella dentata (Forssk.) Brownsey & Jermy	Thelypteridaceae	CD	South
Chromolaena odorata (L.) R.M.King & H.Rob.	Compositae	ANR AR	Sepahijala South Unakoti West
Chrysopogon aciculatus Trin.	Poaceae	ANR AR CD	Khowai North Sepahijala Unakoti
Cissampelos mucronata A.Rich.	Menispermaceae	AR	Unakoti
Cissampelos pareira L.	Menispermaceae	ANR AR	Khowai
Cissus repanda Vahl	Vitaceae	ANR RBP	Gomoti Khowai Sepahijala South
Clerodendrum infortunatum L.	Lamiaceae	AR	North
Colocasia esculenta (L.) Schott	Araceae	ANR AR CD RBP	Gomoti Khowai North Sepahijala South Unakoti
Combretum punctatum Blume	Combretaceae	ANR AR CD	South Unakoti
Commelina benghalensis L.	Commelinaceae	AR RBP	Khowai South
Commelina communis L.	Commelinaceae	CD	Gomoti
Commelina diffusa Burm.f.	Commelinaceae	AR	North
Crassocephalum crepidioides (Benth.) S.Moore	Compositae	ANR AR CD	North South Unakoti
Crotalaria retusa L.	Fabaceae	AR	Khowai
Curculigo latifolia Dryand. ex W.T.Aiton	Hypoxidaceae	ANR AR CD	Khowai North Sepahijala Unakoti
Curculigo orchioides Gaertn.	Hypoxidaceae	ANR AR	Unakoti
Curcuma zedoaria (Christm.) Roscoe	Zingiberaceae	ANR AR CD	North Sepahijala Unakoti
Cyanthillium cinereum (L.) H.Rob.	Compositae	ANR AR CD	Gomoti Khowai South Unakoti West
Cyclea barbata Miers		ANR AR	Khowai
Cynodon dactylon (L.) Pers.	Poaceae	ANR AR	Gomoti Khowai South

		CD RBP	
Cyperus cyperoides Kuntze	Cyperaceae	AR CD	Gomoti Unakoti
Cyperus distans L.f.	Cyperaceae	CD	Gomoti
Cyperus esculentus L.	Cyperaceae	CD	South
Cyperus exaltatus Retz.	cyperaceae	AR	West
Cyperus haspan L.	Cyperaceae	ANR AR CD	Gomoti Khowai North Sepahijala South Unakoti
Cyperus iria L.	Cyperaceae	ANR AR CD	Khowai North Unakoti
Cyrtococcum oxyphyllum Stapf	Poaceae	ANR AR CD	Khowai North Unakoti
Cyrtococcum patens A.Camus	Poaceae	ANR AR	West
Dactyloctenium aegyptium (L.) Willd.		AR	Khowai
Dendrophthoe falcata (L.f.) Ettingsh.	Loranthaceae	AR	South
Desmodium gangeticum (L.) DC.	Fabaceae	AR	South
Dicranopteris linearis (Burm.f.) Underw.		ANR CD	Khowai Sepahijala
Digitaria ciliaris (Retz.) Koeler	Poaceae	AR CD	Gomoti Khowai North
Dioscorea alata L.	Dioscoreaceae	ANR AR CD	Gomoti Khowai North Sepahijala Unakoti West
Dioscorea bulbifera L.	Dioscoreaceae	ANR AR CD	Gomoti Khowai North Sepahijala Unakoti West
Dioscorea glabra Roxb.	Dioscoreaceae	ANR	West
Dioscorea hamiltonii Hook.f.	Dioscoreaceae	ANR AR CD	Gomoti Khowai North Sepahijala Unakoti
Dioscorea oppositifolia L.	Dioscoreaceae	ANR AR CD	Gomoti Khowai North Sepahijala Unakoti West
Dioscorea pentaphylla L.	Dioscoreaceae	ANR AR CD	Gomoti Khowai North Unakoti
Dioscorea villosa L.	Dioscoreaceae	AR	North
Dioscorea wallichii Hook.f.	Dioscoreaceae	ANR AR CD	North Sepahijala Unakoti
Diplazium esculentum (Retz.) Sw.	Athyriaceae	ANR AR CD RBP	Gomoti Khowai North South Unakoti
Dryopteris wallichiana (Spreng.) Hyl.	Dryopteridaceae	AR CD RBP	Gomoti Khowai North South
Echinochloa stagnina P.Beauv.	Poaceae	ANR	South
Eclipta prostrata (L.) L.	Asteraceae	CD	Gomoti
Elatostema lineolatum Wight	Urticaceae	RBP	Gomoti
Elatostema rugosum A.Cunn.	Urticaceae	CD	South
Elephantopus scaber L.	Asteraceae	ANR AR CD	Khowai North Sepahijala
Eleusine indica Gaertn.	Poaceae	CD	Khowai Unakoti
Eragrostis tenella (L.) P.Beauv. ex Roem. & Schult.	Poaceae	ANR AR	Khowai Sepahijala
Etlingera linguiformis (Roxb.) R.M.Sm.	Zingiberaceae	ANR AR CD	Khowai North South Unakoti
Euphorbia hirta L.	Euphorbiaceae	ANR AR CD	Khowai North Unakoti
Evolvulus nummularius (L.) L.	Convolvulaceae	ANR AR	Khowai Sepahijala West

Ficus lamponga Miq.	Moraceae	AR	North
Fimbristylis acuminata Vahl	Cyperaceae	CD	Gomoti
Fimbristylis aestivalis (Retz.) Vahl	cyperaceae	CD	Khowai Sepahijala
Fimbristylis dichotoma (L.) Vahl	Cyperaceae	AR CD	North Unakoti
Fimbristylis ferruginea (L.) Vahl	Cyperaceae	CD	South
Geodorum densiflorum (Lam.) Schltr.		ANR	Khowai
Globba bulbifera Roxb.	Zingiberaceae	ANR CD	North
Globba multiflora Wall. ex Baker	Zingiberaceae	ANR AR CD RBP	Gomoti North South Unakoti
Grona triflora (L.) H.Ohashi & K.Ohashi	Fabaceae	ANR	Khowai West
Hedychium coccineum Buch.-Ham. ex Sm.	Zingiberaceae	ANR CD	North Unakoti
Hellenia speciosa (J.Koenig) Govaerts	Zingiberaceae	ANR AR CD	Khowai North Sepahijala Unakoti West
Helminthostachys zeylanica (L.) Hook.	Ophioglossaceae	ANR AR RBP	Gomoti Khowai North Sepahijala
Hemidesmus indicus (L.) R. Br. ex Schult.	Apocynaceae	ANR AR	Gomoti South
Hemigraphis hirta T.Anderson		AR	Khowai
Hewittia malabarica (L.) Suresh		AR	Khowai
Homalomena aromatica Schott	Araceae	ANR AR CD	North Sepahijala Unakoti
Hypolytrum nemorum (Vahl) Spreng.	Cyperaceae	ANR AR CD	Gomoti Khowai North South Unakoti
Ichnocarpus frutescens (L.) W.T.Aiton	Apocynaceae	ANR AR CD	Khowai Sepahijala Unakoti West
Imperata cylindrica (L.) Raeusch.	Poaceae	ANR AR CD	Gomoti Khowai North Sepahijala South Unakoti West
Ipomoea carnea Jacq.	Convolvulaceae	CD	Sepahijala
Ipomoea carolina L.	Convolvulaceae	CD	North
Ipomoea coccinea L.	Convolvulaceae	ANR AR	West
Ipomoea hederifolia L.	Convolvulaceae	ANR AR	Khowai
Ipomoea obscura (L.) Ker Gawl	Convolvulaceae	AR	Unakoti
Ipomoea pileata Roxb.	Convolvulaceae	AR	West
Ipomoea triloba L.	Convolvulaceae	ANR AR	West
Ipomoea umbellata L.	Convolvulaceae	CD	Gomoti
Isachne globosa Kuntze	Poaceae	ANR AR	Khowai
Ischaemum rugosum Salisb.	Poaceae	CD	Sepahijala
Kyllinga brevifolia Rottb.	Cyperaceae	ANR AR CD	Khowai Sepahijala Unakoti
Kyllinga nemoralis (J.R.Forst. & G.Forst.) Dandy ex Hutch. & Dalziel	Cyperaceae	ANR AR CD	Gomoti South
Lantana camara L.	verbanaceae	CD	Sepahijala
Lasia spinosa (L.) Thwaites	Araceae	CD	Unakoti
Leucas aspera (Willd.) Link	Lamiacaee	ANR AR CD RBP	Gomoti Khowai Sepahijala South
Lindernia crustacea (L.) F.Muell.	Linderniaceae	CD	Gomoti
Lindernia procumbens (Krock.) Philcox	Linderniaceae	AR CD	Khowai Sepahijala
Ludwigia adscendens (L.) H.Hara	Onagraceae	CD	South

Ludwigia octovalvis (Jacq.) P.H.Raven	Onagraceae	AR CD	Khowai North Sepahijala South Unakoti
Lycopodiella cernua (L.) Pic. Serm.	Lycopodiaceae	CD	South
Lygodium flexuosum (L.) Sw.	Lygodiaceae	ANR AR CD RBP	Gomoti Khowai North Sepahijala South Unakoti
Manihot esculenta Crantz	Euphorbiaceae	CD	Gomoti
Mecardonia procumbens (Mill.) Small	Plantaginaceae	AR	North
Merremia tridentata (L.) Hallier f.	Convolvulaceae	ANR AR	West
Merremia vitifolia Hallier f.	Convolvulaceae	AR	West
Microlepia strigosa (Thunb.) C. Presl	Dennstaedtiacea e	ANR CD RBP	Gomoti North
Mikania cordata (Burm.f.) B.L.Rob.	Compositae	ANR AR CD RBP	Gomoti Khowai North Sepahijala South Unakoti West
Mimosa himalayana Gamble	Fabaceae	ANR AR	West
Mimosa pudica L.	Fabaceae	ANR AR CD RBP	Gomoti Khowai North Sepahijala Unakoti West
Mimosa rubicaulis subsp. himalayana (Gamble) H.Ohashi	Fabaceae	ANR	West
Molineria latifolia (Dryand. ex W.T.Aiton) Herb. ex Kurz	Hypoxidaceae	ANR AR CD RBP	Gomoti South
Mucuna bracteata DC. ex Kurz	Fabaceae	ANR AR	West
Mucuna pruriens (L.) DC.	Fabaceae	ANR AR CD	Gomoti Khowai North Sepahijala Unakoti
Musa acuminata Colla	Musaceae	ANR AR CD RBP	Gomoti Khowai North Sepahijala South Unakoti
Neustanthus phaseoloides (Roxb.) Benth.	Fabaceae	AR	Khowai South Unakoti
Ocimum tenuiflorum L.	Lamiaceae	AR	Khowai
Onychium siliculosum (Desv.) C.Chr.	Pteridaceae	ANR	North
Oplismenus burmanni (Retz.) P.Beauv.	Poaceae	ANR AR CD	Khowai Sepahijala South Unakoti
Oplismenus compositus (L.) P.Beauv.	Poaceae	ANR AR RBP	Gomoti Khowai Unakoti West
Oplismenus hirtellus (L.) P.Beauv.	Poaceae	ANR AR CD	Gomoti South West
Panicum auritum Presl ex Nees	Poaceae	ANR AR	Khowai North Unakoti
Panicum repens L.	Poaceae	AR CD	Khowai Sepahijala
Panicum notatum Retz.	Poaceae	ANR AR CD	Gomoti Khowai Sepahijala South Unakoti
Paspalum conjugatum P.J.Bergius	Poaceae	ANR AR CD	Khowai North Sepahijala West
Passiflora foetida L.	Passifloraceae	ANR AR	Gomoti North Unakoti
Pavetta indica L.	Rubiaceae	AR	North
Peliosanthes teta Andrews	Asparagaceae	ANR	South
Pennisetum polystachion (L.) Schult.	Poaceae	ANR AR	West
Peperomia pellucida (L.) Kunth	Piperaceae	AR	Unakoti
Peristylus constrictus Lindl.	Orchidaceae	ANR	North
Persicaria chinensis (L.) H.Gross	Polygonaceae	CD	Gomoti Unakoti
Persicaria hydropiper (L.) Delarbre	Polygonaceae	ANR CDRBP	Gomoti Khowai North Sepahijala South Unakoti

Phragmites karka (Retz.) Trin. ex Steud.	Poaceae	AR CD	Khowai Unakoti
Phrynium pubinerve Blume	Marantaceae	ANR CD RBP	Gomoti South Unakoti
Phyllanthus emblica L.	Phyllanthaceae	AR	North
Phyllanthus niruri L.	Phyllanthaceae	AR	North
Phyllanthus urinaria L.	Phyllanthaceae	ANR AR CD	North Sepahijala Unakoti
Physalis angulata L.	Solanaceae	AR CD RBP	North Sepahijala South Unakoti West
Piper longum L.	Piperaceae	AR CD	South
Piper nigrum L.	Piperaceae	ANR AR	Khowai North
Piper sp	Piperaceae	AR	Unakoti
Pityrogramma calomelanos (L.) Link	Pteridaceae	ANR CD	Gomoti North South
Pleurolobus gangeticus (L.) J.St.-Hil. ex H.Ohashi & K.Ohashi	Fabaceae	AR CD	Sepahijala
Pogostemon hispidus Prain	Lamiaceae	AR	West
Polygonum sp	Polygonaceae	ANR CD	North South
Pontederia hastata L.	Pontederiaceae	CD	North
Pothos scandens L.	Araceae	CD	Khowai
Pteris ensiformis Burm.		AR	Khowai
Pteris vittata L.	Pteridaceae	ANR CD	North South
Pueraria tuberosa (Roxb. ex Willd.) DC.	Fabaceae	ANR AR CD RBP	Gomoti Khowai North Sepahijala South Unakoti West
Rhynchospora corymbosa (L.) Britton	Cyperaceae	ANR AR CD	Khowai North Unakoti
Rostellularia procumbens (L.) Nees		AR	Khowai
Rungia pectinata Nees	Acanthaceae	ANR AR	Khowai West
Saccharum arundinaceum Retz.	Poaceae	ANR	West
Saccharum spontaneum L.	Poaceae	ANR	Sepahijala
Sacciolepis interrupta Stapf	Poaceae	AR	Unakoti
Schoenoplectiella juncoides (Roxb.) Lye	Cyperaceae	CD	South
Scleria lacustris C.Wright	Cyperaceae	ANR AR CD	Gomoti Khowai North
Scleria terrestris (L.) Fassett	Cyperaceae	ANR AR CD	North Unakoti
Scoparia dulcis L.	Plantaginaceae	ANR AR CD	Khowai South Unakoti West
Setaria italica (L.) P.Beauv.	Poaceae	CD	Unakoti
Setaria pumila Roem. & Schult.	Poaceae	ANR AR	Khowai North
Sida cordata (Burm.f.) Borss.Waalk.	Malvaceae	ANR AR	Gomoti North
Sida rhombifolia L.	Malvaceae	CD	Sepahijala
Smilax glabra Roxb.	Smilacaceae	ANR AR	Khowai North Sepahijala
Smilax zeylanica L.	Smilacaceae	ANR AR CD	Gomoti Khowai North Sepahijala South Unakoti West
Solanum nigrum L.	Solanaceae	AR	West
Spermacoce hispida L.	Rubiaceae	ANR AR CD	Gomoti Khowai North Sepahijala South Unakoti West
Spermacoce ocymoides Burm.f.	Rubiaceae	ANR AR	Gomoti Khowai Unakoti West

		CD	
Sphagneticola calendulacea (L.) Pruski	Asteraceae	ANR	Sepahijala
Sphagneticola trilobata (L.) Pruski	Asteraceae	AR	Khowai
Stemona tuberosa Lour.	Stemonaceae	ANR AR	Khowai North
Stephania japonica (Thunb.) Miers	Menispermaceae	ANR AR CD	Gomoti Khowai North Sepahijala South Unakoti
Steudnera assamica Hook.f.	Araceae	ANR CD RBP	Gomoti Khowai North Sepahijala South
Synedrella nodiflora (L.) Gaertn.	Compositae	ANR AR CD	Gomoti Khowai North Sepahijala Unakoti West
Tacca integrifolia Ker Gawl.	Dioscoreaceae	RBP	Gomoti
Tetrastigma bracteolatum (Wall.) Planch.	Vitaceae	ANR AR CD	Khowai Sepahijala South
Tetrastigma obovatum Gagnep.	Vitaceae	AR	Khowai
Tetrastigma serrulatum (Roxb.) Planch.	Vitaceae	ANR	Unakoti
Thelypteris dentata (Forssk.) E.P.St.John	Thelypteridaceae	ANR AR CD	Khowai North Unakoti West
Thelypteris hispidula (Decne.) C.F.Reed	Thelypteridaceae	ANR	North West
Themeda arundinacea (Roxb.) A.Camus	Poaceae	ANR	Sepahijala West
Themeda caudata (Nees) A.Camus	Poaceae	ANR AR	Khowai
Thladiantha cordifolia Cogn.	Cucurbitaceae	ANR	Unakoti
Thunbergia grandiflora Roxb.	Acanthaceae	ANR AR CD RBP	Gomoti Khowai North Sepahijala South Unakoti West
Thysanolaena latifolia (Roxb. ex Hornem.) Honda	Poaceae	ANR AR CD RBP	Gomoti Khowai North Sepahijala South Unakoti
Tinospora cordifolia (Willd.) Miers ex Hook.f. & Thomson	Menispermaceae	ANR AR CD	Khowai North Sepahijala Unakoti
Tinospora sinensis (Lour.) Merr.	Menispermaceae	CD RBP	Gomoti
Torenia cordifolia Roxb.	Linderniaceae	AR	Khowai
Torenia crustacea (L.) Cham. & Schltdl.	Linderniaceae	AR	Sepahijala
Trachyspermum roxburghianum H.Wolff	Apiaceae	AR	South
Trichosanthes tricuspidata Lour.	Cucurbitaceae	ANR CD	Unakoti
Triumfetta pilosa Roth	Malvaceae	AR	Sepahijala
Triumfetta rhomboidea Jacq.	Malvaceae	AR CD	North Sepahijala West
Uraria crinita (L.) Desv. ex DC.	Urticaceae	AR	Khowai
Urena lobata L.	Malvaceae	AR	North
Urochloa panicoides P.Beauv.	Poaceae	AR	Sepahijala
Urtica dioica L.	Urticaceae	ANR	Unakoti
Xanthosoma sagittifolium (L.) Schott	Araceae	CD	Khowai
Xenostegia tridentata (L.) D.F.Austin & Staples		ANR	Khowai
Zingiber chrysanthum Roscoe	Zingiberaceae	ANR	Unakoti
Zingiber sp	Zingiberaceae	AR	Khowai
Ziziphus oenopolia (L.) Mill.	Rhamnaceae	AR	North

Annexure-IV

Comprehensive Summary of Relative Frequency, Relative Density, Relative Basal Area, and Important Value Index

An average for Relative frequency, relative density, relative basal area and important value index of trees species for each sample class (AR miscellaneous, ANR miscellaneous and bamboo, Check dams (Upper parts), riverbank plantation) has been displayed in the following table 1, 2, 3 & 4 with the highest (1^{st}, 2^{nd} & 3^{rd}) and the lowest calculated values.

1. Relative frequency, relative density, relative basal area and important value index of trees in ANR plantations (TREE)

Highest	Species	Relative Density	Species	Relative Frequency	Species	Relative BA	Species	IVI
1st	*Tectona grandis*	14.1	*Tectona grandis*	3.58	*Tectona grandis*	23.62	*Tectona grandis*	41.3
2nd	*Bambusa tulda*	9.52	*Terminalia belirica*	3.26	*Anogeissus acuminata*	7.06	*Anogeissus acuminata*	13.31
3rd	*Melocanna baccifera*	7.88	*Anogeissus acuminata*	3.15	*Albizia procera*	6.9	*Albizia procera*	11.08
Lowest	*Ziziphus oenopolia*	0.03	*Ziziphus rugosa*	0.22	*Mallotus roxburghianus*	0	*Mallotus roxburghianus*	0
Total (All species)		**100**		**100**		**100**		**300**

2. Relative frequency, relative density, relative basal area and important value index of trees in AR plantations (TREE)

Highest	Species	Relative Density	Species	Relative Frequency	Species	Relative BA	Species	IVI
1st	*Bambusa tulda*	13.34	*Anogeissus acuminata*	3.82	*Tectona grandis*	20.93	*Tectona grandis*	34.44
2nd	*Tectona grandis*	9.69	*Tectona grandis*	3.82	*Albizia procera*	9.99	*Bambusa tulda*	17.29
3rd	*Melocanna baccifera*	7.77	*Bambusa tulda*	3.24	*Anogeissus acuminate*	8.36	*Albizia procera*	15.94
Lowest	*Ziziphus xylopyrus*	0.01	*Ziziphus xylopyrus*	0.02	*Spondias mombin*	0	*Spondias mombin*	0
Total (All species)		**100**		**100**		**100**		**300**

3. Relative frequency, relative density, relative basal area and important value index of trees in CD plantations (TREE)

Highest	Species	Relative Density	Species	Relative Frequency	Species	Relative BA	Species	IVI
1st	*Melocanna baccifera*	20.06	*Melocanna baccifera*	4.03	*Albizia procera*	18.61	*Albizia procera*	27.08
2nd	*Bambusa tulda*	10.19	*Albizia procera*	3.46	*Tectona grandis*	9.02	*Melocanna baccifera*	25.76
3rd	*Tectona grandis*	5.5	*Ficus hispida*	3.46	*Trema orientalis*	6.67	*Tectona grandis*	17.4
Lowest	*Thyrsostachys oliveri*	0.16	*Thyrsostachys oliveri*	0.58	*Bambusa polymorpha*	0	*Bambusa polymorpha*	0.74
Total (All species)		**100**		**100**		**100**		**300**

4. Relative frequency, relative density, relative basal area and important value index of trees in RB plantations (TREE)

Highest	Species	Relative Density	Species	Relative Frequency	Species	Relative BA	Species	IVI
1st	*Bambusa tulda*	42.81	*Bambusa tulda*	42.81	*Tectona grandis*	33.56	*Bambusa tulda*	89.34
2nd	*Dendrocalamus longispathus*	13.71	*Dendrocalamus longispathus*	13.71	*Albizia procera*	11.06	*Tectona grandis*	44.26
3rd	*Melocanna baccifera*	9.03	*Melocanna baccifera*	9.03	*Toona ciliata*	5.53	*Dendrocalamus longispathus*	28.32
Lowest	*Syzygium cumini*	0.33	*Syzygium cumini*	0.33	*Ficus hirta*	0.15	*Ficus hirta*	0.82
Total (All species)		**100**		**100**		**100**		**300**

Annexure-V

Compilation of Encountered Rare, Endangered, and Threatened (RET) Species during field surveys

Approximately 13 species are slated for consideration in the forthcoming Red List of Threatened Species (RET) based on the findings at the study sites. This list encompasses the names of the Joint Forest Management Committee (JFMC) and the district where each species was last observed.

The Red List of Threatened Species is a critical indicator of the conservation status of various species. Inclusion in this list underscores the importance of implementing effective conservation measures to safeguard these vulnerable species and their ecosystems. Conservation efforts may involve habitat protection, restoration initiatives, and targeted strategies to address specific threats the listed species face. Such proactive measures play a pivotal role in ensuring these ecologically significant species' long-term survival and well-being.

Sl. No.	Species	Vernacular names	Family	IUCN RED LIST STATUS	IVI (Plantation type)	JFMC	District
1	*Cyathea gigantea*	Bongreng	Cyatheaceae	CITES Appendix II	0.75 (CD)	Juriharam Para	North
2	*Dipterocarpus turbinatus*	Garjun	Dipterocarpaceae	Vulnerable	1.86 (ANR), 0.84 (AR)	Alochaya, Laxmipur	North, Khowai
3	*Engelhardtia spicata*	-	Juglandaceae	Lower Risk/least concern	0.76 (ANR)	Nabajiban	North
4	*Garcinia xanthochymus*	Dimfol	Clusiaceae	Rare	0.27 (ANR)	Kamchanpur	North
5	*Gnetum montanum*	-	Gnetaceae	Least Concern	-	North laljuri	North
6	*Helminthostachys zeylanica*	Saumaiccha	Ophioglossaceae	Rare	-	Mandirghat, Churaibari	Gomati, North
7	*Hodgsonia macrocarpa*	Thai bai	Cucurbitaceae	Rare	-	Y-ghati	Gomati
8	*Hydnocarpus kurzii*	-	Flacourtiaceae	Data Deficient	-	North Laljuri	North
9	*Magnolia pterocarpa*	-	Magnoliaceae	Data Deficient	1.50	Andhacherra, Churaibari, Damchera	Unakoti, North
10	*Mangifera sylvatica*	Bolong Thaichuk	Anacardiaceae	Lower Risk/least concern	1.78	Khumpuibadal, Hawaibari	Sepahijala, Khowai
11	*Rauvolfia serpentina*	Chandomma	Apocynaceae	Rare	-	South Gayamoni, Purba Belbari	Khowai, West
12	*Saraca asoca*	Bolong baikang	Caesalpiniaceae	Vulnerable	0.45 (ANR), 0.54 (AR), 2.61 (CD)	South Baishnabpur, Kasta Kr Para, Hadrai, Yakbaksa	South, Khowai
13	*Zanthoxylum rhetsa*	Muiching	Rutaceae	Least Concern	0.30 (ANR), 0.17 (AR)	Kathiram bari	West

Annexure-VI

Compiliation list of NTFP encountered during the field survey

Diversity indices for NTFPs cannot be performed. **Reason**: The NTFPs species was surveyed qualitatively (i.e. interviewed and documented verbally) with the informants. Because during the surveys, we solely focused to the study of floral biodiversity in each study area as per our objectives was concerned. So therefore, the quantitative assessment for the NTFPs species could not be possible with the data we collected.

Sl. no	Vernacular name	Species	Part used	Medicinal values	Economic value	JFMC	District
1	Usundoi	*Acmella paniculata*	whole plant	yes	yes	Bolong Naithok, Nabajagaran, Kunaram Para, Herbatali, Mandalipara, Laxmicherra, Sesimdung(Saitha), Tabouhatai Para, Alochaya, Mora Cherra, Rachi Line, Mathura para, Tailenbari, kamalnagar, Khumpuibadal, Mohanpur, Bhupendra Debbarma, Hadrai, Khatansa bodol, Yaprikwtal bodol, Hatai Kator, Shibnagar	Gomoti, South, North, Unakoti, Sepahijala, Khowai, West
2	Therai	*Alpinia nigra*	stem pith	No	yes	Bidyabil, Hadrai, Alochaya, Pushpamanipara, Kanupara, Sebachandra para	Khowai, North, Unakoti
3	Biring	*Amomum dealbatum*	young inflorescence	No	yes	Mandirghat, Balidum, kamalnagar, Salkaham, Yaprikwtal bodol, Hadrai	Gomati, Unaloti, North, Khowai,
4	Batima	*Amorphophallus bulbifer*	whole plant; tuber	No	yes	Y-Ghati, Salkaham, Balicherra, Lankadhar Para, Pushpamanipara, Sesimdung(Saitha), Tabouhatai Para, Khumpuibadal, Bru kami, Mora Cherra, Rachi Line, Tailenbari	Gomati, Khowai, North, Sepahijala, Unakoti,
5	Jram	*Artocarpus chama*	fruit	No	yes	Mandirghat, Hadrai, Hawaibari, South Gayamoni, Alochaya, Balicherra, Bireshpara, Pushpamanipara, Guliraibari, Haricharan Hamkrai, Khumpuibadal, Sanghati, Bru kami, Rachi Line, Sebachandra para,	Gomati, Khowai, North, Sepahijala, Unakoti,
6	Muya wandal	*Bambusa tulda*	young shoot	No	yes	South Baishnabpur, Joysingbari, Kanupara, Herbatali, Gagrabasti, Laxmicherra, Malambari, Mandalipara, Bolong Naithok, Meghabarna, Atharamura, Lailak, Nabajagaran, Shamal Twisa, Y-Ghati, Mandirghat, Alochaya, Balicherra, Nabajiban, Sesimdung(Saitha), Birchandrapara, Gobinda Para, Lankadhar Para, Tabouhatai Para, Judamani Para, Rachi Line, Sebachandra para, Rongchak Bolong, Tailenbari, Kheltang Twisa, Guliraibari, Pravapur, Chandulkami, Khumpuibadal, Rahimpur,kamalnagar, South Gayamoni, Bidyabil, Hatai Kator, Kathiram bari, Purba Belbari	South, Gomati, North, Unakoti, Sepahijala, Khowai, West
7	Chapok	*Brassaiopsis griffithii*	fruit	No	yes	Lailak, Alochaya, North Gayamoni, Salkaham	Gomati, North,

							KNowai
8	Satrai	*Canarium strictum*	resin	No	yes	Bhupendra Debbarma, Bidyabil	Khowai
9	Maisnoi	*Chromolaena odorata*	young leaf	yes	No	Kheltang Twisa Herbatali Gagrabasti South Baishnabpur Joysingbari Kanupara Mandalipara Laxmicherra Malambari Bolong Naithok Meghabarna Shamal Twisa Atharamura Lailak Nabajagaran Sarbajoy Y-Ghati Kunaram Para Salka Patichari Mandirghat Alochaya Balicherra Balidum Birchandrapara Pushpamanipara Bireshpara Brikhyaram Para Tabouhatai Para Gobinda Para Judamani Para Mora Cherra Rachi Line Rongchak Bolong Sebachandra para Bru kami Tailenbari	Unakoti, South, Gomati, North, Unakoti, Sepahijala, Khowai, West
10	Muiktul	*Colocasia esculenta*	whole plant	No	yes	Kanupara Herbatali Meghabarna Atharamura Lailak Nabajagaran Kunaram Para Patichari Mandirghat Alochaya Balicherra Sesimdung(Saitha) Laxmipur Madhya Krisnapur Tabouhatai Para Gobinda Para Mathura para Mora Cherra Rachi Line Rongchak Bolong Tailenbari Kheltang Twisa Sebachandra para Khumpuibadal Bangshibari Mohanpur Bhupendra Debbarma Uttar Krishnapur North Gayamoni Hawaibari	south, Gomati, North, Unakoti,, Sepahijala, Khowai
11	Thai phloh	*Dillenia indica*	fruit	No	yes	Laxmicherra Nabajagaran Balidum Bireshpara Pushpamanipara Birchandrapara Brikhyaram Para Tabouhatai Para Sebachandra para Bru kami Kheltang Twisa Tailenbari Pravapur Burakha para Bamsree Twisya Purba Belbari	South, Gomati, North, Unakoti, Sepahijala, West
12	Tha borok	*Dioscorea alata*	tuber	No	yes	Kunaram Para Salka Gobinda Para Tabouhatai Para Mathura para Bangshibari kamalnagar South Gayamoni Burakha para Hatai Kator Purba Belbari Shibnagar	Gomati, North, Unakoti, Sepahijala, Khowai, West
13	Tha bolong	*Dioscorea hamiltonii*	tuber	No	yes	Lailak, Balidum, Alochaya, Brikhyaram Para, Tabouhatai Para, Mora Cherra, Sebachandra para, Guliraibari, Hawaibari, Laxmipur, Khatansa bodol	Gomati, North, Unakoti, Sepahijala, Khowai
14	Konga	*Dioscorea wallichii*	tuber; young shoot	No	yes	Brikhyaram Para Tabouhatai Para Gobinda Para Sebachandra para Bangshibari Khumpuibadal	North, Unakoti, Sepahijala
15	Jolpoi	*Elaeocarpus floribundus*	fruit	No	yes	Mandalipara Joysingbari Balicherra Pushpamanipara Sesimdung(Saitha) Alochaya Rachi Line Tabouhatai Para Mora Cherra Sebachandra para Bru kami Kheltang Twisa Rachi Line Guliraibari Mohanpur Pravapur Salkaham	South, North, Unakoti, Sepahijala, Khowai
16	Khuichang	*Ficus semicordata*	fruit	No	yes	Herbatali Joysingbari Kanupara Laxmicherra Bolong Naithok Lailak Sarbajoy Mandirghat Nabajiban Sesimdung(Saitha) Tabouhatai Para Sebachandra para Judamani Para Kheltang Twisa Bamsree Twisya Rachi	South, Gomati, North, Unakoti, Sepahijala, Khowai

						Line Haricharan Hamkrai Mohanpur Bidyabil	
17	Kainchara	*Garuga pinnata*	fruit	No	yes	Herbatali South Baishnabpur Joysingbari Kanupara Nabajiban Sesimdung(Saitha) Alochaya	South, North
18	Kambaroi	*Gmelina arborea*	young inflorescence	No	yes	Joysingbari Kanupara Malambari Atharamura Shamal Twisa Y-Ghati Kunaram Para Birchandrapara Gobinda Para Tabouhatai Para Sebachandra para Bru kami Judamani Para Mathura para Tailenbari Rongchak Bolong Kheltang Twisa Chandulkami Rahimpur Bangshibari Bhupendra Debbarma Hadrai North Gayamoni Salkaham South Gayamoni Yakbaksa Yaprikwtal bodol Laxmicherra Kathiram bari Shibnagar	South, Gomati, North, Unakoti, Sepahijala, Khowai, West
19	Gandiri	*Homalomena aromatica*	Stem/petiole	yes	yes	Alochaya Pushpamanipara Rachi Line Bangshibari	North, Unakoti, Sepahijala
20	Gantha	*Lasia spinosa*	stem; rhizome	yes	yes	Sebachandra para	Unakoti
21	Msa phaumah	*Litsea glutinosa*	bark	yes	No	South Baishnabpur Kanupara Mandalipara Laxmicherra Malambari Bolong Naithok Meghabarna Balidum Bireshpara Alochaya Brikhyaram Para Mora Cherra Sebachandra para Judamani Para Kheltang Twisa Haricharan Hamkrai Mohanpur Chandulkami Khumpuibadal Sanghati Hawaibari Shibnagar Tiwari Mairang Purba Belbari	South, Gomati, North, Unakoti, Sepahijala, Khowai, West
22	Thaichu	*Mangifera sylvatica*	fruit	No	No	Khumpuibadal, Hadrai	Sepahijala, Khowai
23	Muya warthui	*Melocanna baccifera*	young shoot	No	yes	Herbatali Sanghati South Baishnabpur Joysingbari Kanupara Gagrabasti Laxmicherra Malambari Mandalipara Meghabarna Atharamura Lailak Nabajagaran Shamal Twisa Y-Ghati Mandirghat Alochaya Balicherra Nabajiban Sesimdung(Saitha) Birchandrapara Gobinda Para Lankadhar Para Tabouhatai Para Judamani Para Rachi Line Sebachandra para Rongchak Bolong Tailenbari Kheltang Twisa Guliraibari Pravapur Chandulkami Khumpuibadal Rahimpur kamalnagar South Gayamoni Bidyabil Hatai Kator Kathiram bari Purba Belbari	South, Gomati, North, Unakoti, Khowai, West
24	Tokharung	*Oroxylum indicum*	fruit	yes	yes	Herbatali Joysingbari Mandalipara Pravapur Meghabarna Shamal Twisa Kunaram Para Balidum Birchandrapara Nabajiban Sesimdung(Saitha) Birchandrapara Gobinda Para Pushpamanipara Tabouhatai Para Bidyabil Judamani Para Mathura para Sebachandra para Tailenbari Bangshibari Haricharan Hamkrai kamalnagar Khumpuibadal Bhupendra Debbarma Bidyabil Hadrai Yakbaksa Hawaibari	South, Gomati, North, Unakoti, Sepahijala, Khowai
25	Yongchak	*Parkia javanica*	fruit	No	yes	Balidum Nabajiban Pushpamanipara Sesimdung(Saitha) Alochaya Brikhyaram Para Tabouhatai Para Mora Cherra	North, Unaloti, West

						Sebachandra para Bru kami Kheltang Twisa Mathura para Tailenbari Bamsree Twisya Kathiram bari Purba Belbari	
26	Amlai	*Phyllanthus emblica*	fruit	yes	yes	Malambari Balidum Bireshpara Pushpamanipara Sesimdung(Saitha) Alochaya Brikhyaram Para Sebachandra para Mathura para Tailenbari Bangshibari Khumpuibadal Uttar Krishnapur Bamsree Twisya Burakha para Purba Belbari	South, North, Unakoti, Sepahijala, Khowai, West
27	Chandoma	*Rauvolfia serpentina*	whole plant	yes	No	South Gayamoni, Purba Belbari	Khowai, West
28	Jambuk	*Syzygium cumini*	fruit	No	yes	Mandali para, Gagrabasti, South Baishnabpur, Joysingbari, Mandalipara, Herbatali, Bolong Naithok, Meghabarna, Shamal Twisa, Nabajagaran, Mandirghat, Balidum, Brikhyaram Para, Tabouhatai Para, Rachi Line, Bru kami, Judamani Para, Kheltang Twisa, Tailenbari, Guliraibari, Haricharan Hamkrai, Mohanpur, Pravapur, Chandulkami, Rahimpur, Sanghati, Laxmipur, South Gayamoni, Uttar Krishnapur, Hawaibari, Madhya Krisnapur, Bamsree Twisya, Tiwari Mairang, Burakha para, Kathiram bari, Purba Belbari	South, Gomati, North, Unakoti, Sepahijala, Khowai, West
29	Boira	*Terminalia belirica*	fruit	yes	No	Herbatali, South Baishnabpur, Joysingbari Kanupara, Malambari, Mandalipara, Bolong Naithok, Meghabarna, Shamal Twisa, Lailak, Nabajagaran, Juriharam Para, Pushpamanipara, Sesimdung(Saitha), Alochaya, Brikhyaram Para, Judamani Para, Mora Cherra, Sebachandra para, Bangshibari Guliraibari, Haricharan Hamkrai, Khumpuibadal, Chandulkami Kamalnagar, Sanghati, Hadrai, Hawaibari, Laxmipur, South Gayamoni, Bidyabil Madhya Krisnapur, North Gayamoni Salkaham, Burakha para, Hatai Kator Shibnagar, Bamsree Twisya, Purba Belbari	South, Gomati, North, Sepahijala, Khowai, West
30	Noksi	*Thysanolaena latifolia*	Inflorescence	No	yes	Mandalipara, Herbatali, Kasta kr para, Laxmicherra, Malambari, Meghabarna Lailak, Nabajagaran, Salka, Mandirghat Balicherra, Balidum, Juriharam Para Nabajiban, Pushpamanipara, Birchandrapara, Lankadhar Para, Sesimdung(Saitha), Tabouhatai Para Judamani Para, Rongchak Bolong Tailenbari, Sebachandra para Haricharan Hamkrai, Khumpuibadal Hadrai, Salka, Sarbajoy, Shamal Twisa Balidum, Brikhyaram Para, Hadrai Hawaibari, Joysingbari	South, Gomati, North, Unakoti,, Sepahijala, Khowai

END OF THE REPORT