



THE WORKING PLAN of DIGBOI FOREST DIVISION

For the period of 2023-24 to 2032-33

Volume-I



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PREFACE

Forests being major natural resources that support sustenance of the human population, play the most important role in the environment and maintaining ecological balance that need to be conserved. Various anthropogenic pressures including industrialization and urbanization are causing depletion of forest cover. Conservation and management of forests has become one of the top priorities globally. Conservation and management practices of forests should focus on the sustained yield and maintaining the flow of ecosystem services. For achieving the sustained yield and improved ecosystem services, there is a need to formulate effective planning. Forests are under the influence of climate change and human-induced pressures affecting sustainability. This has called attention of planners to formulate strategies to achieve the “Sustainability,” defined as “the maintenance of natural capital”. There is an urgent need to harmonize balance between production from forests and ecological goals through planning processes performed at the national, regional, and local levels.

The significance of forest protection supporting sustainability is well witnessed in the Constitution of India. The Constitution of India under the constitution (42nd amendment) Act, 1976, added article 48A which reads as “Protection and improvement of environment and safeguarding of forests and wild life – “The State shall endeavour to protect and improve the environment and to safeguard the forests and wild life of the country”. Similarly, fundamental duties for every citizen were added during 42nd amendment Act, 1976, as Article 51A (51A Fundamental Duties) which says “It shall be the duty of every citizen of India – (g) To protect and improve the natural environment including forests, lakes, rivers and wild life, and to have compassion for living creatures” (National Forest Commission, 2006). The efforts for a structured and scientific forestry planning in India were initiated long ago, beginning with the appointment of Dr. Dietrich Brandis as the first Inspector General of forest in 1894, and the formulation of the first National Forest Policy in 1894. Since then, attempts have been made to evolve more reasonable basis of forest planning and management. This primarily involved the integration of scientific basis for the conservation of natural resources to meet emerging needs of the country and society.

Forests being a renewable resource can be sustained in eternity with well-planned management interventions. The need for management and planning of forests evolves over time with population driven demands. Forest planning is often subjective and unique to situations and problems being addressed. This may also vary according to the forest tract dealt with respect to its characteristics and composition, risks involved, long-term vision, and the requirements visualized at local or national level. Historically, in India, management of forests to retain a sustainable yield, working plan (also called as forest working plan or forest management plan) has been the main instrument in practice for almost 150 years. Although, the

initial focus of these plans was primarily to fetch sustained yield of timber which has gradually shifted to the wider concerns of sustainable management of forests, and also the concerns of the forest fringe communities and overall forest-dependent life support system varying from local level to the national scale.

This Working Plan deals to address the concerns of ecosystem services, environmental stability, biodiversity conservation, climate change, carbon sequestration, soil moisture retention, water yield, minor forest produce in the form of important non timber forest products, pharmaceutical and other industrial requirements, rights of the forest dweller communities. In recent years after the enactment of reducing emissions from deforestation and forest degradation (REDD +) initiative, the requirement of a working plan would shift to fulfill the need to give quantitative evidence about the forest resources to fetch payment benefits. This demands information related to biodiversity conservation, carbon sequestration, and enhancement of rural livelihoods which could fit in the working plans.

There has been a paradigm shift in the preparation of working plans in India. Post-Independence era (i.e. after 1947), forestry witnessed a shift in the priority of forest management from production to conservation forestry, particularly after the enactment of Forest Conservation Act in 1980.

Working plan for the Digboi forest Division, Assam for the period 2021-22 to 2030-2031 has been prepared as per the National Working Plan Code, 2014 (NWPC, 2014 for sustainably managing the forests of the Division, keeping in mind the availability of resources and the issues occurring and expected to occur in the coming ten years. Measures to control the pressure on the forest reserves and increase the forest productivity with increased green cover in the Division have been emphasized in this working plan. It is attempted to integrate information related to Criteria and Indicators (C&I) for sustainable forest management (SFM), carbon sequestration and mitigation, climate change, biodiversity monitoring and conservation, forest certification, enumeration and management of non-timber forest products (NTFPs), preparation of micro-plans for joint forest management (JFM), fringe forest management, water resource management, soil and water conservation, forest health and diseases, forest fires and protection.

The GPS coordinaties for the sample plots were worked out by the North Eastern Space Applications Centre, Shillong (NESAC); with support from O/o the Addl. PCCF (RE&WP), Department of Environment and Forests, Assam. NESAC also supported the Division by mapping the Forest Types, Canopy Density, Slope, Aspect and Landuses. The thematic maps were further validated on the ground with support from IORA Ecological Solutions Pvt Ltd (IORA). Other relevant surveys, including Plantations, Socio-Economic Survey (*forest and fringe villages*) were conducted in line with NWPC, 2014. Mapping of Trees Outside the Forest, Forest Carbon Stocks, Compartment Wise Growing Stocks, Waterbodies in the Division, Delineation of Microwatersheds, Estimation of USF, LULCF, Mapping of Working Circles were also carried out under the guidance of Additional PCCF(RE&WP), supported by consultants from IORA. Findings of the survey were duly discussed with the relevant stakeholders and then finalized.

In this Working Plan six Working Ciecles have been constituted for proper management of the forest:

(1) **Joint Forest Management Working Circle:** This Working Circle should be seen as the pivotal Working Circle. The success of the rest of the Working Plan depends entirely on the successful management of the JFM Working Circle. Joint Forest Management is sharing of responsibilities, authority and usufructs between the village community or the forest user group and the forest department on the basis of a memorandum of understanding (MoU) between the two.

This Working Circle shall include the entire existing plantation in this division raised with the help of JFMCs under different schemes. The areas allotted to this Working Circle will mainly consist of fringe forest areas that are poorly stocked or productive blank areas.

(2) **Plantation and Regeneration Working Circle:** Forest Areas with canopy density of less than 10 percent and suitable for raising plantation but does not fall in Bio-diversity, Protection, JFM Working Circle or NTFP Working Circle or areas having matured plantations, irrespective of canopy density, without any naturally regenerated forest crops as under canopy are allotted to this Working Circle. Management intervention such as artificial regeneration, felling of the matured crop including dead, dying, diseased, wind fallen, top and mid broken trees and artificial regeneration of commercial long rotation high value species, short rotation high yielding species, fuel wood species, soil moisture conservation works are taken up in this working circle.

(3) **Forest Protection Working Circle:** From the view point of forest protection, this working circle shall include entire forest area of the division. All the wetland of Reserved Forests shall be a part of this working circle. Such areas shall not be worked for timber or other NTFPs but shall be preserved by providing highest degree of protection. These areas should be seen as the ones which sustain the flow of ecosystem services to the fringe forest areas/JFMC areas as well as to the non-forest areas. Hence, it becomes absolutely essential to keep the core of the forest areas/ representative ecosystems intact and free from human disturbances. After many years in future, when the ecosystem starts functioning again at its peak productivity, sustainable extraction from these forests may be allowed. Till that time, these forests shall function as nature's laboratories, which will keep on imparting insights about the functioning of the nature, to a keen observer.

(4) **NTFP and Bamboo (overlapping) Working Circle:** The NTFP working circle shall comprise largely of fringe forest areas or such other areas, which are fit for extraction of a particular NTFP at a rate, that does not lead to the long term decline of the biological diversity so as to maintain its potential to meet the needs and aspirations of present and future generations. NTFPs shall be managed on JFMC areas, fringe forest areas, community forest areas with the help of community after imparting proper training to them regarding time of harvesting, grading and storage for sustainable management and value addition etc.

(5) **Soil and Water Conservation (overlapping) Working Circle:** The effective soil conservation measures along with the catchment and watershed management are the pre conditions for a sustainable forest management. The forests are also sources of water (surface, sub-surface and ground water). Over exploitation of the ground water resources results in a decline in ground water levels; there is an urgent need to augment the ground water resources through suitable management interventions. It is desirable to

have forest management practices dovetailed with the principles of watershed based development approach especially in the source areas of water. Such areas should have restrictions on tree felling but there should be operations to improve the water regimes and natural regeneration. Many water streams originate from the R.F.'s of the division and many streams and rivers originated from other states pass through the R.F.'s of this division. Special provisions shall be made in the working plan to sustain water resources and to address the livelihood issues of the people living in and around the natural inland water sources. Further, areas susceptible to soil erosion such as steep slopes and areas in the vicinity of perennial streams shall be focused for soil and water conservation using mechanical or vegetative control measures.

(6) **Wild life Management and Biodiversity Conservation (overlapping) Working Circle:** Wildlife Management working circle will also include Eco-tourism sector as overlapping working circle. All the RFs under this Division are covered by Dibru -Deomali Elephant Reserve. A part of Upper Dehing RF (East block) and Dirak RF has been covered under Dehing Patkai Wildlife Sanctuary. The RFs under this division are brought under Wildlife management overlapping working circle. Under this overlapping working circle activities proposed should be limited to habitat improvement, management for elephants, corridor improvement and protection measures. Special emphasis is given for creation of plantation of fodder species and digging of water holes so that the herds herd gets sufficient food and water within its habitat. Measures should also be suggested for combating man-elephant conflicts.

Keeping in view the management objectives of different Working Circles, prescriptions are given for different Working Circles. It is expected that this Working Plan will meet the necessity of a long awaited Forest Management Plan. This Working Plan takes into account the prevailing forest-degradation conditions and suggests appropriate prescriptions for increasing Forest Productivity to meet Fuelwood, Fodder, Timber Needs, Enhancing Carbon Sink, Enhancing Biodiversity and restoring the Ecosystems Services of Digboi Division. It is our belief that this working plan will help achieving the stated objectives in a systematic manner and lead to sustainable management of forests in Digboi Forest Division.

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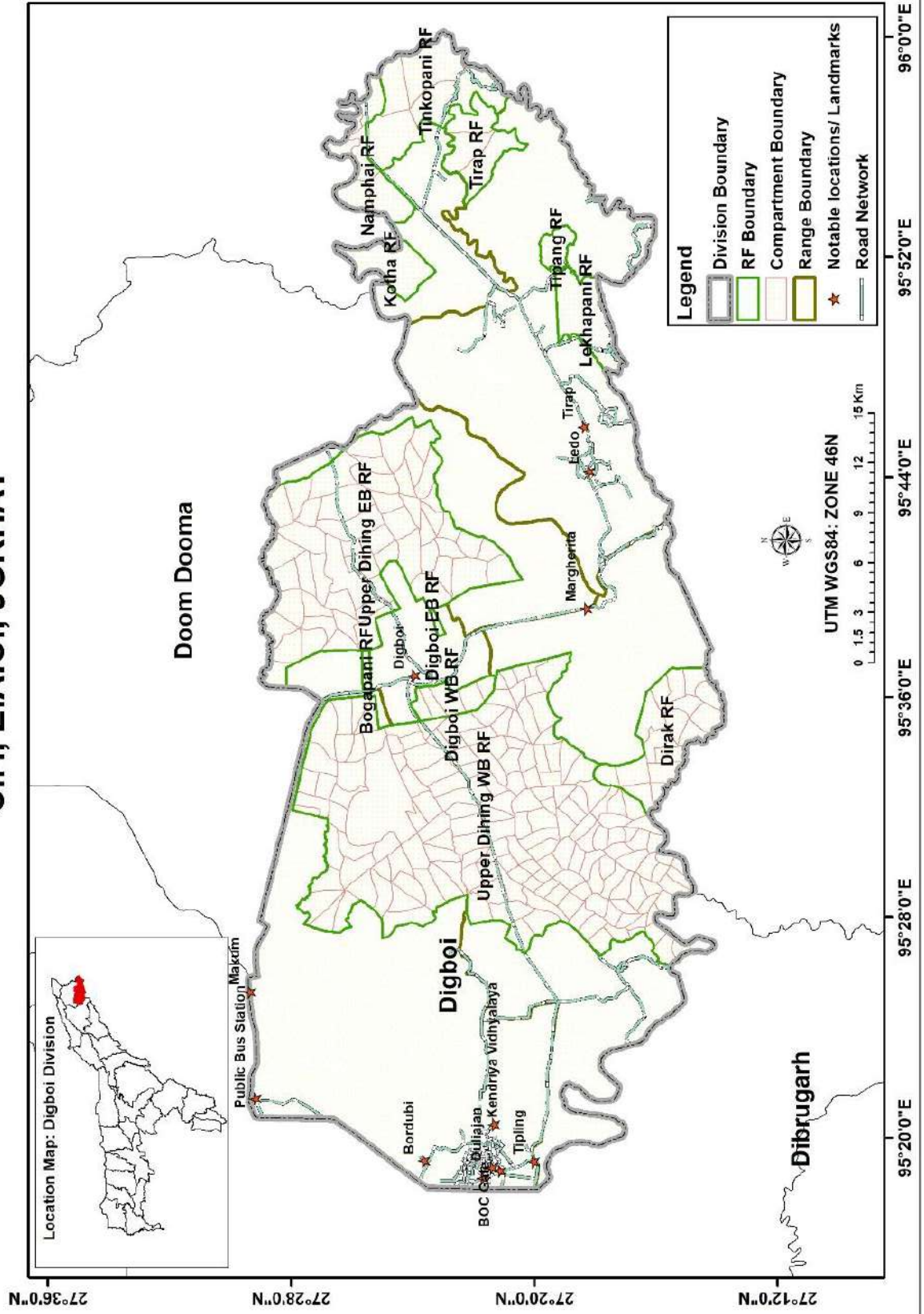
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The GPS co-ordinates for the sample plots were worked out by the North Eastern Space Applications Centre, Shillong (NESAC) with active support from staffs of GIS Cell of the o/o. Addl. PCCF (RE&WP), Assam. The thematic maps were validated on the ground with support from IORA Ecological Solutions Pvt. Ltd (IORA). We offer my sincere acknowledgement to NESAC, IORA and staffs of GIS Cell of o/o. Addl. PCCF (RE&WP), Assam for their valuable contributions.

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DIGBOI DIVISION (LOCATION MAP) C.F., E.A.C., JORHAT



I. Abbreviations

ACF	Assistant Conservator of Forests
AACP	Assam Agricultural Competitiveness Project
AFR	Assam Forest Regulation
APCCF	Additional Principal Chief Conservator of Forests
APFBC	Assam Project on Forest and Bio-Diversity Conservation
AR/ANR	Artificial Regeneration/Aided Natural Regeneration
BCD	Biodiversity Conservation and Development
BFO	Beat Forest Officer
BMC	Bio-Diversity Management Committee
BTAD	Bodoland Territorial Area District
CAI	Current Annual Increment
CAMPA	Compensatory Afforestation fund Management and Planning Authority
CASFoS	Central Academy for State Forest Service
CCF	Chief Conservator of Forests
CF	Conservator of Forests
DBH	Diameter at Breast Height
DCF	Deputy Conservator of Forests
DFO	Divisional Forest Officer
DGF & SS	Director General of Forests and Special Secretary
DGPS	Differential Global Positioning System
DSMs	Defence Series Maps
EC	Environmental Clearance
FAO	Food and Agriculture Organization
FC	Forest Clearance
FCA	Forest Conservation Act
FDA	Forest Development Agency
FRA	Forest Rights Act
FRH	Forest Rest House
FSI	Forest Survey of India
FSR	Forest Schedule of Rates
FYP	Five Year Plan
GCS	Geographic Co-ordination System
GDP	Gross Domestic Product
GHGs	Green House Gases
GIM	Green India Mission
GIS	Geographic Information System
GPS	Global Positioning System
Ha	Hectare
HoD	Head of Department
HoFF	Head of Forest Force
ICFRE	Indian Council of Forestry Research and Education
IGNFA	Indira Gandhi National Forest Academy
IIFM	Indian Institute of Forest Management
ITRF	International Terrestrial Reference Frame

IUCN	International Union for Conservation of Nature
IVI	Importance Value Index
JFM	Joint Forest Management
JFMC	Joint Forest Management Committee
LULUCF	Land Use and Land Use Change and Forestry
MAI	Mean Annual Increment
MAPs	Medicinal and Aromatic Plants
MAR	Monitoring Assessment and Reporting
MEoF	Minister of Environment and Forests
MFP	Minor Forest Produce
MHW	Mixed Hard Wood
MIS	Management and Information System
MODIS	Moderate-resolution Imaging Spectroradiometer
MoU	Memorandum of Understanding
MRV	Measuring Reporting and Verification
MSL	Mean Sea Level
NAP	National Afforestation Project
NBM	National Bamboo Mission
NaRMIL	National Resource Management and Intrigated Livelihood
NFI	National Forest Inventory of India
NGO	Non-Governmental Organization
NH	National Highway
NP	National Park
NPV	Net Present Value
NREGS	National Rural Employment Gurantee Scheme
NREP	National Rural Employment Programme
NRSC	National Remote Sensing Centre
NTCA	National Tiger Conservation Authority
NTFP	Non-Timber Forest Produce
NWAP	National Wildlife Action Plan
NWDB	National Wastelands Development Board
OSMs	Open Series Maps
PA	Protected Area
PBRs	Peoples Biodiversity Registers
PCCF	Principal Chief Conservator of Forests
PCU	Project Co-ordination Unit
PESA	Panchayats (Extension to Scheduled Areas) Act
PIU	Project Implentation Unit
PF	Protected Forests
PRA	Participatory Rural Appraisal
PRF	Proposed Reserved Forest
PWPR	Preliminary Working Plan Report
RAPCCF	Regional Additional Principal Chief Conservator of Forests
RBA	Relative Basal Area
RBAFs	Relative Basal Area Frequencies
RD	Relative Density

REDD	Reducing Emissions from Deforestation and Forest Degradation
REWP	Research Education and Working Plan
RET	Rare, Endangered and Threatened
RF	Reserve Forests
RoFR	Recognition of Forests Rights
RFO	Range Forest Officer
RS	Remote Sensing
SC	Schedule Caste
SD	Standard Deviation
SF	Social Forestry
SFDs	State Forest Departments
SFM	Sustainable Forest Management
SMC	Soil and Moisture Conservation
SOI	Survey of India
ST	Schedule Tribes
TOF	Trees Outside Forests
UF	Unclassified Forests
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
WC	Working Circle
WGS	World Geodetic Survey
WII	Wildlife Institute of India
WLS	Wildlife Sanctuary
WP	Working Plan
WPO	Working Plan Officer
WPU	Working Plan Unit

EXECUTIVE SUMMARY

I. Introduction

The working plan is prepared for fourteen Reserve Forests (RFs) and six Proposed Reserve Forests (PRFs) of Digboi Forest Division. The Division is situated between 27°15' to 27°30' North latitude and 95°18' to 96° East longitude, covering a total geographic area of 1310 sq. km, where Reserve Forests and Proposed Reserved Forests covers an area of **59377.16 hect. and 2464.15 hect.** respectively.

Bifurcating the erstwhile Lakhimpur Forest Division in the year 1960, Digboi Forest Division was created which encompasses within the civil jurisdiction of Tinsukia and part of Dibrugarh District and covering the entire Margherita civil Sub-Division. On the north, it is separated by southern boundary of Doom Dooma Division and south west boundary of Arunachal Pradesh. To the east southern boundary of Arunachal Pradesh, in south Nampong, Changlang and Deomali Forest Divisions of Arunachal Pradesh and Joypur Reserve Forest (RF) of Dibrugarh Forest Division in Assam, and in West Dibrugarh Forest Division.

The forests under Digboi Forest Division are situated on the foothills of Patkai Range. The terrain is plain to low hills. River Buridehing, Tirap, Dirok, Dibru and numerous other small streams keep the terrain well drained. Patkai Range consists of upper tertiary rocks with Tipam sand stone. This is characterized by deposition of oil. The alluvial deposits of River Buridehing go down to a considerable depth. The soil is coarse in nature, which is a mixture of sandy clay deposits. The soil is acidic. The areas under Digboi Forest Division experience high amount of humid. Heavy rainfall takes place in the summer. High humidity and heavy rainfall are the characteristics of evergreen forests region in the Division.

The working plan for the Digboi Forest Division, Assam is prepared for a period of ten years from 2019-20 to 2028- 29. It replaces the previous approved working plan prepared by A.C. Das. The working plan has been prepared as per the guidelines of the Govt. of India contained in the National Working Plan Code - 2014. Remote Sensing / Geographic Information Systems (RS/GIS) tools have been used to develop all the thematic maps. Compartment-wise growing stock of timber has been assessed based on the standardized technique of forest resource survey assessment by laying out quadrats of 0.1 ha based on systematic grid based stratified random sampling. Biomass of the growing stock has been assessed and the carbon sequestration value of the entire forest has been evaluated based on Forest Survey of India's allometric equations, to serve as a baseline for future planning on carbon sequestration. Dependency of the people on forest was assessed through socioeconomic survey. Species Importance Value Index (IVI) was calculated, USF estimated by delineating TOF patches of greater than 10 hectare, micro-watersheds delineated for effective management of forests in this Division. The current working plan is prepared to sustainably manage the forest division keeping in mind the availability of resources and the issues occurring in the division and suggest measures to control the pressure on the forest reserves and increase the green cover of the division.

Encroachment is a threat to the rich forests of this division, 6669.6 ha have been found to be encroached. The Government of Assam is committed not only to conserve its forests and protect them from future

encroachments, but also to clear existing encroachments. In view of this, comprehensive forest and boundary surveys are being carried out and the encroachers will be evicted in due course of time. The RFs and PRFs of the division are surrounded by villages, tea gardens and agricultural fields.

Anthropogenic pressure has affected the forests. Patches of Hollong - Mekai have shrunk and elephant corridors degraded. It has resulted in decrease forest productivity and also increase in incidences of human-elephant conflicts.

a) Vision Statement

The vision statement of the Working Plan of Digboi Forest Division is to increase forest productivity and maintain the ecological and biodiversity components through participation of the local people. Enhancing density of the signatory forest species namely Hollong-Mekai-Nahar, through afforestation in the open forest patches. The clear vision of the Working Plan of Digboi Forest Division is that after implementation of this Working Plan prescriptions, one can see -

- A forest as it was 50 years ago with multi layered floral richness and with good stock of timber trees- so as to fetch sizeable revenue to the State.
- A forest of very rich biodiversity- to give abode to all endemic, endangered, rare species of flora and fauna.
- A Forest with maximum green foliage that can replenish maximum oxygen to the atmosphere.
- A forest of heavy Carbon Sink- enabling greater amount of carbon sequestration.
- A forest capable of sustainable yield – facilitating to harvest forest produces regularly.
- A forest devoid of any biotic interference- devoid of any anthropogenic activity, illegal felling.
- A forest devoid any kind of encroachment- ensuring its protected boundary.
- A forest capable of supplying livelihood needs of local rural people- enabling local forest Dependents to harvest at their need.
- A forest to ensure sustain flow of income and ecosystem services to local communities considering conservation and ecological security.
- A forest of ideal habitat to wildlife - providing food, water and shelter to the wildlife.
- A forest that may be a learning environment for forestry and environmental education.
- A forest managed jointly by Government and the local people.

b) Goals and Objectives of Management

- To bring back the encroached areas under forestry plantation.
- To enhance carbon sequestration by extensive afforestation and reforestation program.
- Protection of inter-State boundaries that are common with RF boundary.
- Involve fringe villagers in the forestry activities for payment of ecosystem services for future forestry operations.
- To upgrade ecotourism and wildlife management.

The goals of this working plan are to bring back the unique forest types and biodiversity by protection of natural forest which will provide numerous ecosystem services. To enhance the growing stock by bringing back the areas under open forest to dense forests, that will ultimately result in the enriched green cover in the RFs.

c) SWOT Analysis

The rich biodiversity of the Division represents maximum forest type in the state and abounded with perennial water resources. Dense forest stretch is along with the inter-State boundary of Arunachal Pradesh that results into rich and diverse habitat for wildlife in the division representing both the State. Wildlife management in the division can be a cause to populate the forest division with diverse faunal species. Ecotourism can be a major prospect to focus on as the livelihood opportunity to the forest fringe dwelling people will be provided. The division falls under Hotspot region and thus has a very high value for biodiversity, exploring ideas to interlink the conservation and sustainable practices can be a boon.

Lack of infrastructure and manpower to manage around the disputed areas is the key weakness that needs to be looked into as the inter-State boundary demarcation is not proper in the forest division. Encroachment and extension of tea cultivation plots on the forest land is a major driver that leads to degradation of forest resources and loss of biodiversity. Activities like poaching and illegal felling of trees are the added pressure on the forest resources.

Alternate livelihood opportunities for the forest dependent communities like Payment for Ecosystem Services (PES) have been proposed in the present scheme so as to counter major inherent threats. Lack of a plan to sustainably utilize the resources applying innovative tools is a major weakness. Conservation and utilization of forest resources through different working circles is proposed in Digboi division through this working plan. The detailed SWOT analysis carried out for prescriptions and strategies for achieving the goals and objectives is shown in the table 1.

Table ES.1: SWOT Analysis of the Digboi Forest Division, Assam

STRENGTHS	WEAKNESS
<ul style="list-style-type: none"> • Unique and rich biodiversity (Rain forest) • Representing maximum forest types • Perennial water resource • Continuous forest stretches • Rich habitat for wildlife 	<ul style="list-style-type: none"> • Limitation of infrastructure • Shortage of manpower • Insufficient financial resources • Devoid of inter-State boundary demarcation
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> • Ecotourism • Potential to become enhanced carbon sink • Biodiversity Conservation • Payment of Ecosystem Services 	<ul style="list-style-type: none"> • Encroachment • Extension of tea cultivation inside forest • Inter-State boundary • Illegal felling • Poaching

d) Expected outcome

The Expected Outcomes of the Working Plan for the Dibrugarh Division are:

- Conservation of forests, reduce forest degradation, restoration of degraded forests, increase of forest stock and sustained yield.
- Ensure people's involvement for forest conservation and protection and thereby attain the objective for sustainable supply of forest produce for fringe village communities and generation of green livelihoods.
- Restoration of woodland leading to long term carbon sequestration.
- Conservation of soil and water resources
- Management of flood affected/low lying areas by afforestation activities and controlled rate of erosion.
- Ecosystem services including ecotourism activities will be developed.
- Sustainable JFMC/NTFP plantation area development and Biodiversity conservation with a focus on rare and endangered species of floral-faunal components.

e) Abstract of plan prescriptions

The abstract of plan prescriptions in the working plan of Digboi forest division for the plan period 2021-22 to 2030-31 as per the format laid out under National Working Plan Code 2014 is summarized in Table 2.

Table 2: Abstract of plan prescriptions

Chapter No	Name of W.C.	Prescribed activity	Remarks/ target
Ch:2	Joint Forest Management Working Circle	Estd of 5 nos. community forest nurseries having 1,50,000 seedlings	5 Nurseries, 1,50,000 seedlings each
		Area to be protected = 10504.00 Hect	10504.00 Hect
		Plantation 2550 hectares as production forest.	2550 hectares
		Joint Forest Management Working Circle (Maintenance) 2550 hect.	2550 hect.
		JFMC training and awareness programmes (4 programs twice a year for ten years, each programme 30 persons). a) 40 training. b) 40 awareness programme. c) 2400 beneficiaries target.	40 awareness programme. 2400 beneficiaries target.
		Ecotourism in Dehing patkai	As required
Ch: 3	Plantation and Regeneration Working Circle	Plantation and regeneration works 10 % of total allotted area of 41598.14 hect. = 4159.81 (say) 4200 hectares	4200 hectares
		Plantation and regeneration Working Circle (Maintenance)= 12075 hect	12075 hect
Ch:4	Forest protection Working Circle	a) Intensive protection measures will be taken for protection of those forest areas with over 60 percent canopy cover, grassland of Jeypore reserve forest. b) Ejection plan. (2000 hect.)	Ejection plan. (2000 hect.)

		c) Boundary pillars (Main pillars 1 every kilometer and sub pillars 3 every 1 km) = 188 nos	188 nos
		d) Sub Pillars = 564 nos	564 nos
		Creation of barriers including razor-wire permanent fencing etc. to check biotic interference wherever necessary. = 20 KM(approx)	20 KM(approx)
Ch: 5	Non timber forest produce and bamboo overlapping) working circle	a) NTFP Plantation Creation, 5% of total allotted area of 3248.43 = 162.42 (say) 170 hect.	170 hect.
		Maintenance = 490 hect.	490 hect.
		b) Bamboo Plantation Creation, 5% of total allotted area of 3248.43 = 162.42 (say) 170 hect.	170 hect.
		b) Bamboo Plantation Maintenance = 490 hect	490 hect
Ch: 6	Soil and Water Conservation (overlapping) Working Circle	Soil and water conservation works Proposed treatment area, Plantation 25% of total allotted area of 1996.05 = 499.01 (say) 500 hect.	500 hect.
Ch: 7	Wildlife Management and Biodiversity Conservation (overlapping) Working Circle	Enrichment plantations = 10% of total allotted area of 7972.39 = 797.24 (say) 800 hectares.	800 hectares.
		Maintenance	
		b) Establishment of 1 anti-wildlife depredation unit.	As required
		c) Elephant proof trenching of earthwork = 3,75,000 m ³ . (unit x1000 m ³)	3,75,000 m ³ .
		d) Safe elephant corridors 4 nos. (Continuous for 10 years)	4 nos.
		e) 160 nos. wildlife awareness camps.	160 nos

f) Abstract of works prescribed during the plan period along with annual target

The abstract of works prescribed in the working plan of Digboi forest division, Assam, for the plan period 2021-22 to 2031-32 showing its year wise target is summarized in table 2 as per the format laid out under National Working Plan Code 2014.

Table 3. Abstract of annual targets of Dgboi Division

Chapter No	Name of W.C.	Prescribed activity	Physical target over a period of ten years									
			Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Ch:2	Joint Forest Management Working Circle	Estd of 5 nos. community forest nurseries having 1,50,000 seedlings	1	-	1	-	1	-	1	-	1	-
		Plantation 2550 hectares as production forest.	200	400	550	500	450	300	150	-	-	-

		Joint Forest Management Working Circle (Maintenance) 2550 hect.	-	200	400	550	500	450	300	150		
		JFMC training and awareness programmes (4 programs twice a year for ten years, each programme 30 persons). a) 40 training. b) 40 awareness programme. c) 2400 beneficiaries target.	8	8	8	8	8	8	8	8	8	8
		Ecotourism in Jokai RF and Namdang RF (Jeep safari of captured and released wild animals)	2	2	2	2	2	2	2	2	2	2
Ch: 3	Plantation and Regeneration Working Circle	Plantation and regeneration works 10 % of total allotted area of 41598.14 hect. = 4159.81 (say) 4200 hectares	525	525	525	525	525	525	525	525	-	-
		Plantation and regeneration Working Circle (Maintenance)= 12075 hect	-	525	1050	1575	1575	1575	1575	1575	1575	1050
Ch:4	Forest protection Working Circle	a) Intensive protection measures will be taken for protection of those forest areas with over 60 percent canopy cover, grassland of Jeyapore reserve forest. b) Ejection plan. (2000 hect.)	500	500	500	500	-	-	-	-	-	-
		c) Boundary pillars (Main pillars 1 every kilometer and sub pillars 3 every 1 km) = 188 nos	26	26	26	26	26	22	22	14	-	--
		d) Sub Pillars = 564 nos	74	70	70	70	70	70	70	70		
		Creation of barriers including rajor-wire permanent fencing etc. to check biotic interference wherever necessary. = 20 KM(approx)	4	4	4	4	4	-	-	-	-	-
Ch: 5	Non timber forest produce and bamboo overlapping) working circle	a) NTFP Plantation Creation, 5% of total allotted area of 3248.43 = 162.42 (say) 170 hect.	25	25	25	25	25	25	20	-	-	-
		Maintenance = 490 hect.	-	25	50	75	75	75	75	70	45	-
		b) Bamboo Plantation Creation, 5% of total allotted area of 3248.43 = 162.42 (say) 170 hect.	25	25	25	25	25	25	20	-	-	-
		b) Bamboo Plantation Maintenance = 490 hect	-	25	50	75	75	75	75	70	45	-

Ch: 6	Soil and Water Conservation (overlapping) Working Circle	Soil and water conservation works Proposed treatment area , Plantation 25% of total allotted area of 1996.05 = 499.01 (say) 500 hect.	-	250	250	-	-	-	-	-	-	-
Ch: 7	Wildlife Management and Biodiversity Conservation (overlapping) Working Circle	Enrichment plantations = 10% of total allotted area of 7972.39 = 797.24 (say) 800 hectares.	100	100	100	100	100	100	100	100	-	-
		Maintenance	-	100	200	300	300	300	300	300	300	200
		b) Establishment of 1 anti-wildlife depredation unit.	1	1	1	1	1	1	1	1	1	1
		c) Elephant proof trenching of earthwork = 3,75,000 m ³ . (unit x1000 m ³)	75	75	75	75	75	-	-	-	-	-
		d) Safe elephant corridors 4 nos. (Continuous for 10 years)	4	4	4	4	4	4	4	4	4	4
		e) 160 nos. wildlife awareness camps.	16	16	16	16	16	16	16	16	16	16

ii) Glossary of Terms

Sl.No.	Term	Definition
1.	Abiotic	Pertaining to the non-living parts of an ecosystem, such as soil particles bedrock, air, and water.
2.	Afforestation	The establishment of a forest or stand in areas where the preceding vegetation or land use was not forest.
3.	Agroforestry	A collective name for land-use systems and practices in which trees and shrubs are deliberately integrated with non-woody crops and (or) animals on the same land area for ecological and economic purposes.
4.	Artificial Regeneration	“Establishing a new forest by planting seedlings or by direct seeding (as opposed to natural regeneration).
5.	Aspect	The direction toward which a slope faces; its exposure in relation to the sun.
6.	Basal Area	The area of the circle formed by the cross-section of a tree taken 1.3 m above the ground.
7.	Benefit/Cost Analysis	A set of procedures for defining and comparing the quantified benefits and costs of a project or course of action; used as an aid to decision making
8.	Biodiversity	The biological diversity of plants, animals, and other living organisms in all their forms and levels of organization, including the biological diversity of genes, species, and ecosystems.
9.	Biofuel	Biomass or materials derived from biomass that can be used to generate energy.
10.	Biomass	The dry weight of all organic material, living or dead, above or below the soil surface.
11.	Biosphere	The portion of the earth comprising the lower atmosphere, the seas, and the land surface (mantle rock) in which living organisms exist.
12.	Biosphere Reserve	A management model proposed by the United Nations Man and the Biosphere program, in which a core area is preserved free from human disturbances, surrounded by buffer zones, which then lead into more intensive areas of disturbance and human activity.
13.	Biota	The animal and plant life (fauna and flora) of a given area.
14.	Block Cutting	Removal of the crop in blocks in one or more operations, generally for wildlife management purposes, encouraging regeneration, or protecting fragile sites.
15.	Breast Height	The standard height, 1.3 m above ground level, at which the diameter of a standing tree is measured.
16.	Buffer Zone	A strip of land where disturbances are not allowed, or are closely monitored, to preserve aesthetic and other qualities adjacent to roads, trails, waterways, and recreation sites.
17.	Canopy	The more or less continuous cover of branches and foliage formed collectively by the crowns of adjacent trees.
18.	Carbon	The uptake and storage of carbon. Trees and plants, for example,

Sl.No.	Term	Definition
	Sequestration	absorb carbon dioxide, release the oxygen and store the carbon. Fossil fuels were at one time biomass and continue to store the carbon until burned.
19.	Carbon Sink	An area where the rate of carbon uptake by living organisms exceeds the rate of carbon release. The surplus carbon is actively sequestered into organic or inorganic forms.
20.	Carrying Capacity	The average number of livestock and (or) wildlife that can be sustained on a management unit, compatible with management objectives for the unit. It is a function of site characteristics, management goals, and management intensity
21.	Climate Change	An alteration in measured quantities (e.g., precipitation, temperature, radiation, wind, and cloudiness) within the climate system that departs significantly from previous average conditions and is seen to endure, bringing about corresponding changes in ecosystems and socio-economic activity.
22.	Conservation	The management or control of human use of resources (biotic and abiotic) and activities on the planet, in an attempt to restore, enhance, protect, and sustain the quality and quantity of a desired mix of species, and ecosystem conditions and processes for present and future generations.
23.	Contour Map	A topographic map that portrays relief by means of lines that connect points of equal elevation.
24.	Crown	The live branches and foliage of a tree.
25.	Crown Density	The amount and compactness of foliage of a tree crown.
26.	Dbh (Diameter At Breast Height)	The stem diameter of a tree measured at breast height, 1.3 m above the ground.
27.	Decision Support Systems (DSS)	Analytical tools (e.g., computer models) that aid decision making by providing information on the projected implications of alternative management actions.
28.	Deforestation	The long-term removal of trees from a forested site to permit other site uses.
29.	Degradation	(1) The erosional removal of materials from one place to another, which lowers the elevation of streambeds and floodplains. (2) Any process or activity that removes or lessens the viability of ecosystem functions and processes, and hence biological diversity.
30.	Depletion	The use or consumption of a resource at a rate greater than the resource can be replenished within a defined time period. The notion of time is important, since many renewable resources can be restored if consumption is halted.
31.	Ecosystem Services	Valuable, ongoing streams of benefits provided by healthy ecosystems, such as air and water purification, biodiversity maintenance, climate stabilization, mitigation of floods and droughts, detoxification and decomposition of wastes, generation and renewal of soil and soil fertility
32.	Endemic Species	A species that is indigenous to a particular area; not introduced and

Sl.No.	Term	Definition
		often with a limited geographical range.
33.	Environmental/Ecological Assessment	A process designed to contribute pertinent environmental information to the decision-making process of forest management and other resource projects and programs.
34.	Evergreen	Never entirely without green foliage, leaves persisting until a new set has appeared.
35.	Forage	Grasses, herbs, and small shrubs that can be used as feed for livestock or wildlife.
36.	Forest	A complex community of plants and animals in which trees are the most conspicuous members and where the tree crown density—the amount of compactness of foliage in the tree tops—is greater than 10 percent.
37.	Forest Cover	Forest stands or cover types consisting of a plant community made up of trees and other woody vegetation, growing more or less closely together.
38.	Forest Cover Type	A group of forested areas or stands of similar composition which differentiates it from other such groups. Forest cover types are usually separated and identified by species composition and often also by height and crown closure classes. In detailed typing, age, site, and other classes may also be recognized.
39.	Forest Encroachment	The intrusion or establishment of a significant number of trees on grassland(s).
40.	Forest Fire	Any wildfire or prescribed fire that is burning in forest, grass, alpine, or tundra vegetation types
41.	Forest Floor	“Layers of fresh leaf and needle litter, moderately decomposed organic matter, and humus or well-decomposed organic residue.
42.	Forest Management	The practical application of biological, physical, quantitative, managerial, economic, social, and policy principles to the regeneration, management, utilization, and conservation of forests to meet specified goals and objectives while maintaining the productivity of the forest. Particularly, that branch of forestry concerned with the overall administrative, economic, legal, and social aspects and with the essentially scientific and technical aspects, especially silviculture, protection, and forest regulation. Includes management for aesthetics, fish, recreation, urban values, water, wilderness, wildlife, wood products, and other forest resource values.
43.	Gap Analysis	A technique that assesses conservation plans and identifies ecosystems, land formations, or habitat types that are not currently adequately represented in the existing system of protected areas and reserves. Should be performed at regional, sub regional, landscape, and watershed scales.
44.	Genetic Diversity	Variation among and within species that is attributable to differences in hereditary material.
45.	GPS (Global Positioning System)	A method of accurately determining or relocating a ground position using the signal from several satellites simultaneously. A small

Sl.No.	Term	Definition
		portable computer evaluates the time for each signal to reach it and then computes a three-dimensional location.
46.	Global Warming	A real and projected trend in the warming of the earth's surface caused by natural changes in the global climate system and by human activities such as the release into the atmosphere of the gaseous by-products (principally carbon dioxide) of fossil-fuel consumption, which trap long-wavelength radiant energy.
47.	Greenbelt	A strip of undisturbed soil and vegetation left along waterways or access routes to minimize the environmental impact from development.
48.	Greenhouse Effect	The warming of the earth's atmosphere caused by increasing levels of carbon dioxide and other gases in the air, which trap the sun's heat within the atmosphere.
49.	Greenhouse Gases	Those gases, such as water vapour, carbon dioxide, tropospheric ozone, nitrous oxide, and methane, that are transparent to solar radiation but opaque to longwave radiation. Their action is similar to that of glass in a greenhouse.
50.	Ground Truthing	The use of a ground survey to confirm the findings of an aerial survey or to calibrate quantitative aerial observations.
51.	Groundwater	Water below the level of the water table in the ground; water occupying the subsurface saturated zone.
52.	Growing Stock	The volume estimate for all standing timber at a particular time.
53.	Habitat	The environment in which a population or individual lives; includes not only the place where a species is found, but also the particular characteristics of the place (e.g., climate or the availability of suitable food and shelter) that make it especially well-suited to meet the life cycle needs of that species.
54.	Harvest	To fell or remove timber, other than under a silviculture treatment.
55.	Height Class	Any interval into which the range of tree or stand heights is divided for classification and use (commonly 3-, 5-, or 10-m classes); also the trees or stands falling into such an interval.
56.	Hydrology	Science that deals with the waters above and below the land surfaces of the earth, their occurrence, circulation, and distribution, both in time and space, their biological, chemical, and physical properties, their reaction with their environment, including their relation to living beings.
57.	Institutional Arrangements	"The laws, regulations, policies, social norms, and organizations governing and participating in resource use. Institutional arrangements specify who has access to resources, guide resource development activities, and define who will monitor and enforce the rules.
58.	Intergovernmental Panel On Climate Change (IPCC)	A panel open to all members of the United Nations Environment Programme and the World Meteorological Organization. The IPCC assesses the scientific, technical, and socio-economic information relevant to the understanding of the risk of human-induced climate

Sl.No.	Term	Definition
		change.
59.	Invasive Species	Any species not native to a particular ecosystem whose introduction causes, or is likely to cause, economic or environmental harm or harm to human health.
60.	Litter	The surface layer of the forest floor that is not in an advanced stage of decomposition, usually consisting of freshly fallen leaves, needles, twigs, stems, bark, and fruits.
61.	Livestock	Farm animals regarded as an asset.
62.	Lopping	Chopping branches, tops, and small trees after felling into lengths such that the resultant slash will lie close to the ground.
63.	Mean Annual Increment (MAI)	Stand volume divided by stand age. The age at which average stand growth, or MAI, reaches its maximum is called the culmination age. Harvesting all stands at this age results in a maximum average harvest over the long term.
64.	Microclimate	The climate of small areas, such as under a plant or other cover, differing in extremes of temperature and moisture from the climate outside that cover.
65.	Microplan	Microplan is a community based empowering tool for preparing a road map for development and management of forest and livelihood enhancement of the forest dependent communities with properly defined roles and responsibilities of all stakeholders, clearly set targets and well discussed deadlines.
66.	Mitigation	To minimize, reduce, or moderate a certain force such as potential for wildfires.
67.	Mortality	Death or destruction of forest trees as a result of competition, disease, insect damage, drought, wind, fire, and other factors (excluding harvesting).
68.	Native Species	A species known to have existed on a site before the influence of humans.
69.	Net Present Value (NPV)	A stand's present worth before harvesting once costs associated with its establishment and tending have been subtracted.
70.	Non Timber Forest Products (NTFP's)	Any commodity obtained from the forest that does not necessitate harvesting trees. It includes game animals, fur-bearers, nuts and seeds, berries, mushrooms, oils, foliage, medicinal plants, peat, fuelwood, forage, etc.
71.	Plantation Forest	Forest stands established by planting and (or) seeding in the process of afforestation or reforestation which are either of introduced species (all planted stands) or intensively managed stands of indigenous species, which meet the following criteria: one or two species at plantation, even age class, and regular spacing.
72.	Plot	A carefully measured area laid out for experimentation or measurement.
73.	Reforestation	The re-establishment of trees on denuded forest land by natural or artificial means, such as planting and seeding.

Sl.No.	Term	Definition
74.	Regeneration	The act of renewing tree cover by establishing young trees naturally (natural seeding, coppice, or root suckers) or artificially (direct seeding or planting). Regeneration usually maintains the same forest type and is done promptly after the previous stand or forest was removed.
75.	Reserve	An area of forest land that, by law or policy, is not available for harvesting. Areas of land and water set aside for ecosystem protection, outdoor and tourism values, preservation of rare species, gene pool, wildlife protection, etc.
76.	Sapling	The stage of tree development in between the seedling and the pole stage. Saplings are typically 1–2 m tall and 2–4 cm in diameter, with vigorous growth, no loose, dead bark, and few (if any) dead branches.
77.	Silviculture	The art and science of controlling the establishment, growth, composition, health, and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis.
78.	Spacing	The removal of undesirable trees within a young stand to control stocking, to maintain or improve growth, to increase wood quality and value, or to achieve other resource management objectives.
79.	Species	A group of individuals that have their major characteristics in common and (usually) can only breed with each other.
80.	Sustainability	A state or process that can be maintained indefinitely. The principles of sustainability integrate three closely interlined elements—the environment, the economy, and the social system—into a system that can be maintained in a healthy state indefinitely.
81.	Temperate Forest	One of three main forest zones in the world. The woodland of rather mild climatic areas; composed mainly of deciduous trees.
82.	Timber	Trees, whether standing, fallen, living, dead, limbed, bucked, or peeled.
83.	Topography	The collective physical features of a geographic area, such as those represented on a map, especially the relief and contours of the land.
84.	Volume	The amount of wood or fiber contained in a tree, stand, or forest, or parts of these measured in cubic units (e.g., cubic meters per hectare) inside the bark.
85.	Wetland	A swamp, marsh, or other similar area that supports natural vegetation that is distinct from adjacent upland areas.

iii) List of Flora in Digboi Division, Assam

The Digboi forest division provides habitats to diverse flora. The detailed list of diverse flora found in Digboi forest division is given below:

Table ES.3: List of diverse flora found in Digboiforest division, Assam

Sl. No	Vernacular Name	Botanical Name	Status
Trees			
1.	Ajhar	<i>Lagerstroemiaspeciose</i>	Abundant
2.	Am	<i>Mangifera indica</i>	Abundant
3.	Amari	<i>Aglaia hiernii</i>	Abundant
4.	Amol	<i>Myristica kingie</i>	Endangered
5.	Amora	<i>Spomdius pimata</i>	Endangered
6.	Amsia	<i>Drimycarpus racemosus</i>	Endangered
7.	Badam	<i>Mansonia dipikae</i>	Endangered
8.	Bagiou	<i>Billemia scabrella</i>	Endangered
9.	Bandordima	<i>Dysoxylum binectariferum</i>	Endangered
10.	Barhamthuri	<i>Talauma hodghonii</i>	Endangered
11.	Barun	<i>Craeteva nurvala</i>	Endangered
12.	Bhatghila	<i>Oroxylum Indicum</i>	RET
13.	Bher	<i>Salix tetrasperma</i>	Threatened
14.	Bhelkor	<i>Trewia nudiflora</i>	Endangered
15.	Bhelu	<i>Tetrameles mudiflora</i>	Endangered
16.	Bhumloti	<i>Symplocos spicata</i>	Rare
17.	Bhomora, Bohera	<i>Terminalia belerica</i>	Abundant
18.	Bogijam	<i>Eugenia jambos</i>	Endangered
19.	Bogipoma	<i>Chikrassia tabularis</i>	Abundant
20.	Brajanali	<i>Zanthoxylum ractsa</i>	Abundant
21.	Bola	<i>Morus laevigata</i>	Abundant
22.	Bon-am	<i>Mangiftra sylvatica</i>	Abundant
23.	Bon Bagari	<i>Zizyphus rugosas</i>	Abundant
24.	Bon-hualo	<i>Cryetocarya anbersonii</i>	Abundant
25.	Bon-jolokia	<i>Cryptocarya amygdalina</i>	Abundant
26.	Bon-pitha	<i>Denella roxburghii</i>	Abundant
27.	Borpat	<i>Ailanthus grandis</i>	Abundant
28.	Borthekera	<i>Garcinia pedunculata</i>	Endangered
29.	Bual	<i>Cordia dichotoma</i>	Abundant
30.	Chalmugra	<i>Hudnocarpus kurzii</i>	Abundant
31.	Dalchini	<i>Cinnamomum zeylanicum</i>	Abundant
32.	Dewa-cham	<i>Artocarpus lakoocha</i>	Abundant
33.	Dhuna	<i>Canarium bengalensis</i>	Endangered
34.	Dimaru	<i>Ficus hispida</i>	Abundant
35.	Galranga	<i>Elaeocarus rugosus</i>	Endangered
36.	Gendhelipoma	<i>Dysoxylum hamiltonii</i>	Endangered
37.	Gohora	<i>Premna dengalensis</i>	Endangered

38.	Gaharisopa	<i>Magnolia griffithii</i>	Endangered
39.	Gomari	<i>Gmelima arborea</i>	Abundant
40.	Gonsoroi	<i>Cinnamomum cecicodaphne</i>	Abundant
41.	Gorumora	<i>Crypteronia paniculata</i>	Endangered
42.	Ghogra, Makarisal, Naga-bhe	<i>Schima wallichii</i>	Endangered
43.	Haludsopa	<i>Adina obocephala</i>	Endangered
44.	Haludsaki	<i>Endospermum chinensis</i>	Endangered
45.	Hatipolia	<i>Pterospermum acerifolium</i>	Endangered
46.	Hengunia	<i>Meliosma pinnata</i>	Endangered
47.	Hingori	<i>Castanopsis indica</i>	Abundant
48.	Hilikha	<i>Terminalia chebula</i>	Abundant
49.	Holock	<i>Terminalia myriocarpa</i>	Abundant
50.	Hollong	<i>Dipterocarpus macrocarpus</i>	Endangered
51.	Jalpai	<i>Elaeocarpus floribundus</i>	Abundant
52.	Jamak	<i>Syzygium cumini</i>	Abundant
53.	Jawa	<i>Holigama longifolia</i>	Abundant
54.	Morolia	<i>Macranga denticulate</i>	Abundant
55.	Jia	<i>Lannea grandis</i>	Abundant
56.	Jinari	<i>Podocarpus nerifolia</i>	RET
57.	Joba-hingori	<i>Stoanea assamica</i>	Abundant
58.	Jutuli	<i>Altingia excelsa</i>	Abundant
59.	Kadam, Raghu	<i>Anthocephalus indicus</i>	Abundant
60.	Kharipati-dimoru	<i>Ficus nervosa</i>	Abundant
61.	Kathal	<i>Artocarpus integrifolius</i>	Abundant
62.	Kathal-sopa	<i>Michelia manii</i>	Abundant
63.	Khakan	<i>Duabanga grandiflora</i>	Abundant
64.	Khorikedwa	<i>Artocarpus gomezianus</i>	Abundant
65.	Khorikasopa	<i>Talauma phellocarpa</i>	Abundant
66.	Koliori	<i>Mitrephora tomentosa</i>	Abundant
67.	Bor-Koliori	<i>Polyathia simiarum</i>	Abundant
68.	Koroi	<i>Albizia procera</i>	Abundant
69.	Kuhir	<i>Bridelia retusa</i>	Abundant
70.	Kurial, Kanchan	<i>Bauhinia purpurea</i>	Abundant
71.	Leluk	<i>Beilschmiedia bramdissii</i>	Endangered
72.	Lamtem	<i>Gynocardia odorata</i>	Endangered
73.	Leteku	<i>Baccaurea sapida</i>	Endangered
74.	Lewa	<i>Engelhardtia spicata</i>	Endangered
75.	Maskoita	<i>Callicarpa arborea</i>	Endangered
76.	Madar	<i>Erythrina stricia</i>	Abundant
77.	Maiphak	<i>Evodia meliaefolia</i>	Endangered
78.	Mekai	<i>Shorea assamica</i>	Abundant
79.	Medelua	<i>Dalbergia assamica</i>	Abundant
80.	Mekahi	<i>Phoebe cooperiana</i>	Abundant
81.	Moj	<i>Albizia lucida</i>	Abundant

82.	Morhal	<i>Vatica lanceaefolia</i>	Endangered
83.	Morolia	<i>Massous albus</i>	Abundant
84.	Motanahor	<i>Pterospermum lanceaefolium</i>	Endangered
85.	Patihunda	<i>Cinnamomum obtusifolium</i>	Abundant
86.	Nagaudal, Hirikh	<i>Sterculia guttata</i>	Abundant
87.	Nahor	<i>Mesua ferrea</i>	Abundant
88.	Odal	<i>Sterculia villosa</i>	Endangered
89.	Outenga	<i>Dillenia indica</i>	Abundant
90.	Oxi	<i>Dillenia pentagyna</i>	Abundant
91.	Pahari	<i>Sterculia alata</i>	Abundant
92.	Panikadam	<i>Hymenodictyon excelsum</i>	Endangered
93.	Pan-sopa	<i>Michelia montana</i>	Abundant
94.	Paroli	<i>Stereospermum chelonoides</i>	Abundant
95.	Phakdima, Phulgamari	<i>Trema orientalis</i>	Abundant
96.	Phulkata	<i>Styrax serrulatum</i>	Endangered
97.	Phulsopa	<i>Manglietia insignis</i>	Abundant
98.	Pichola	<i>Kydia calycina</i>	Abundant
99.	Poma	<i>Toona ciliate</i>	Abundant
100.	Ramanbih	<i>Aesculus punduana</i>	Abundant
101.	Rudraksha	<i>Elaeocarpus genitrus</i>	Abundant
102.	Sam	<i>Artocarpus chaplasi</i>	Abundant
103.	Satiana	<i>Alstonia scholaris</i>	Abundant
104.	Celeng	<i>Sepium baccatum</i>	Abundant
105.	Simol	<i>Salmalia malabarica</i>	Abundant
106.	Sirish	<i>Alibizia lebbek</i>	Abundant
107.	Sissoo	<i>Dalbergia sissoo</i>	Abundant
108.	Sopa	<i>Michelia manipurensis</i>	Abundant
109.	Tepor	<i>Garcinia xanphochymus</i>	Endangered
110.	Thekera	<i>Garcinia Sp</i>	Endangered
111.	Tezpat	<i>Cinnamomum tamala</i>	Abundant
112.	Thutmala	<i>Garuga pinnata</i>	Abundant
113.	Titasopa	<i>Michelia champaca</i>	Abundant
114.	Urium	<i>Bischofia javanica</i>	Abundant
Bamboo			
1	Bhaluka	<i>Bambusa balcooa</i>	Abundant
2	Kotoha, Kotabanh	<i>Bambusa bambos</i>	Abundant
3	Beti banh	<i>Bambusa mastersii.</i>	Abundant
4	Deobanh, Jotia,	<i>Bambusa nutans</i>	Abundant
5	Bijuli, Jowa, Makal.	<i>Bambusa pallida</i>	Abundant
6	Bhaluki, paura	<i>Bambusa teres</i>	Abundant
7	Jati, Nal banh.	<i>Bambusa tulda</i>	Abundant
8	Karail, Jati	<i>Dendrocalamus strictus</i>	Abundant
9	Worra	<i>Dendrocalamus giganteus.</i>	Abundant
10	Kakoa, Kakeo banh	<i>Dendrocalamus hamiltonii.</i>	Abundant

11	Madang	Schizostachyum pergracile	Abundant
12	Behti banh	Schizostachyum griffithii	Abundant
13	Dalu banh	Schizostachyum dullooa	Abundant
14	Bajal banh, bajah banh.	Schizostachyum polymorphum	Abundant
15	Tarai banh, Nah banh, Muli banh.	Melocanna baccifera=M.bambusoides	Abundant
Shrubs			
1.	Bahaka	<i>Adhatoda vasica</i>	Abundant
2.	Betibah	<i>Bambusa mastprsii</i>	Abundant
3.	Bhang	<i>Cannabis sativa</i>	Abundant
4.	Bhekuri	<i>Solanum indicum</i>	Abundant
5.	Bogitora	<i>Alpinia allughas</i>	Abundant
6.	Bajalbah	<i>Pseudospachyum polymorphum</i>	Endangered
7.	Bon-madhuriam	<i>Pyrenaria barringtoniaefolia</i>	Abundant
8.	Bon-pasala	<i>Sarauja roxburghil</i>	Abundant
9.	Bon-manmani	<i>Centella asiatica</i>	Abundant
10.	Bon-medula	<i>Cassia tora</i>	Abundant
11.	Dhopat-tita	<i>Clerodendron infortunatum</i>	Abundant
12.	Dighloti	<i>Litsaea salicifolia</i>	Abundant
13.	Ekra	<i>Sclerosiachya fusca</i>	Abundant
14.	Eragocs	<i>Ricinus communis</i>	Abundant
15.	Ramtamul	<i>Pinanga gracilus</i>	Endangered
16.	Harumanimuni	<i>Hydrocotyle rotundifolia</i>	Abundant
17.	Haukabat	<i>Zalacca seceunda</i>	Abundant
18.	Heloch	<i>Antidesma ghaesembilia</i>	Abundant
19.	Jarmonibon	<i>Eupatorium odoratum</i>	Abundant
20.	Jatibah	<i>Bambusa tulda</i>	Abundant
21.	Jatibet	<i>Calamus tenuis</i>	Endangered
22.	Jengu	<i>Licuala peltata</i>	Abundant
23.	Lejaibet	<i>Calamus floribundus</i>	Endangered
24.	Kakobah	<i>Dendrocalamus hamiltonii</i>	Abundant
25.	Kasidoria	<i>Myrsine capipellata</i>	Abundant
26.	Kathandaphul	<i>Coffea bengalensis</i>	Abundant
27.	Kwpat	<i>Phrynium parviflorum</i>	Abundant
28.	Kush	<i>Saccharum sponpancum</i>	Abundant
29.	Makhioti	<i>Moghania strobilifera</i>	Abundant
30.	Meghela	<i>Narenga porphyrocoma</i>	Abundant
31.	Nol	<i>Phragmites karka</i>	Abundant
32.	Patidoi	<i>Schumannianthus dichotomus</i>	Abundant
33.	Phutkula	<i>Melastoma melabathrcium</i>	Abundant
34.	Sorat	<i>Laoportia cremulata</i>	Abundant
35.	Titaphul	<i>Phlogacanthus thyrsoflorus</i>	Abundant
36.	Tokopat	<i>Livistonia jenkinsiana</i>	Endangered
37.	Makalbah	<i>Bambusa pallida</i>	Abundant
38.	Kukurathengia	<i>Leea sambucina</i>	Abundant

Climbers and woody climbers			
Sl No.	Scientific Name	Family	Status
1	<i>Ampelopsis nerrifolia</i> D.Don.	Vitaceae	Abundant
2	<i>Ampelopsis rubifolia</i> Planch.	Vitaceae	Abundant
3	<i>Cissampelos Pereira</i> Lin.	Manispermaceae	Abundant
4	<i>Cyclea bicristata</i> (Griff).	Menispermaceae	Endangered
5	<i>Dalbergia pinnata</i> (Lour) Prain.	Papilionaceae	Abundant
6	<i>Derris ferruginea</i> Benth.	Papilionaceae	Endangered
7	<i>Dioscorea bulbifera</i> L	Dioscoreaceae	Abundant
8	<i>D.glabra</i> Roxb.	Dioscoreaceae	Abundant
9	<i>Enantheum album</i> .Nees.	Acanthaceae	Abundant
10	<i>Erythralium scandens</i> Bl.	Oleaceae	Abundant
11	<i>Ficus villosa</i> Bl.	Moraceae	Abundant
12	<i>Fissistigma wallichii</i> (Hkf) Thm.	Annonaceae	Abundant
13	<i>Gnetum scandens</i> Roxb.	Gnetaceae	Abundant
14	<i>Hoya longifolia</i> Wall.ex Wight.	Asclepiaceae	Abundant
15	<i>H. parasitica</i> Wall.	Asclepiaceae	Abundant
16	<i>H. vaccinioides</i> Hook.f.	Asclepiaceae	Abundant
17	<i>Jesminum anastomosans</i> Wall	Oleaceae	Abundant
18	<i>J. attenuatum</i> Roxb	Oleaceae	Abundant
19	<i>J. dispersum</i> Wall	Oleaceae	Endangered
20	<i>J. lanceolaria</i> Roxb	Oleaceae	Abundant
21	<i>J.laurifolium</i> Roxb	Oleaceae	Abundant
22	<i>Marsdenia tinctoria</i> Br	Asclepiaceae	Abundant
23	<i>Mikania micrantha</i> H.B&K	Asteraceae	Endangered
24	<i>Mimosa himalayana</i> Gamble	Mimosaceae	Abundant
25	<i>Modecca trilobata</i> Roxb	Passifloraceae	Endangered
26	<i>Myrioneuron smilacifolia</i> Wall.	Oleaceae	Abundant
27	<i>Myxopyrum smilacifolium</i> .Bl	Oleaceae	Abundant
28	<i>Oxymitra fornicata</i> (Roxb.) Hook. f. &	Annonaceae	Abundant
29	<i>Pericampylus glaucus</i> (Colebr) Miers	Menispermaceae	Abundant
30	<i>Piper attenuatum</i> Ham.	Piperaceae	Abundant
31	<i>P. griffithii</i> C.DC.	Piperaceae	Abundant
32	<i>P. hymanophyllum</i> Miq.	Piperaceae	Abundant
33	<i>P. syvaticum</i> Roxb.	Piperaceae	Abundant
34	<i>Polygonum chinense</i> . Linn.	Polygonaceae	Abundant
35	<i>Pothos cathcartii</i> Schott.	Araceae	Abundant
36	<i>Rapidophora hookari</i> (Scott).	Araceae	Abundant
37	<i>Rourea caudata</i> Planch.	Connaraceae	Abundant
38	<i>Rubus hamiltoni</i> Hk.f .	Rosaceae	Endangered
39	<i>Sabia limoniaceae</i> Wall.	Sabiaceae	Abundant
40	<i>Smilax lancaefolia</i> Roxb.	Liliaceae	Abundant
41	<i>Stemona tuberosa</i> Lour.	Stemonaceae	Abundant
42	<i>Stephania glandulifera</i> Nees.	Menispermaceae	Endangered

43	<i>S.hernandifolia</i> (Wall) Walp.	Manispermaceae	Abundant
44	<i>Tetracera sarmentosa</i> L.	Deliniaceae	Endangered
45	<i>Tetrastigma planicaulata</i> Hk.f.	Vitaceae	Abundant
46	<i>Thunbergia coccinea</i> Wall.	Acanthaceae	Abundant
47	<i>T. grandiflora</i> Roxb.	Acanthaceae	Abundant
48	<i>Vitis capriolata</i> D.Don.	Vitaceae	Abundant
49	<i>V. elongata</i> Wall.	Vitaceae	Abundant
50	<i>V.lanceolaria</i> Roxb.	Vitaceae	Abundant
51	<i>V. trifolia</i> Linn	Vitaceae	Abundant
Orchids			
Sl. no	Species	Flowering	Habitat
Acampe			
1	<i>Acampe praemorsa</i> (roxburgh)	Nov – Dec	Epiphyte on tree trunk
2	<i>Epidendrum praemorsum</i>	Nov – Dec	Epiphyte on tree trunks or large branches.
3	<i>Acampe rigida</i>	June – July	Epiphyte on tree trunks or large branches.
Acanthephippium			
4	<i>Acanthephippium striatum</i>	June – July	Grow in shaded and humid places in dense forests, banks of streams
Aerides			
5	<i>Aerides multiflora</i>	May – July	Shaded and humid places in dense forests, banks of streams
6	<i>Aerides odorata</i>	May – June	Epiphyte in lowland forest
Agrostophyllum			
7	<i>Agrostophyllum planicaule</i>	Aug – Oct	Epiphyte deciduous and humid forest
8	<i>Agrostophyllum khasianum</i>	Aug – Oct	Epiphyte deciduous and humid forest
Bryobium			
9	<i>Bryobium pudicum</i>	April – Aug	Epiphyte, deciduous and evergreen forest
Bulbophyllum			
10	<i>Bulbophyllum affine</i>	June – Aug	Epiphyte, humid forest
11	<i>Bulbophyllum andersonii</i>	October	Epiphyte, humid forest
12	<i>Bulbophyllum careyanum</i>	October – December	Epiphyte on tree trunks in humid forest
13	<i>Bulbophyllum delitescens</i>	June – July	Epiphyte in humid evergreen near a waterfall
14	<i>Bulbophyllum odoratissimum</i>	May – Sept	Epiphyte in humid evergreen near a waterfall
15	<i>Bulbophyllum roxburghii</i>	April – July	Epiphytic in evergreen forest
16	<i>Bulbophyllum spathulatum</i>	April	Epiphytic in evergreen forest
Calanthe			
17	<i>Calanthe sylvatica</i>	Aug – Sept	Terrestrial in damp places
Callostylis			
18	<i>Callostylis rigida</i>	Jan – March.	Epiphytic on trees in mixed forests
Ceratostylis			
19	<i>Ceratostylis subulata</i>	May – Aug	Epiphyte in dense humid forest

	Cleisocentron		
20	<i>Cleisocentron pallens</i>	June – July	Epi. on tree trunks humid forests
21	<i>Cleisocentron trichromum</i>	Jan – March	Epiphytic on trees in mixed forests
	Cleisostoma		
22	<i>Cleisostoma appendiculatum</i>	Aug– Oct	Epiphytic, tree trunks in evergreen forests
23	<i>Cleisostoma filiforme</i>	April – June	Epiphytic, tree trunks in evergreen forests
24	<i>Cleisostoma paniculatum</i>	Sept – Feb	Epiphytic, tree trunks in evergreen forests
25	<i>Cleisostoma simondii</i>	Aug– Oct	Epiphyte, thick-barked tree trunks in humid forest
26	<i>Cleisostoma subulatum</i>	May – June	Epiphyte, tree trunk in dense humid forest
	Coelogyne		
27	<i>Coelogyne fimbriata</i>	Oct– Dec	Epiphyte, on tree trunk in humid forest
28	<i>Coelogyne ovalis</i>	Aug– Dec	Epiphyte on tree trunk in humid forest
29	<i>Collabium chinense</i>	June – July	Shaded and humid places in dense forests
	Crepidium		
30	<i>Crepidium acuminatum</i>	June – July	Terrestrial in dense evergreen forest on rocky terrain, also in the lowlands
	Cymbidium		
31	<i>Cymbidium aloifolium</i>	April – May	Epiphyte on tree trunk in humid forest
32	<i>Cymbidium bicolor</i>	May – June	Epiphyte on tree trunk in humid forest
33	<i>Cymbidium dayanum</i>	June – July	Epiphyte on tree trunk in humid forest
	Dendrobium		
34	<i>Dendrobium acinaciforme</i>	June – Aug	Epiphyte on tree trunk in humid forest
35	<i>Dendrobium aduncum</i>	May	Epiphyte on a small tree evergreen forest
36	<i>Dendrobium aphyllum</i>	April – May	Epiphyte in mixed deciduous forest
37	<i>Dendrobium densiflorum</i>	April – July	Epiphyte tree trunk in evergreen forest
38	<i>Dendrobium fimbriatum</i>	March – May	Epiphyte in humid evergreen forest
39	<i>Dendrobium fugax</i>	March – October	Epiphyte, evergreen, mixed deciduous forest
40	<i>Dendrobium litiiflorum</i>	April – May	Epiphytic on tree trunks in open forests
41	<i>Dendrobium moschatum</i>	April – June	Epiphytic on tree trunks in open forests
42	<i>Dendrobium nobile</i>	April – May	Epiphyte, humid evergreen forest, in lowlands
43	<i>Dendrobium stuposum</i>	June – Aug	Epiphytic, tree trunks, open, mountain forests
44	<i>Dendrobium sulcatum</i>	April – May	Epiphytic on tree trunks in dense forests
45	<i>Dendrobium terminale</i>	April – June	Epiphytic on tree trunks at forest
46	<i>Dendrobium transparens</i>	April – May	Epiphytic on tree trunks at forest

	Didymoplexis		
47	<i>Didymoplexis pallens</i>	May – June	Terrestrial, growing in bamboo forest
	Dienia		
48	<i>Dienia ophrydis</i>	May – June	Terrestrial in open humid evergreen forest
	Eria		
49	<i>Eria connata</i>	July – Sept	Epiphyte in dense humid evergreen forest
50	<i>Eria ferruginea</i>	June – July	Epiphyte in dense humid evergreen forest
51	<i>Eria lasiopetala</i>	March – April	Epiphyte in humid forest
	Eulophia		
52	<i>Eulophia dabia</i>	Aug – Dec	Terrestrial, grow on open and loose soil
	Gastrochilus		
53	<i>Gastrochilus calceolaris</i>	Oct – Nov	Epiphyte in humid forest
54	<i>Gastrochilus dasypogon</i>	Oct – Nov	Epiphyte in humid forest
55	<i>Gastrochilus inconspicuus</i>	June – July	Epiphyte, humid evergreen forest
	Geodorum		
56	<i>Geodorum densiflorum</i>	June – July	Terrestrial in evergreen forest, grass land
	Goodyera		
57	<i>Goodyera procera</i>	April – June	Terrestrial, bank of a small stream and in evergreen forest, also on rock in a stream
	Habenaria		
58	<i>Habenaria stenopetala</i>	Aug – Oct	Terrestrial in evergreen forest
	Hetaeria		
59	<i>Hetaeria affinis</i>	Jan– Feb	Terrestrial, secondary evergreen forest
	Liparis		
60	<i>Liparis mannii</i>	Nov– Jan	Epiphyte in humid evergreen forest
61	<i>Liparis viridiflora</i>	April – May	Epiphyte in humid evergreen forest
	Luisia		
62	<i>Luisia trichorrhiza</i>	March – May	Epiphyte, humid forest, grow on exposed trees
63	<i>Luisia tristis</i>	April – May	Epiphyte in humid evergreen forest,
	Micropera		
64	<i>Micropera rostrata</i>	April – May	Epiphyte on tree trunk in evergreen forest
	Mycarantes		
65	<i>Mycarantes floribunda</i>	Dec – March	Epiphyte in dense humid evergreen forest
66	<i>Mycarantes panneae</i>	May – July	Epiphyte in dense evergreen forest
67	<i>Micropera rostrata</i>	April – May	Epiphyte on tree trunk in tropical forest
	Nervilia		
68	<i>Nervilia juliana</i>	May – July	Terrestrial, grow on open and loose soil
	Oberonia		
69	<i>Oberonia mucronata</i>	Sept – Oct	Epiphyte on tree trunk in tropical forest
	Papilionanthe		
70	<i>Papilionanthe teres</i>	April – May	Epiphyte, mixed deciduous forest,

			also on solitary roadside trees
	Phaius		
71	<i>Phaius mishmensis</i>	Nov – Jan	Terrestrial, in e humid evergreen forest
72	<i>Phaius tankervilleae</i>	Nov – Jan	Terrestrial, damp places in forests
	Phalaenopsis		
73	<i>Phalaenopsis delicosa</i>	May – July	Epiphyte along a large river, in a shady spot in humid evergreen forest
74	<i>Phalaenopsis mannii</i>	March – May	Epiphytic on tree trunks in EG forests
75	<i>Phalaenopsis parishii</i>	March – April	Epiphytic on tree trunks in open forests
	Pholidota		
76	<i>Pholidota articulata</i>	July – Oct	Epiphyte in dense humid evergreen forest close to a waterfall
77	<i>Pholidota imbricata</i>	June – Aug	Epiphyte on tree humid evergreen forest
	Pinalia		
78	<i>Pinalia acervata</i>	May – July	Epiphyte in dense humid evergreen forest
79	<i>Pinalia amica</i>	March – May	Epiphyte in dense humid evergreen forest
80	<i>Pinalia pumila</i>	Jan – March	Epiphyte, humid forest
	Podochilus		
81	<i>Podochilus cultratus</i>	April – May	Epiphyte, tree trunk, wet evergreen forest
	Pomatocalpa		
82	<i>Pomatocalpa undulatum</i>	March – May	Epiphyte in the wet evergreen forest
	Rhynchostylis		
83	<i>Rhynchostylis retusa</i>	May – June	Epiphyte, evergreen, mixed deciduous forest,
	Robiquetia		
84	<i>Robiquetia spatulata</i>	May – July	Epiphyte humid evergreen forest
	Spiranthes		
85	<i>Spiranthes sinensis</i>	June – Aug	Epiphyte in wet evergreen tropical forest
86	<i>Podochilus khasianus</i>	Feb-April	Terrestrial in open grassland
	Tainia		
87	<i>Tainia latifolia</i>	March – May	Terrestrial, dense humid evergreen forest
88	<i>Tainia minor</i>	June – Aug	Terrestrial, dense humid evergreen forest
	Thelasis		
89	<i>Thelasis longifolia</i>	June – Aug	Epiphytic in evergreen forest
	Thrixspermum		
90	<i>Thrixspermum centipeda</i>	May – Aug	Epiphyte, mixed deciduous humid forest
	Trichotosia		
91	<i>Trichotosia velutina</i>	Aug – Sept	Epiphyte on tree trunks in humid forest
	Tropidia		
92	<i>Tropidia curculigoides</i>	Sept – Nov	Terrestrial, dense humid evergreen forest

	Vanda		
93	<i>Vanda tessellata</i>	April – June	Epiphytic on trees in mixed forests
94	<i>Vanda testacea</i>	May – June	Epiphytic on tree trunks in dense forests
	Zeuxine		
95	<i>Zeuxine glandulosa</i>	March- April	Grow in dense forest, shady place
96	<i>Zeuxine goodyeroides</i>	Jan – Feb	Grow in dense forest, shady place
97	<i>Zeuxine lindleyana</i>	March – April	Terrestrial, growing in grass land
98	<i>Zeuxine strateumatica</i>	Jan–March	Terrestrial, growing in grass land

Source: A checklist of orchids in Tinsukia District by Khyanjeet Gogoi, Daisa Bordoloi Nagar, Talap, Tinsukia in East Himalayan Society for Spermatophyte Taxonomy ISSN: 0973-9467

iv) List of Fauna in Digboi Division, Assam

The Digboi forest division provides suitable habitat for a diverse fauna. The detail list of different Fauna found in this division is shown in table below.

Table ES.4: List of diverse fauna found in Digboi forest division, Assam

Mammals			
Sl. No.	Vernacular Name	Scientific Name	Status
1	Chinese Pangolin	<i>Manis pentadactyla</i>	Rare
2	Flying fox	<i>Pteropus giganteus</i>	Rare
3	Slow Loris	<i>Nycticebus bengalensis</i>	Threatened
4	Stump-tailed Macaque	<i>Macaca arctoides</i>	Rare
5	Assamese Macaque	<i>Macaca assamensis</i>	Common
6	Northern Pig-tailed Macaque	<i>Macaca leonina</i>	Rare
7	Pig tailed macaque	<i>M. nemestrina</i>	Rare
8	Rhesus Macaque	<i>Macaca mulata</i>	Threatened
9	Capped Langur	<i>Trachypithecus pileatus</i>	Common
10	Western Hoolock Gibbon	<i>Hoolock hoolock</i>	Threatened
11	Asiatic black bear	<i>Ursus thibetanus</i> (Schedule-1)	Few
12	Malayan Sunbear Sloth Bear	<i>Melursus ursinus</i>	Rare
13	Indian Wild Dog (Dhole)	<i>Cuon alpinus</i>	Rare
14	Yellow throated marten	<i>Martes flavigula</i>	Threatened
15	Hog Badger	<i>Arctonyx collaris</i>	Threatened
16	Binturong	<i>Arctictis binturong</i>	Threatened
17	Jackal	<i>Canis aureus</i>	Threatened
18	Jungle Cat	<i>Felis chaus</i>	Common
19	Fishing Cat	<i>Prionailurus viverrinus</i>	Rare
20	Golden Cat	<i>Catopuma temminckii</i>	Rare
21	Leopard Cat	<i>Prionailurus bengalensis</i>	Enadangered
22	Marble Cat	<i>Pardofelis marmorata</i>	Enadangered
23	Clouded Leopard	<i>Neofelis nebulosa</i>	Enadangered
24	Common Leopard	<i>Panthera pardus</i>	Few
25	Royal Bengal Tiger	<i>Panthera tigris</i>	Enadangered
26	Asian Elephant	<i>Elephus maximus</i>	Enadangered
27	Wild Pig	<i>Sus scrofa</i>	Common

28	Sambar	<i>Cervus unicolor</i>	Rare
29	Indian Muntjac	<i>Muntiacus muntjak</i>	Threatened
30	Small Indian Civet	<i>Viverricula indica</i>	common
31	Large Indian Civet	<i>Viverra zibetha</i>	Common
32	Common Palm Civet	<i>Paradoxurus jerdoni</i>	Rare
33	Masked Palm Civet	<i>Paguma larvata</i>	Rare
34	Crab Eating Mongoose	<i>Herpestes urva</i>	Common
35	Grey Mongooses	<i>Herpestes edwardsii</i>	Common
36	Small Asian Mongoose	<i>Herpestes javanicus</i>	Common
37	Small Asian Clawed Otter	<i>Amblonyx cinereus</i>	Rare
38	Gaur (dung and tracks).	<i>Bos gaurus</i>	Threatened
39	Serow	<i>Capricornis Sumatraensis</i>	Rare
40	Malayan Giant Squirrel	<i>Ratufa bicolor</i>	Rare
41	Hoary-bellied Himalayan Squirrel	<i>Callosciurus pygerythrus</i>	Threatened
42	Pallas' red-bellied squirrel	<i>Callosciurus erythraeus</i>	Common
43	Himalayan Stripped Bellied Squirrel	<i>Tamias maclellandii</i>	Common
44	Northern Red Giant Flying Squirrel	<i>Petaurista petaurista candidula</i>	Common
45	Asian Red-cheeked squirrel	<i>Dremomys rufigenis</i>	Common
46	Parti-coloured flying squirrel	<i>Hylopetes alboniger</i>	Common
47	Hoary bamboo rat	<i>Rhizomys pruinosus</i>	Common
48	Chinese or crestless Himalayan porcupine	<i>Hystrix brachyura</i>	Rare
49	Brushtailed Porcupine	<i>Atherurus macrourus</i>	Rare
50	Rhifous tailed hare	<i>Lepus nigricollis Syn.ruficaudatus</i>	Threatened
51	Chinese Pangolin	<i>Manis pentadactyla</i>	Threatened
52	White-tailed Mole	<i>Parascaptor sp.</i>	Rare
53	House Rat	<i>Rattus rattus</i>	Common
54	Himalayan Rat	<i>Rattus nitidus</i>	Common
55	House mouse	<i>Mus musculus</i>	Common
56	Northern tree shrew	<i>Tupaia belangeri</i>	Common
57	Indian Flying Fox	<i>Pteropus giganteus</i>	Treated
58	Dobson's Horseshoe Bat	<i>Rhinolophus yunnanensis</i>	Common
59	Greater False Vampire Bat	<i>Megaderma lyra</i>	Common
Avifauna (Birds)			
	Phasianidae		
1	Red Jungle Fowl	<i>Gallus gallus</i>	R, C
2	White-cheeked Partridge	<i>Arborophila atrogularis</i>	R, r (NT)
3	Rufous-throated Partridge	<i>Arborophila rufogularis</i>	R, r
4	Kaleej Pheasant	<i>Lophura leucomelanos</i>	R, r
5	Grey Peacock Pheasant	<i>Polyplectron bicalcaratum</i>	R, r
6	Barred Buttonquail	<i>Turnix suscitator</i>	R, C
7	Small Buttonquail	<i>Turnix sylvatica</i>	R, C
8	Blue-breasted Quail	<i>Coturnix chinensis</i>	R, r
9	Black Francolin	<i>Francolinus francolinus</i>	R, C

10	Swamp Francolin	<i>Francolinus gularis</i>	R, r, VU
	Anatidae		
11	Ruddy Shelduck	<i>Tadorna ferruginea</i>	WM, C
12	White-wing Wood Duck	<i>Cairina scutulata</i>	R, r (EN)
13	Lesser Whistling Teal	<i>Dendrocygna javanica</i>	R, C
14	Openbill stork	<i>Anastomus oscitans</i>	R, C
15	Lesser Adjutant Stork	<i>Leptoptilos javanicus</i>	R, C (VU)
	Ardeidae		
16	Cattle Egret	<i>Bulbulcus ibis</i>	R, C
17	Little Egret	<i>Egretta garzetta</i>	R, C
18	Large Egret	<i>Casmerodius albus</i>	R, C
19	Little Heron	<i>Butorides striatus</i>	R, C
20	Indian Pond Heron	<i>Ardeola grayii</i>	R, C
21	Cinnamon Bittern	<i>Ixobrychus cinnamomeus</i>	R, r
22	Yellow Bittern	<i>Ixobrychus sinensis</i>	R, r
	Phalacrocoracidae		
23	Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	R, r
24	Great Cormorant	<i>Phalacrocorax carbo</i>	WM, C
25	Little Cormorant	<i>Microcarbo niger</i>	R, C
	Anhingidae		
26	Oriental Darter	<i>Anhinga melanogaster</i>	NT, R, r
	Accipitridae		
27	Crested Serpent Eagle	<i>Spilornis cheela</i>	R, C
28	Eurasian Sparrowhawk	<i>Accipiter nisus</i>	R, C
29	Crested Goshawk	<i>Accipiter trivirgatus</i>	R, r
30	Pied Harrier	<i>Circus melanoleucos</i>	WM, r
31	Black Kite	<i>Milvus migrans</i>	R, r
32	Shikra	<i>Accipiter badius</i>	R, C
33	Long-billed Vulture	<i>Gyps indicus</i>	R, r (CR)
34	Indian White-backed Vulture	<i>Gyps bengalensis</i>	CR, R, r
35	Greater Grey-headed Fish-Eagle	<i>Ichthyophaga ichthyaetus</i>	NT, R, r
	Falconidae		
36	Common Kestrel	<i>Falco tinnunculus</i>	WM, C
	Rallidae		
37	White-breasted Waterhen	<i>Amaurornis phoenicurus</i>	R, C
38	Water Cock	<i>Gallicrex cinerea</i>	R, r
39	Purple Moorhen	<i>Porphyrio porphyrio</i>	WM, C
40	Common Moorhen	<i>Gallinula chloropus</i>	WM, C
	Charadriidae		
41	Little-ring Plover	<i>Charadrius dubius</i>	R, C
42	Lesser Sand Plover	<i>Charadrius mongolus</i>	WM, C
43	Little Stint	<i>Calidris minuta</i>	WM, C
44	Red-wattled Lapwing	<i>Vanellus indicus</i>	R, C
45	River Lapwing	<i>Vanellus duvaucelii</i>	R, C

	Scolopacidae		
46	Common Snipe	<i>Gallinago gallinago</i>	WM, r
47	Pintail Snipe	<i>Gallinago stenura</i>	WM, C
48	Common Greenshank	<i>Tringa nebularia</i>	
49	Common Sandpiper	<i>Actitis hypoleucos</i>	WM, C
	Laridae		
50	River Tern	<i>Sterna aurantia</i>	WM, C
	Columbidae		
51	Pompadour Green Pigeon	<i>Treron pompadoura</i>	R, C
52	Yellow-footed Green Pigeon	<i>Treron phoenicoptera</i>	R, C
53	Thick-billed Green Pigeon	<i>Treron curvirostra</i>	R, C
54	Pin-tailed Green Pigeon	<i>Treron apicauda</i>	R, C
55	Wedge-tailed Green Pigeon	<i>Treron sphenura</i>	R, C
56	Green Imperial Pigeon	<i>Ducula aenea</i>	R, C
57	Mountain Imperial Pigeon	<i>Ducula badia</i>	R, C, VU
58	Purple Wood Pigeon	<i>Columba pulchricollis</i>	R, C
59	Ashy Wood Pigeon	<i>Columba pulchricollis</i>	
60	Spotted Dove	<i>Streptopelia chinensis</i>	R, C
61	Oriental Turtle Dove	<i>Streptopelia orientalis</i>	R, r
62	Red Collared Dove	<i>Streptopelia tranquebarica</i>	R, r
63	Emerald Dove	<i>Chalcophaps indica</i>	R, r
64	Eurasian Collard Dove	<i>Streptopelia decaocto</i>	R, r
65	Barred Cuckoo Dove	<i>Macropygia unchall</i>	R, r
	Psittacidae		
66	Rose-ringed Parakeet	<i>Psittacula krameri</i>	R, C
67	Alexandrine Parakeet	<i>Psittacula eupatria</i>	R, C
68	Red-breasted Parakeet		R, C
69	Blossom-headed Parakeet		R, r
	Cuculidae		
70	Drongo Cuckoo	<i>Surniculus lugubris</i>	SM, r
71	Large Hawk Cuckoo	<i>Heiropoccyx sparveroides</i>	
72	Common Hawk Cuckoo	<i>Heiropoccyx varius</i>	R, r
73	Indian Cuckoo	<i>Cuculus micropterus</i>	R, C
74	Rufous-bellied Plaintive Cuckoo	<i>Cacomantis merulinus</i>	R, r
75	Pied Crested Cuckoo	<i>Clamator jacobinus</i>	SM, r
76	Red-winged Crested Cuckoo	<i>Clamator coromandus</i>	R, r
77	Asian Koel	<i>Eudynamys scolopacea</i>	R, C
78	Green-billed Malkoha	<i>Phaenicophaeus tristis</i>	R, C
79	Lesser Coucal	<i>Centropus bengalesis</i>	R, C
80	Greater Coucal	<i>Centropus sinensis</i>	R, C
	Strigidae		
81	Spotted Owlet	<i>Athene brama</i>	R, r
82	Collared Owlet	<i>Glaucidium brodiei</i>	R, r
83	Asian Barred Owlet	<i>Glaucidium cuculoides</i>	R, r

84	Brown Fish Owl	<i>Ketupa zeylonensis</i>	R, r
85	Spotted Scops Owl	<i>Otus spilocephalus</i>	R, r
	Caprimulgidae		
86	Grey Nightjar	<i>Caprimulgus indicus</i>	R, r
	Apodidae		
87	Asian Palm Swift	<i>Cypsiurus balasiensis</i>	R, C
88	Himalayan Swiftlet	<i>Collocalia fuciphaga</i>	R, r
89	House Swift	<i>Apus affinis</i>	R, C
	Trogonidae		
90	Red-headed Trogon	<i>Herpactes erythrocephalus</i>	R, C
	Coraciidae		
91	Indian Roller	<i>Coracias benghalensis</i>	R, C
92	Oriental Broad-billed Roller	<i>Eurystomus orientalis</i>	
	Alcedinidae		
93	White-breasted Kingfisher	<i>Halcyon smyrensis</i>	R, C
94	Common Kingfisher	<i>Alcedo atthis</i>	R, C
95	Crested Kingfisher	<i>Magaceryle lugubris</i>	R, C
96	Ruddy Kingfisher	<i>Halcyon coromanda</i>	R, r
97	Oriental Dwarf Kingfisher	<i>Ceyx erithacus</i>	R, r
98	Pied Kingfisher	<i>Ceryle rudis</i>	R, C
99	Blue-eared Kingfisher	<i>Alcedo meninting</i>	R, r
100	Stork-billed Kingfisher	<i>Halcyon capensis</i>	R, r
	Meropidae		
101	Green Bee-eater	<i>Merops orientalis</i>	R, C
102	Blue-bearded Bee-eater	<i>Nyctyornis athertoni</i>	R, r
	Upupidae		
103	Hoopoe	<i>Upupa epops</i>	R, C
	Bucerotidae		
104	Oriental Pied Hornbill	<i>Anthracoceros albrostris</i>	R, C
105	Brown Hornbill	<i>Anorrhinus tickelli</i>	R, r, En (NT)
106	Wreathed Hornbill	<i>Aceros undulatus</i>	R, C
107	Great Pied Hornbill	<i>Buceros bicornis</i>	R, r (NT)
	Megalaimidae		
108	Coppersmith Barbet	<i>Megalaima haemocephala</i>	R, C
109	Blue-throated Barbet	<i>Megalaima asiatica</i>	R, C
110	Lineated Barbet	<i>Megalaima lineata</i>	R, C
111	Great Barbet	<i>Megalaima virens</i>	R, r
112	Golden-throated Barbet	<i>Megalaima franklinii</i>	R, r
	Picidae		
113	Fulvous-breasted Woodpecker	<i>Dendrocopos macei</i>	R, r
114	Grey-headed Woodpecker	<i>Picus canus</i>	R, r
115	Greater Yellownape Woodpecker	<i>Picus flavinucha</i>	R, C
116	Lesser Yellownape Woodpecker	<i>Picus chlorolophus</i>	R, C
117	Rufous Woodpecker	<i>Celeus brachyurus</i>	R, C

118	Bay Woodpecker	<i>Blythipicus pyrrhotis</i>	R, C
119	Himalayan Flameback	<i>Dinopium shorii</i>	R, C
120	Greater Flameback	<i>Chrysocolaptes lucidus</i>	R, r
121	Pale-headed Woodpecker	<i>Gecinulus grantia</i>	R, r
122	Crimson-breasted Woodpecker	<i>Dendrocopos cathpharius</i>	R, r
123	White-browed Piculet	<i>Sasia ochracea</i>	R, r
124	Speckled Piculet	<i>Picumnus innominatus</i>	R, r
	Pittidae		
125	Blue Pitta	<i>Pita cyanea</i>	R, r
126	Blue-naped Pitta	<i>Pitta nipalensis</i>	R, r
	Aegithinidae		
127	Common Lora	<i>Aegithina tiphia</i>	R, r
	Campephagidae		
128	Rosy Minivet	<i>Pericrocotus roseus</i>	WM, r
129	Scarlet Minivet	<i>Pericrocotus flammeus</i>	R, C
130	Grey-chinned Minivet	<i>Pericrocotus solaris</i>	R, C
131	Long-tailed Minivet	<i>Pericrocotus ethologus</i>	R, C
132	Large Cuckoo-shrike	<i>Coracina macei</i>	R, C
133	Black-winged Cuckoo-shrike	<i>Coracina melaschistos</i>	R, C
134	Large Wood-shrike	<i>Tephrodornis gularis</i>	R, C
135	Pied Flycatcher-shrike	<i>Hemipus picatus</i>	R, r
	Lanidae		
136	Brown Shrike	<i>Lanius cristatus</i>	WM, r
137	Grey-backed Shrike	<i>Lanius tephronotus</i>	R, r
	Monarchidae		
138	Asian Paradise Flycatcher	<i>Terpsiphone paradisi</i>	SM, r
	Motacillidae		
139	White Wagtail	<i>Motacilla alba</i>	WM, C
140	Grey Wagtail	<i>Motacilla cinerea</i>	WM, r
141	Citrine Wagtail	<i>Motacilla citreola</i>	WM, C
142	Paddyfield Pipit	<i>Anthus rufulus</i>	R, C
	Paridae		
143	Great Tit	<i>Parus major</i>	R, C
144	Sultan Tit	<i>Melanochlora sultanea</i>	R, C
145	Green-backed Tit	<i>Parus monticolus</i>	R, r
	Timaliidae		
146	Striated Marsh-Warbler	<i>Megalurus palustris</i>	R, C
147	Abott's babbler	<i>Malacocinda abbotti</i>	R, C
148	Rufous-capped Babbler	<i>Stachyris ruficeps</i>	R, C
149	Golden Babbler	<i>Stachyris chrysaea</i>	R, C
150	Spot-throated Babbler	<i>Pnoepyga albiventris</i>	R, C
151	Pygmy Wren Babbler	<i>Pnoepyga pusilla</i>	R, C
152	Chestnut-capped Babbler	<i>Timalia pileata</i>	R, C
153	White-browed Scimitar Babbler	<i>Pomatorhinus schisticeps</i>	R, C

154	Streak-breasted Scimitar Babbler	<i>Pomatorhinus ruficollis</i>	R, C
155	Wedge-billed Wren Babbler	<i>Sphenocichla humei</i>	R, r, En (NT)
156	Marsh Babbler	<i>Pellorneum palustre</i>	R, r, En (NT)
157	Striped Tit Babbler	<i>Macronous gularis</i>	R, C
158	Yellow-eyed Babbler	<i>Chrysomma sinense</i>	R, C
159	Striated Babbler	<i>Turdoides earlei</i>	R, C
160	Slender-billed babbler	<i>Turdoides longitostris</i>	R, r (VU)
161	Jungle Babbler	<i>Turdoides striatus</i>	R, C
162	Silver-eared Mesia	<i>Leiothrix argentauris</i>	R, C
163	White-crested Laughing Thrush	<i>Garrulax leucolophus</i>	R, r
164	White-throated Laughing thrush	<i>Garrulax albogularis</i>	R, r
165	Greater-necklace Laughing Thrush	<i>Garrulax pectoralis</i>	R, C
166	Lesser-necklace Laughing Thrush	<i>Garrulax monileger</i>	R, C
167	Striated Laughing Thrush	<i>Garrulax striatus</i>	R, C
168	Rufous-vented Laughing Thrush	<i>Garrulax gularis</i>	R, C
169	Rufous-necked Laughing Thrush	<i>Garrulax ruficollis</i>	R, r
170	Blue Rock-Thrush	<i>Monticola solitarius</i>	WM, C
171	Red Faced Liocichla	<i>Liocichla phoenicea</i>	R, C
172	White-naped Yuhina	<i>Yuhina bakeri</i>	R, r, En
173	White-bellied Yuhina	<i>Yuhina zantholeuca</i>	R, r
174	Black-chinned Yuhina	<i>Yuhina nigrimenta</i>	R, r
175	Whiskered Yuhina	<i>Yuhina flavicollis</i>	R, C
176	Nepal Fulvetta	<i>Alcippe nipalensis</i>	R, C
177	Long-tailed Sibia	<i>Heterophasia picaodes</i>	R, C
178	Beautiful Sibia	<i>Heterophasia pulchella</i>	R, r, En
179	Cutia	<i>Cutia nipalensis</i>	R, r
180	Common Tailorbird	<i>Orthotomus sutorius</i>	R, C
181	Mountain Tailorbird	<i>Orthotomus cuculatus</i>	R, C
	Phyllocopidae		
182	Grey-cheeked Warbler	<i>Seicercus poliogenys</i>	R, C
183	Grey-hooded Warbler	<i>Seicercus xanthoschistos</i>	R, C
184	Greenish Warbler	<i>Phylloscopus trochiloides</i>	WM, r
	Cettidae		
185	Black-faced Warbler	<i>Abroscopus schisticeps</i>	R, C
186	Rufous-faced Warbler	<i>Abroscopus albogularis</i>	R, C
187	Grey-sided Bush-warbler	<i>Cettia brunnifrons</i>	R, C
188	Aberrant-bush warbler	<i>Cettia flavolivacea</i>	R, r
	Muscicapidae		
189	Grey-headed Canary-flycatcher	<i>Culicicapa ceylonensis</i>	R, r
190	Pale Blue-flycatcher	<i>Muscicapa unicolor</i>	R, r
191	Little Pied-flycatcher	<i>Ficedula westermanni</i>	R, r
192	White Gorgeted-flycatcher	<i>Ficedula monileger</i>	R, r
193	Sapphire Flycatcher	<i>Ficedula sapphira</i>	R, r
194	Rufous Gorgeted-flycatcher	<i>Ficedula strophciata</i>	R, r

195	Snowy Browed-flycatcher	<i>Ficedula hyperythra</i>	R, r
196	Pygmy Blue-flycatcher	<i>Muscicapella hodgsoni</i>	R, r
197	Magpie Robin	<i>Copsychus saularis</i>	R, C
198	Common Stonechat	<i>Saxicola torquata</i>	WM, r
199	Grey Bushchat	<i>Saxicola ferrea</i>	R, C
200	White-rumped Shama	<i>Copsychus malabaricus</i>	R, r
201	Rufous-breasted Bush Robin	<i>Tarsiger indicus</i>	R, r
202	White-crowned Forktail	<i>Enicurus leschenaulti</i>	R, C
203	Black-backed Forktail	<i>Enicurus immaculatus</i>	R, C
204	Slaty-backed Forktail	<i>Enicurus schistaceus</i>	R, C
205	Small Niltava	<i>Niltava macgrigoriae</i>	R, C
206	Green Cochoa	<i>Cochoa viridis</i>	SM, r
207	White-capped Water-redstart	<i>Chaimarrornis leucocephalus</i>	R, r
208	Daurian Redstart	<i>Phoenicurus aureus</i>	WM, r
209	Plumbeous Water-redstart	<i>Rhyacornis fuliginosus</i>	R, C
	Cisticolidae		
210	Grey-breasted Prinia	<i>Prinia hodgsonii</i>	R, C
211	Striated Prinia	<i>Prinia criniger</i>	R, C
212	Beavan's Prinia	<i>Prinia rufescens</i>	R, C
	Turdidae		
213	Blue Whistling Thrush	<i>Myophonus caeruleus</i>	R, C
214	Orange headed Thrush	<i>Zoothera citrina</i> (SV)	SM, r
215	Scaly Thrush	<i>Zoothera dauma</i>	WM, C
	Chloropseidae		
216	Blue-winged Leafbird	<i>Chloropsis cochinchinensis</i>	R, C
217	Golden-fronted Leafbird	<i>Chloropsis aurifrons</i>	R, C
218	Asian Fairy-bluebird	<i>Irena puella</i>	R, C
	Pycnonotidae		
219	Red-vented Bulbul	<i>Pycnonotus cafer</i>	R, C
220	Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>	R, C
221	White-throated Bulbul	<i>Alophoixus flaveolus</i>	R, C
222	Ashy Bulbul	<i>Hemixos flava</i>	R, C
223	Himalayan Bulbul	<i>Pycnonotus leucogenys</i>	R, r
224	Striated Bulbul	<i>Pycnonotus striatus</i>	R, C
225	Black Bulbul	<i>Hypsipetes leucocephalus</i>	R, r
226	Black-crested Bulbul	<i>Pycnonotus melanicterus</i>	R, C
227	Mountain Bulbul	<i>Hypsipetes maclellandii</i>	R, C
228	Crested Finchbill	<i>Spizixos canifrons</i>	R, C
	Sittidae		
229	Velvet-fronted Nuthatch	<i>Sitta frontalis</i>	R, C
230	Chestnut-bellied Nuthatch	<i>Sitta castanea</i>	R, C
	Saturnidae		
231	Common Myna	<i>Acridotheres tristis</i>	R, C
232	Pied Myna	<i>Sturnus contra</i>	R, C

233	Jungle Myna	<i>Acridotheres fuscus</i>	R, C
234	Grey-headed Myna	<i>Sturnus malabaricus</i>	R, C
235	Hill Myna	<i>Gracula religiosa</i>	R, r
	Oriolidae		
236	Black-headed oriole	<i>Oriolus xanthornus</i>	R, C
237	Maroon Oriole	<i>Oriolus traillii</i>	R, C
	Dicruridae		
238	Black Drongo	<i>Dicrurus macrocercus</i>	R, r
239	Bronze Drongo	<i>Dicrurus aeneus</i>	R, C
240	Spangled Drongo	<i>Dicrurus hottentottus</i>	R, C
241	Ashy Drongo	<i>Dicrurus leucophaeus</i>	WM, r
242	Lesser Racket-tailed Drongo	<i>Dicrurus remifer</i>	R, r
243	Greater Racket-tailed Drongo	<i>Dicrurus paradiseus</i>	R, r
	Corvidae		
244	Rufous Treepie	<i>Dendrocitta vagabunda</i>	R, r
245	Grey Treepie	<i>Dendrocitta formosae</i>	R, r
246	Collared Treepie	<i>Dendrocitta frontalis</i>	R, r
247	Common Green Magpie	<i>Cissa chinensis</i>	R, r
248	Jungle Crow	<i>Corvus macrorhynchus</i>	R, C
249	Common Crow	<i>Corvus splendens</i>	R, C
250	White-throated Fantail	<i>Rhipidura albicollis</i>	R, r
251	Eurasian Jay	<i>Garrulus glandarius</i>	R, r
	Passeridae		
252	House Sparrow	<i>Passer domesticus</i>	R, C
	Ploceidae		
253	Baya Weaver	<i>Ploceus philippinus</i>	R, r
	Zosteropidae		
254	Oriental white-eye	<i>Zosterops palpebrosus</i>	R, C
	Estrildidae		
255	Scaly-breasted Munia	<i>Lonchura punctulata</i>	R, C
256	White-rumped Munia	<i>Lonchura striata</i>	R, C
257	Black-headed Munia	<i>Lonchura malacca</i>	R, C
	Tichodromidae		
258	Wallcreeper	<i>Tichodroma muraria</i>	W, V
	Dicacidae		
259	Fire-breasted Flowerpecker	<i>Dicaeum ignipectus</i>	R, C
260	Scarlet-backed Flowerpecker	<i>Dicaeum cruentatum</i>	R, C
	Nectariniidae		
261	Purple-rumped sunbird	<i>Nectarinia zeylonica</i>	R, C
262	Purple Sunbird	<i>Nectarinia asiatica</i>	R, r
263	Crimson sunbird	<i>Aethopyga siparaja</i>	R, C
264	Green-tailed Sunbird	<i>Aethopyga nipalensis</i>	R, C
265	Ruby-cheeked Sunbird	<i>Anthreptes singalensis</i>	R, C
266	Fire-tailed Sunbird	<i>Aethopyga ignicauda</i>	R, r

267	Streaked Spiderhunter	<i>Arachnothera magna</i>	R, r
268	Little Spiderhunter	<i>Arachnothera longirostra</i>	R, C
	Aegithalidae		
269	Black-throated Bushtit	<i>Aegithalos concinnus</i>	R, C
	Hirundinidae		
270	Common Swallow	<i>Hirundo rustica</i>	WM, C

R - Resident; C - Common; r - Rare; WM - Winter Migrant; SM - Summer Migrant; V - Vagrant; EN - Endangered; En - Endemic; NT - Near Threatened; VU - Vulnerable; CR - Critically Endangered; NR - New record

Note: A=abundant, E=endangered, R=rare, T=threatened, LC=least concern.

Snakes		
Sl.No.	Common Name	Scientific Name
1	Brahminy Worm Snake	<i>Indotyphlops braminus</i>
2	Diard's Worm Snake	<i>Argyrophis diardii</i>
3	Burmese Python	<i>Python molurus bivittatus</i>
4	Green Trinket Snake	<i>Elaphe prasina</i>
5	Copper Headed Trinket Snake	<i>Coelognathus radiatus</i>
6	Common Trinket Snake	<i>Coelognathus helena helena</i>
7	Banded Trinket Snake	<i>Oreocryptophis porphyraceus</i>
8	Collared Black-headed Snake	<i>Sibynophis collaris</i>
9	Indo-Chinese Rat Snake	<i>Ptyas korros</i>
10	Indian Rat Snake	<i>Ptyas mucosa</i>
11	White-barred Khukri Snake	<i>Oligodon albocinctus</i>
12	Blue Bronze-back Tree Snake	<i>Dendrelaphis cyanochloris</i>
13	Painted Bronze-back Tree Snake	<i>Dendrelaphis pictus</i>
14	Ornate Flying Snake	<i>Chrysopelea ornata*</i>
15	White-banded Wolf Snake	<i>Dinodon septentrionalis</i>
16	Yellow-speckled Wolf Snake	<i>Lycodon jara</i>
17	Common Wolf Snake	<i>Lycodon aulicus</i>
18	Banded Wolf Snake	<i>Lycodon fasciatus</i>
19	Zaw's Wolf Snake	<i>Lycodon zawi</i>
20	Blyth's Reticulate Snake	<i>Blythia reticulata</i>
21	Assam Snail Eater	<i>Poreas monticolus</i>
22	Himalayan Keelback	<i>Amphiesma platyceps</i>
23	Striped Keelback	<i>Amphiesma stolatum</i>
24	Checkered Keelback Water Snake	<i>Xenochrophis piscator</i>
25	Yellow-spotted Keelback	<i>Xenochrophis flavipunctatus</i>
26	Orange-Collared Himalayan Keelback	<i>Rhabdophis himalayanus*</i>
27	Red-necked Keelback	<i>Rhabdophis subminiatus*</i>
28	Long-nosed Whip Snake	<i>Ahaetulla nasuta*</i>
29	Short-nosed Vine Snake	<i>Ahaetulla prasina*</i>
30	Green Cat Snake	<i>Boiga cyanea*</i>
31	Eastern Cat Snake	<i>Boiga gokool*</i>
32	Large-spotted Cat Snake	<i>Boiga multomaculata*</i>
33	Common Indian Cat Snake	<i>Boiga trigonata*</i>

34	Assam Cat Snake	<i>Boiga quincunciata</i> *
35	Thai Cat Snake	<i>Boiga siamensis</i> *
36	Common Mock Viper	<i>Psammodynastes pulverulentus</i> *
37	King Cobra	<i>Ophiophagus hannah</i> **
38	Monocled Cobra	<i>Naja kouthia</i> **
39	MacClelland's Coral Snake	<i>Sinomicrurus maclellandii</i> **
40	Banded Krait	<i>Bungarus fasciatus</i> **
41	Lesser Black Krait	<i>Bungurus lividus</i> **
42	Greater Black Krait	<i>Bungarus niger</i> **
43	White Lipped Pit Viper	<i>Cryptelytrops albolabris</i> **
44	Mountain Pit Viper	<i>Ovophis moticola</i> **
45	Jerdon's Pit Viper	<i>Protobothrops jerdonii</i> **
46	Pope's Pit Viper	<i>Popeia popeiorum</i> **
47	Yunnun Bamboo Pit Viper	<i>Trimeresurus yunnensis</i> **
	NOTE: * Indicates Midly-Venomous ** Indicates Venomous	
Lizards		
Sl. No.	Common Name	Scientific Name
1	Brook's House Gecko	<i>Hemidactylus brookii</i>
2	Asian House Gecko	<i>Hemidactylus frenatus</i>
3	Flat- tailed Gecko	<i>Hemidactylus platyrus</i>
4	Yellow-green House Gecko	<i>Hemidactylus flaviviridis</i>
5	Tokay Gecko	<i>Gekko gekko</i>
6	Indo-Pacific Gecko/ Fox Gecko	<i>Hemidactylus garnotii</i>
7	Indian Garden lizard	<i>Calotes versicolour</i>
8	Jerdon's Forest lizard	<i>Calotes jerdoni</i>
9	Emma Gray's Forest Lizard	<i>Calotes emma</i>
10	Norvill's Flying lizard	<i>Draco norvillii</i>
11	Bule –Throated lizard	<i>Ptycolaelmus gularis</i>
12	Many Lined Grass Skink	<i>Eutropis multifasciata</i>
13	Bronze Grass Skink	<i>Eutropis macularia</i>
14	Spotted Litter skink	<i>Sphenomorphus maculatus</i>
15	Bengal Monitor	<i>Varanus bengalensis</i>
Tortoise/Turtles		
Sl. No.	Common Name	Scientific Name
1	Asian leaf turtle	<i>Cyclemys gemeli</i>
2	Assam roofed turtle	<i>Pangshura sylhetensis</i>
3	Southeast Asian box turtle	<i>Cuora amboinensis</i>
4	Indian softshell turtle	<i>Nilssonia gangeticus</i>
5	Narrow headed softshell turtle	<i>Chitra indica</i>
6	Flapshell turtle	<i>Lissemys punctata andersoni</i>
Amphibians		
Sl.No.	Common Name	Scientific Name
1	Myanmar pelobatid toad	<i>Xenophrys cf. parva</i>

2	Red eyed Shortleg	<i>Leptobrachium smithii</i>
3	Common toad	<i>Duttaphrynus melanostictus</i>
4	Marbled toad	<i>Duttaphrynus stomaticus</i>
5	Indian Hylid Frog	<i>Hyla annectans</i>
6	Ornate narrow mouth frog	<i>Microhyla ornata</i>
7	Himalayan tree frog	<i>Polypedates himalayaensis</i>
8	Common Tree Frog	<i>Polypedates teraiensis</i>
9	Warty tree frog	<i>Theloderma asperum</i>
10	Suffry's Tree Frog	<i>Rhacophorus cf. suffry</i>
11	Twin spotted tree frog	<i>Rhacophorus bipunctatus</i>
12	Green tree frog	<i>Rhacophorus maximus</i>
13	Bush frog	<i>Philautus sp.</i>
14	Indian Bull frog	<i>Hoplobatrachus tigerinus</i>
15	Jerdon's Bull frog	<i>Haplobatrachus crassus</i>
16	Pointed-nosed Frog	<i>Clinotarsus alticola</i>
17	Common water frog	<i>Euphlyctis cyanophlyctis</i>
18	Pierre's Cricket frog	<i>Fejervarya pierrei</i>
19	Small-eared Torrent Frog	<i>Amolops gerbillus</i>
20	Cope's Assam Frog	<i>Hylarana leptoglossa</i>
21	Taipeh Frog	<i>Hylarana taipehensis</i>
22	Black-spotted Frog	<i>Hylarana nigrovittata</i>
23	Broad-headed Frog	<i>Limnonectes laticeps</i>
24	Two-striped Pigmy Tree Frog	<i>Chiromantis vittatus</i>
25	Bhamo Frog	<i>Humerana humeralis</i>

Fishes

	Common Name	Scientific Name
1	Clown knifefish	<i>Chitala chitala</i> (Hamilton-Buchanan)
2	Black knifefish	<i>Notopterus notopterus</i> (Pallas)
3	Indian longfin eel	<i>Anguilla bengalensis</i> (Gray & Hardwicke)
4	Indian River Shad	<i>Gudusia chapra</i> (Hamilton Buchanan)
5	Jaya	<i>Aspidoparia jaya</i> (Hamilton-Buchanan)
6	Morar	<i>Aspidoparia morar</i> (Hamilton-Buchanan)
7	Upstream carp	<i>Bangana(Labeo) dero</i> (Hamilton-Buchanan)
8	Bared trout	<i>Barilius barila</i> (Hamilton-Buchanan)
9	Silver hill trout	<i>B. barna</i> (Hamilton-Buchanan)
10	Hamilton trout	<i>B. bendelisis</i> (Hamilton Buchanan)
11	Spotted hill trout	<i>B. tileo</i> (Hamilton Buchanan)
12	Zebra danio	<i>Brachydanio rario</i> (Hamilton-Buchanan)
13	Indian glassy hatchet	<i>Chela laubuca</i> (Hamilton-Buchanan)
14	Mrigal	<i>Cirrhinus mrigala</i> (Hamilton-Buchanan)
15	Reba carp	<i>C. reba</i> (Hamilton-Buchanan)
16	Giant danio	<i>Danio aequipinnatus</i> (McClelland)
17	-	<i>Danio dangila</i>

18	Silver/ Turquoise danio	<i>Danio/Devario devario</i> (Hamilton-Buchanan)
19	Indian Flying barb	<i>Esomus danricus</i> (Hamilton-Buchanan)
20	Bata labeo	<i>Labeo bata</i> (Hamilton-Buchanan)
21	-	<i>L. boga</i> (Hamilton-Buchanan)
22	Black Rohu	<i>L. calbasu</i> (Hamilton-Buchanan)
23	-	<i>Labeo dyocheilus</i> (McClelland)
24	Kuria labeo	<i>L. gonius</i> (Hamilton-Buchanan)
25	Rohu	<i>L. rohita</i> (Hamilton-Buchanan)
26	Pangusia	<i>L. pangusia</i> (Hamilton-Buchanan)
27	Diamond barb	<i>Ostreobrama cotio</i> (Hamilton-Buchanan)
28	Olive barb	<i>P. sarana sarana</i> (Hamilton-Buchanan)
29	Soft fin barb	<i>P. sophore</i> (Hamilton-Buchanan)
30	Fire fin/ two spot barb	<i>P. ticto</i> (Hamilton-Buchanan)
31	Indian trout	<i>Raimas bola</i> (Hamilton-Buchanan)
32	Yellow tail black tip rasbora	<i>Rasbora rasbora</i> (Hamilton-Buchanan)
33	Razor belly	<i>Salmostoma bacaila</i> (Hamilton-Buchanan)
34	Balitora minnow	<i>Psilorhynchus balitora</i> (Hamilton)
35	Leopard loach	<i>Acanthocobitis botia</i> (Hamilton-Buchanan)
36	Queen loach	<i>Botia dario</i> (Hamilton)
37	Reticulated/Twin banded loach	<i>Botia rostrata</i> (Gunther)
38	Panther loach	<i>Lepidocephalichthys guntea</i> (Hamilton-Buchanan)
39	Day's mystus	<i>Mystus bleekeri</i> (Day)
40	Gangetic mystus	<i>M. cavasius</i> (Hamilton- Buchanan)
41	-	<i>M. dibrugarensis</i> (Chaudhuri)
42	-	<i>M. tengra</i> (Hamilton- Buchanan)
43	White catfish	<i>Rita rita</i> (Hamilton-Buchanan)
44	Long whiskered catfish	<i>Sperata aor</i> (Hamilton-Buchanan)
45	Giant river catfish	<i>S. seenghala</i> (Sykes)
46	Pabo catfish	<i>Ompok pabo</i> (Hamilton- Buchanan)
47	Boal	<i>Wallago attu</i> (Boch & Schneider)
48	Gangetic ailia	<i>Ailia coila</i> (Hamilton- Buchanan)
49	Garua bachcha	<i>Clupisoma garua</i> (Hamilton-Buchanan)
50	Batchwa vacha	<i>Eutropiichthys vacha</i> (Hamilton-Buchanan)
51	-	<i>Silonia silondia</i> (Hamilton-Buchanan)
52	Stripped Glass catfish	<i>Pseudeutropius atherinoides</i> (Bloch)
53	Gangetic goonch	<i>Bagarius bagarius</i> (Hamilton-Buchanan)
54	Whiptail catfish	<i>Sisor rhabdophorus</i> (Hamilton-Buchanan)
55	Butterfly catfish	<i>Erethistes(Hara) hara</i> (Hamilton- Buchanan)
56	Magur	<i>Clarius batrachus</i> (Linn)
57	Stinging catfish	<i>Heteropneustes fossilis</i> (Bloch)
58	Long fighting catfish	<i>Olyra longicaudata</i> (McClelland)
59	Silver needlefish	<i>Xenentodon cancila</i> (Hamilton- Buchanan)
60	Peacock eel	<i>Macrogathus aral</i> (Bloch & Schneider)
61	Striped spiny green eel	<i>M. pancalus</i> (Hamilton- Buchanan)

62	Tire track spiny eel	<i>Mastacembelus armatus</i> (Lacepede)
63	Gangetic mudeel	<i>Monopterusuchia</i> (Hamilton-Buchanan)
64	Indian glassfish	<i>Chanda nama</i> (Hamilton- Buchanan)
65	Dwarf chameleon catfish	<i>Badis badis</i> (Hamilton-Buchanan)
66	Yellow tail mullet	<i>Sicamugil cascasia</i> (Hamilton- Buchanan)
67	Sleeper goby	<i>Glossogobius giuris</i> (Hamilton-Buchanan)
68	(Ass.Senga)	<i>Channa blecheri</i> (Hamilton-Buchanan)
69	Blue dwarf snakehead	<i>Channa gachua</i> (Bloch & Schneider)
70	Peacock snakehead	<i>C. marulius</i> (Hamilton-Buchanan)
71	Checkered snakehead	<i>C. punctata</i> (Bloch)

Butterfly

Sl. No.	Scientific name	Common name	Status as per Evans 1932	Species restricted to northeastern and eastern Himalaya in India
A.	Family: Hesperidae			
i.	Subfamily: Coeliadinae			
1	<i>Badamia exclamationis</i> (Fabricius, 1775)	Brown Awl	Common	-
2	<i>Hasora badra badra</i> (Moore, [1858])	Common Awl	Not Rare	-
3	<i>Choaspes benjaminii japonica</i> (Murray, 1875)	Indian Awlking	Not Rare	-
4	<i>Burara jaina</i> (Moore, [1866])	Orange Awlet	Not Rare	-
ii.	Subfamily: Pyrginae			
6	<i>Sarangesa dasahara dasahara</i> Moore, [1866]	Common Small Flat	Common	-
7	<i>Celaenorrhinus leucocera</i> (Kollar, [1844])	Common Spotted Flat	Common	-
8	<i>Celaenorrhinus aurivittata aurivittata</i> (Moore, 1878)	Dark Yellow-banded Flat	Not Rare	Endemic
9	<i>Pseudocoladenia dan fabia</i> Evans, 1949	Fulvous Pied Flat	Common	-
10	<i>Tagiades japetus ravi</i> (Moore, [1866])	Common Snow Flat	Common	-
11	<i>Tagiades litigiosa litigiosa</i> Möschler, 1878	Water Snowflat,	Not Rare	-
12	<i>Tagiades gana athos</i> Plötz, 1884	Suffused Snow Flat	Not Rare	-
13	<i>Gerosis phisara phisara</i> (Moore, 1884)	Dusky Yellow-breast Flat	Not Rare	Endemic
14	<i>Mooreana trichoneura pralaya</i> Moore, [1866]	Yellow-veined Flat	Not Rare	Endemic
15	<i>Seseria sambara sambara</i> Moore, [1866]	Sikkim White Flat	Not Rare	-
16	<i>Odontoptilum angulata angulata</i> (. Felder, 1862)	Chestnut Angle	Not Rare	-
17	<i>Psolos fuligo subfasciatus</i> Moore, 1878	Dusky Partwing/ Coon,	Common	Endemic
iii.	Subfamily: Hesperinae			
18	<i>Ochus subvittatus subradiatus</i> (Moore, 1878)	Tiger Hopper	-	Endemic
19	<i>Ampittia dioscorides</i> (Fabricius, 1793)	Bush Hopper	Common	-
20	<i>Aeromachus pygmaeus</i> Fabricius, 1775	Pygmy Scrub Hopper	Not Rare	-
21	<i>Pithauria stramineipennis</i> Wood- Mason & deNicéville, [1887]	Light Straw Ace	Not Rare	Endemic
22	<i>Thoressa cerata</i> Hewitson, 1876	Northern Spotted Ace	Not Rare	Endemic
23	<i>Halpe zema zema</i> Hewitson, 1877	Banded Ace	Common	Endemic
24	<i>Halpe aucma</i> Swinhoe, 1893 (IWPA Schll)	Indian Ace	Not Rare	-
25	<i>Halpe porus porus</i> (Mabille, [1877])	Moore's Ace	Not Rare	-
26	<i>Halpe kusala</i> Fruhstorfer, 1911	Hill Ace	Common	Endemic

27	<i>Sebastonyma dolopia</i> Hewitson, 1868	Tufted Ace	Not Rare	Endemic
28	<i>Cupitha purreea purreea</i> (Moore, 1877)	Wax Dart,	Not Rare	-
29	<i>Potanthus pseudomaesa</i> Moore, [1881]	Indian Dart		-
30	<i>Telicota colon</i> (Fabricius, 1775)	Common Palm Dart	Not Rare	-
31	<i>Telicota bambusae bambusae</i> Moore, 1878	Dark Palm Dart	Common	-
32	<i>Oriens gola pseudolus</i> Mabille, 1883	Common Dartlet	Not Rare	-
33	<i>Notocrypta paralysos asawa</i> Fruhstorfer, 1911	Common Banded Demon	Common	-
34	<i>Notocrypta curvifascia curvifascia</i> (C.&R. Felder, 1862)	Restricted Demon	Common	-
35	<i>Notocrypta feisthamelii alysos</i> Moore, [1866]	Spotted Demon	Common	-
36	<i>Ancistroides nigrita diocles</i> (Moore, [1866])	Chocolate Demon	Common	-
37	<i>Iambrix salsala salsala</i> (Moore, [1866])	Chestnut Bob	Common	-
38	<i>Koruthaialos butleri butleri</i> (de Nicéville, [1884])	Dark Velvet Bob	Rare	Endemic
39	<i>Arnetta atkinsoni</i> (Moore, 1878)	Atkinson's Bob	Not Rare	-
40	<i>Scobura cephalis</i> Hewitson, 1876	Extra Forest Bob	Not Rare	Endemic
41	<i>Matapa aria</i> Moore, [1866]	Common Red Eye	Common	-
42	<i>Borbo cinnara</i> (Wallace, 1866)	Rice Swift	Common	-
43	<i>Pelopidas</i> sp. Walker, 1870	Swift	-	-
44	<i>Pelopidas assamensis</i> (de Nicéville, 1882) (IWPA Sch IV)	Great Swift	-	-
45	<i>Boaris farri</i> (Moore, 1878)	Paintbrush Swift	Not Rare	-
46	<i>Parnara guttatus</i> (Bremer & Grey, [1852])	Straight Swift	Common	-
47	<i>Pseudoborbo bevani</i> (Moore, 1878)	Bevan's Swift	Not rare	-
48	<i>Caloris aurociliata</i> (Elwes & Edwards, 1897)	Yellow Fringed Swift	Rare	Endemic
49	<i>Baoris chapmani</i> Evans, 1937	Small Paintbrush Swift	-	Endemic
50	<i>Pyroneura margherita</i> (Doherty, 1889)	Yellow-vein Lancer	Very Rare	Endemic
B. Family: Papilionidae				
i. Subfamily: Papilioninae				
51	<i>Graphium eurypylus</i> Cheronus (Jordan, 1909)	Great Jay	Not Rare	-
52	<i>Graphium chironides chironides</i> (Honrath, 1884)	Veined Jay	Not Rare	-
53	<i>Graphium agamemnon agamemnon</i> (Linnaeus, 1758)	Tailed Jay	Common	-
54	<i>Graphium antiphates pompilius</i> (Fabricius, 1787)	Five Bar Swordtail	Common	
55	<i>Graphium xenocles xenocles</i> (Doubleday, 1842)	Great Zebra	Not Rare	Endemic
56	<i>Graphium cloanthus cloanthus</i> (Westwood, 1841)	Glassy Blue Bottle	Not Rare	-
57	<i>Graphium sarpedon sarpedon</i> (Linnaeus, 1758) (IWPA SchII)	Common Blue Bottle	Common	
58	<i>Lamproptera curius curius</i> (Fabricius, 1787)	White Dargontail	Not Rare	
59	<i>Papilio paradoxa telearchus</i> (Hewitson, 1852) (IWPA SchII)	Great Blue Mime	Rare	
60	<i>Papilio memnon agenor</i> Linnaeus, 1768 (Female- <i>alcanor</i>)	Great Mormon	Common	-
61	<i>Papilio polytes romulus</i> Cramer, [1775]	Common Mormon	Very Common	-
62	<i>Papilio helenus helenus</i> Linnaeus, 1758	Red Helen	Common	-

63	<i>Papilio nephelus chaon</i> Westwood, 1845 (IWPA SchII)	Yellow Helen	Common	Endemic
64	<i>Papilio protenor euprotenor</i> Fruhstorfer, 1908	Spangle	Not Rare	-
65	<i>Papilio bianor ganesa</i> Doubleday, 1842	Common Peacock	Common	-
66	<i>Papilio paris paris</i> Linnaeus, 1758	Paris Peacock	Common	-
67	<i>Papilio castor castor</i> Westwood, 1842	Common Raven	Not Rare	Endemic
68	<i>Papilio demoleus demoleus</i> Linnaeus, 1758	Lime Swallowtail	Very Common	-
69	<i>Atrophaneura aidoneus</i> (Doubleday, 1845)	Lesser Batwing	Rare	-
70	<i>Atrophaneura varuna astroion</i> (Westwood, 1842)	Common Batwing	Not Rare	-
71	<i>Atrophaneura dasarada dasarada</i> (Moore, 1857) (IWPA Sch II)	Great Windmill	Not Rare	-
72	<i>Atrophaneura polyeuctes polyeuctes</i> (Doubleday, 1842)	Common Windmill	Common	-
73	<i>Pachliopta aristolochiae aristolochiae</i> (Fabricius, 1775)	Common Rose	Very Common	-
74	<i>Troides aeacus aeacus</i> (C. & R. Felder, 1860)	Golden Birdwing	Not Rare	-
C. Family: Pieridae				
i. Subfamily: Pierinae				
75	<i>Appias albina darada</i> (C. & R. Felder, [1865])	Common Albatross	Rare	-
76	<i>Appias lyncida eleonora</i> (Boisduval, 1836)	Chocolate Albatross	Common	-
77	<i>Appias olferna</i> Swinhoe, 1890	Eastern Striped Albatross	Rare	Endemic
78	<i>Catopsilia pomona pomona</i> (Fabricius, 1775)	Common Emigrant	Common	-
79	<i>Cepora nerissa nerissa</i> (Fabricius, 1775)	Common Gull	Common	-
80	<i>Cepora nadina nadina</i> (Lucas, 1852)	Lesser Gull	Not Rare	-
81	<i>Delias pasithoe pasithoe</i> (Linnaeus, 1767)	Red Base Jezebel	Not Rare	-
82	<i>Hebomoia glaucippe glaucippe</i> (Linnaeus, 1758)	Great Orange Tip	Common	-
83	<i>Ixias pyrene latifasciata</i> Butler, 1871	Yellow Orange Tip	Common	-
84	<i>Leptosia nina</i> (Fabricius, 1793)	Psyche	Common	-
85	<i>Pareronia avatar</i> (Moore, [1858])	Pale Wanderer	Rare	Endemic
86	<i>Pieris canidia canidia</i> (Linnaeus, 1768)	Indian Cabbage White	Very Common	-
87	<i>Eurema andersonii jordanii</i> Corbet & Pendlebury, 1932	One Spot Grass Yellow	Rare	-
ii. Subfamily: Coliadinae				
88	<i>Dercas verhuelli doubledayi</i> Moore, [1905]	Tailed Sulphur	Not Rare	-
89	<i>Eurema hecabe hecabe</i> (Linnaeus, 1758)	Common Grass Yellow	Very Common	-
90	<i>Eurema blanda silhetana</i> (Wallace, 1867)	Three spot Grass Yellow	Common	-
91	<i>Gandaca harina assamica</i> Moore, [1906]	Common Tree Yellow	Not Rare	Endemic
C. Family: Riodinidae				
i. Subfamily: Nemeobiinae				
92	<i>Abisara neophron neophron</i> (Hewitson, 1861)	Tailed Judy	Not Rare	-
93	<i>Zemeros flegyas flegyas</i> (Cramer, [1780])	Punchinello	Very Common	-
D. Family: Lycaenidae				
i. Subfamily: Poritinae				
94	<i>Poritia hewitsoni hewitsoni</i> Moore, [1866] (IWPA SchII)	Common Gem	Not Rare	-
ii. Subfamily: Miletinae				

95	<i>Taraka hamada mendesia</i> Fruhstorfer, 1918	Forest Pierrot	Not Rare	-
iii.	Subfamily: Curetinae			
96	<i>Curetis bulis bulis</i> (Westwood, 1851)	Bright Sunbeam	Not Rare	-
97	<i>Curetis saronis</i> Moore, 1877	Burmese Sunbeam	Not Rare	Endemic
iv.	Subfamily: Theclinae			
98	<i>Arhopala silhetensis silhetensis</i> (Hewitson, 1862) (IWPA SchII)	Sylhet Oakblue	Rare	Endemic
99	<i>Arhopala centaurus pirithous</i> (Moore, [1884])	Centaur Oakblue	Not Rare	-
100	<i>Arhopala paramuta paramuta</i> (de Nicéville, [1884])	Hooked Oakblue	Not Rare	-
101	<i>Arhopala ace arata</i> Tytler, 1915 (IWPA1972 Sch I)	Tytler's Dull Oakblue	Very Rare	Endemic
102	<i>Cheritra freja evansi</i> Cowan, 1965	Common Imperial	Not Rare	-
103	<i>Chliaria othona othona</i> Hewitson, 1869 (IWPA SchI)	Orchid Tit	Not Rare	-
104	<i>Chliaria kina kina</i> (Hewitson, 1869) (IWPA SchII)	Blue Tit	Rare	-
105	<i>Zeltus amasa amasa</i> (Hewitson, 1865)	Fluffy Tit	Not Rare	-
106	<i>Hypolycaena erylus himavantus</i> Fruhstorfer, 1912	Common Tit	Common	-
107	<i>Rapala dienece</i> (Hewitson, 1878)	Scarlet Flash	Not Rare	-
108	<i>Rapala pheretima petosiris</i> (Hewitson, 1863)	Copper Flash	Not Rare	-
109	<i>Ancema ctesia ctesia</i> (Hewitson, 1865)	Bispot Royal	Not Rare	-
110	<i>Remelana jangala ravata</i> (Moore, [1866])	Chocolate Royal	Common	Endemic
111	<i>Ancema blanka minturna</i> (Fruhstorfer, 1912) (IWPA SchII)	Silver Royal	Rare	Endemic
112	<i>Surendra quercetorum quercetorum</i> (Moore, [1858])	Common Acacia Blue	Common	-
113	<i>Yasoda tripunctata tripunctata</i> (Hewitson, 1863) (IWPA SchII)	Branded Yamfly	Rare	Endemic
114	<i>Loxura atymnus continentalis</i> Fruhstorfer, 1912	Common Yamfly	Common	-
115	<i>Spindasis lohita himalayanus</i> (Moore, 1884) (IWPA SchII)	Long-banded Silverline	Common	-
v.	Subfamily: Lycaeninae			
116	<i>Heliophorus epicles latilimbata</i> Eliot, 1963	Purple Sapphire	Common	-
117	<i>Catochrysops strabo strabo</i> (Fabricius, 1793)	Forget-me-not	Common	-
vi.	Subfamily: Polyommatae			
118	<i>Anthe emolus emolus</i> (Godart, [1824])	Common Ciliate Blue	Common	-
119	<i>Anthe lycaenina lycambes</i> (Hewitson, 1878)	Pointed Ciliate Blue	Not Rare	-
120	<i>Prosotas aluta coelestis</i> (Wood- Mason & deNicéville, [1887]) (IWPA SchII)	Banded Lineblue	Rare	-
121	<i>Chilades lajus lajus</i> (Stoll, [1780])	Lime Blue	Common	-
122	<i>Caleta elna noliteia</i> (Fruhstorfer, 1918)	Elbowed Pierrot	Not Rare	-
123	<i>Castalius rosimon rosimon</i> (Fabricius, 1775)	Common Pierrot	Common	-
124	<i>Jamides celeno</i> (Cramer, [1775])	Common Cerulean	Common	-
125	<i>Jamides caerulea</i> (Druce, 1873)	Royal Cerulean	Rare	Endemic
126	<i>Jamides elpis pseudelpis</i> (Butler, 1879)	Glistening Cerulean	Not Rare	Endemic
127	<i>Prosotas nora ardates</i> (Moore, [1875])	Common Line Blue	Common	-

128	<i>Prosotas dubiosa indica</i> (Evans, [1925])	Tailless Line Blue	Common	-
129	<i>Prosotas bhutea</i> (deNicéville, [1884])	Bhutia Line Blue	Not Rare	-
130	<i>Nacaduba kurava euplea</i> Frushstorfer, 1916	Transparent Sixline Blue	Common	-
131	<i>Megisba malaya sikkima</i> Moore, 1884	Malayan	Not Rare	-
132	<i>Neopithecops zalmora zalmora</i> (Butler, [1870])	Common Quaker	Common	-
133	<i>Pithecops fulgens fugens</i> Doherty, 1889 (IWPA SchII)	Blue Quaker	Rare	Endemic
134	<i>Acytolepis puspa gisca</i> (Fruhstorfer, 1910)	Common Hedge Blue	Common	-
135	<i>Udara dilectus dilectus</i> (Moore, 1879)	Pale Hedge Blue	Not Rare	-
136	<i>Pseudozizeeria maha maha</i> (Kollar, [1844])	Pale Grass Blue	Very Common	-
137	<i>Zizina oti soti</i> (Fabricius, 1787)	Lesser Grass Blue	Common	-
E. Family: Nymphalidae				
i. Subfamily: Danainae				
138	<i>Danaus genutia genutia</i> (Cramer, [1779])	Striped Tiger	Very Common	-
139	<i>Danaus chrysippus chrysippus</i> (Linnaeus, 1758)	Plain Tiger	Very Common	-
140	<i>Parantica aglea melanoides</i> Moore, 1883	Glassy Tiger	Common	-
141	<i>Parantica melaneus plataniston</i> (Fruhstorfer, 1910)	Chocolate Tiger	Common	-
142	<i>Parantica sita sita</i> (Kollar, [1844])	Chestnut Tiger	Not Rare	-
143	<i>Tirumala septentrionis septentrionis</i> (Butler, 1874)	Dark Blue Tiger	Not Rare	-
144	<i>Tirmula limniace exotica</i> (Gmelin, 1790)	Blue Tiger	Very Common	-
145	<i>Euploea algea deione</i> Westwood, 1848	Long-banded Crow	Not Rare	-
146	<i>Euploea core core</i> (Cramer, [1780])	Common Indian Crow	Common	-
147	<i>Euploea mulciber mulciber</i> (Cramer, [1777]) (IWPA SchIV)	Striped Blue Crow	Common	-
148	<i>Euploea midamus rogenhoferi</i> C.&R. Felder, [1865] (IWPA SchII)	Blue Spotted Crow	Rare	-
149	<i>Euploea radamanthus radamanthus</i> (Fabricius, 1793)	Magpie Crow	Not Rare	-
150	<i>Polyura athamas</i> (Drury, [1773])	Common Nawab	Common	-
151	<i>Polyura arja</i> (C.&R. Felder, [1867])	Pallid Nawab	Not Rare	Endemic
ii. Subfamily: Charaxinae				
152	<i>Charaxes eudamippus eudamippus</i> (Doubleday, 1843)	Great Nawab	Not Rare	--
153	<i>Charaxes delphis delphis</i> (Doubleday, 1843) (IWPA1972 Sch II)	Jewelled Nawab	Not Rare	Endemic
154	<i>Charaxes kahruba</i> (Moore, [1895])	Variegated Rajah	Rare	-
155	<i>Charaxes bernardus hierax</i> (C.&R. Felder, [1867])	Tawny Rajah	Common	-
156	<i>Charaxes marmax marmax</i> Westwood, 1847 (IWPA SchII)	Yellow Rajah	Rare	-
iii. Subfamily: Satyrinae				
157	<i>Elymnias hypermnestra undularis</i> (Drury, 1773)	Common Palmfly	Common	-
158	<i>Elymnias nesaea</i> Linnaeus, 1764	Tiger Palmfly	Not Rare	Endemic
159	<i>Ethope himachala</i> (Moore, 1857)	Dusky Diadem	Not Rare	Endemic
160	<i>Lethe chandica flanona</i> Fruhstorfer, 1911	Angled Red Forester	Not Rare	-
161	<i>Lethe vindhya vindhya</i> (C.&R. Felder, 1859)	Black Forester	Not Rare	Endemic
162	<i>Lethe mekara mekara</i> (Moore, [1858])	Common Red Forester	Common	Endemic

163	<i>Lethe satyavati</i> deNicéville, 1881 (IWPA1972 Sch I)	Pallid Forester	Rare	Endemic
164	<i>Lethe sinorix sinorix</i> (Hewitson, 1863)	Tailed Red Forester	Rare	Endemic
165	<i>Lethe verma sintica</i> Fruhstorfer, 1911	Straight Banded Treebrown	Common	-
166	<i>Lethe europa niladana</i> Fruhstorfer, 1911	Bamboo Treebrown	Not Rare	-
167	<i>Melanitis zitenius zitenius</i> (Herbst, 1796) (IWPA SchII)	Great Evening Brown	Not Rare	-
168	<i>Melanitis phedima bela</i> Moore, 1857	Dark Evening Brown	Common	-
169	<i>Melanitis leda leda</i> (Linnaeus, 1758)	Common Evening Brown	Very Common	-
170	<i>Mycalesis perseus blasius</i> (Fabricius, 1798)	Common Bushbrown	Very Common	-
171	<i>Mycalesis adamsoni</i> Watson, 1897	Watson's Bushbrown	Rare	Endemic
172	<i>Mycalesis anaxias aemate</i> Fruhstorfer, 1911 (IWPA SchII)	White-Bar Bushbrown	Not rare	-
173	<i>Mycalesis malsarida</i> Butler, 1868 (IWPA SchII)	Plain Bushbrown	Rare	Endemic
174	<i>Mycalesis visala visala</i> (Moore, 1858)	Long-branded Bushbrown	Common	-
175	<i>Mycalesis francisca sanatana</i> Moore, [1858]	Lilacine Bushbrown	Not Rare	-
176	<i>Mycalesis gotama charaka</i> Moore, [1875] (IWPA1972 Sch II)	Chinese Bushbrown	Rare	Endemic
177	<i>Mycalesis mineus mineus</i> (Linnaeus, 1758)	Dark Brand Bushbrown	Very Common	-
178	<i>Orsotriaena medus medus</i> (Fabricius, 1775)	Medus Brown	Common	-
179	<i>Ypthima baldus baldus</i> (Fabricius, 1775)	Common Five-ring	Very Common	-
180	<i>Ypthima huebneri huebneri</i> Kirby, 1871	Common Four Ring	Very Common	-
181	<i>Zipaetis scylax scylax</i> Hewitson, 1863	Dark Catseye	Not Rare	Endemic
iv.	Subfamily: Heliconiinae			
182	<i>Acraea issoria issoria</i> (Hübner, [1819])	Yellow Coster	Not Rare	-
183	<i>Cethosia cyane cyane</i> (Drury, [1773])	Leopard Lacewing	Not Rare	-
184	<i>Cethosia biblis tisamena</i> Fruhstorfer, 1912	Red Lacewing	Common	-
185	<i>Cirrochroa tyche mithila</i> Moore, 1872	Common Yeoman	Common	-
186	<i>Cirrochroa aoris aoris</i> Doubleday, [1847]	Large Yeoman	Not Rare	-
187	<i>Phalantha phalantha</i> (Drury, [1773])	Common Leopard	Common	-
188	<i>Vagrans egista sinha</i> (Kollar, [1844])	Vagrant	Not Rare	-
189	<i>Vindula erota erota</i> (Fabricius, 1793)	Cruiser	Not Rare	-
v.	Subfamily: Limentidinae			
190	<i>Athyma pravara acutipennis</i> Fruhstorfer, 1906 (IWPA SchII)	Unbroken Sergeant	Rare	Endemic
191	<i>Athyma kanwa phorkys</i> (Fruhstorfer, 1913) (IWPA SchII)	Dot-dash Sergeant	Rare	Endemic
192	<i>Athyma ranga ranga</i> Moore, [1858] (IWPA SchII)	Blackvein Sergeant	Rare	-
193	<i>Athyma inara inara</i> Westwood, 1850	Colour Sergeant	Not Rare	-
194	<i>Athyma perius perius</i> (Linnaeus, 1758)	Common Sergeant	Common	-
195	<i>Athyma cama cama</i> Moore, [1858]	Orange Staff Sergeant	Not Rare	-
196	<i>Athyma zeroa zecroa</i> Moore, 1872	Small Staff Sergeant	Not Rare	-
197	<i>Athyma selenophora bahula</i> Moore, 1858	Staff Sergeant	Not Rare	-
198	<i>Euthalia phemius phemius</i> (Doubleday, 1848)	White-edged Blue Baron	Not Rare	-
199	<i>Euthalia anosia anosia</i> (Moore, [1858]) (IWPA SchII)	Grey Baron	Rare	Endemic

200	<i>Euthalia monina kesava</i> (Moore, 1859)	Powdered Baron	Not Rare	Endemic
201	<i>Euthalia aconthea garuda</i> (Moore, [1858]) (IWPA SchII)	Common Baron	Not Rare	-
202	<i>Lexias dirtea khasiana</i> (Swinhoe, 1890) (IWPA SchII)	Dark Archduke	Not Rare	Endemic
203	<i>Lexias cyanipardus cyanipardus</i> (Butler, [1869])	Great Archduke	Rare	Endemic
204	<i>Lebadea martha ismene</i> (Doubleday, [1848])	Knight	Not Rare	-
205	<i>Moduza procris procris</i> (Cramer, [1777])	Commander	Not Rare	-
206	<i>Neptis hylas varmona</i> Moore, 1872	Common Sailer	Very Common	-
207	<i>Neptis harita harita</i> Moore, [1875]	Dingiest Sailer	Not Rare	Endemic
208	<i>Neptis pseudovikasi</i> (Moore, 1899)	False Dingy Sailer	Not Rare	-
209	<i>Neptis miah miah</i> Moore, 1857	Small Yellow Sailer	Not Rare	-
210	<i>Neptis ananta ochracea</i> Evans, 1924	Yellow Sailer	Rare	-
211	<i>Neptis cartica</i> Moore, 1872	Plain Sailer	Not Rare	Endemic
212	<i>Neptis clinia susruta</i> Moore, 1872	Sullied Sailer	Rare	-
213	<i>Neptis sankara amba</i> Moore, 1858	Broad-banded Sailer	Not Rare	-
214	<i>Nepis nata adipala</i> Moore, 1872	Clear Sailer	Rare	-
215	<i>Phaedyma columella ophiana</i> (Moore, 1972)	Short-banded Sailer	Not Rare	-
216	<i>Neptis magadha khasiana</i> Moore, 1872	Spotted Sailer	Rare	Endemic
217	<i>Pantoporia paraka paraka</i> (Butler, 1879)	Perak Lascar	Not Rare	Endemic
218	<i>Pantoporia hordonia hordonia</i> (Stoll, [1790])	Common Lascar	Common	-
219	<i>Tanaecia jahnu jahnu</i> (Moore, [1858])	Plain Earl	Not Rare	Endemic
220	<i>Tanaecia julii appiades</i> (Ménétrés, 1857)	Common Earl	Common	-
221	<i>Tanaecia lepidea sthavara</i> (Fruhstorfer, 1913) (IWPA SchII)	Grey Count	Not Rare	-
vi.	Subfamily: Cyrestinae			
222	<i>Cyrestis thyodamas thyodamas</i> Boisduval, 1846	Common Map	Common	-
223	<i>Chersonesia risa risa</i> (Doubleday, [1848])	Common Maplet	Not Rare	-
224	<i>Chersonesia rahrioides</i> Moore, [1899] (IWPA SchII)	Wavy Maplet	Rare	Endemic
225	<i>Dichorrhaga nesimachus nesimachus</i> (Doyère, [1840])	Constable	Not Rare	-
226	<i>Stibochiona nicea nicea</i> (Gray, 1846)	Popinjay	Not Rare	-
vii.	Subfamily: Bibiliinae			
227	<i>Ariadne merione tapestrina</i> (Moore, 1884)	Common Castor	Common	-
viii.	Subfamily: Apaturinae			
228	<i>Euripus nyctelius nyctelius</i> (Doubleday, 1845)	Courtsean	Not Rare	Endemic
ix.	Subfamily: Nymphalinae			
229	<i>Junonia iphita iphita</i> (Cramer, [1779])	Chocolate Pansy	Common	-
230	<i>Junonia lemonias</i> (Linnaeus, 1758)	Lemon Pansy	Common	-
231	<i>Junonia atlites atlites</i> (Linnaeus, 1763)	Grey Pansy	Not Rare	-
232	<i>Junonia almana almana</i> (Linnaeus, 1758)	Peacock Pansy	Common	-
233	<i>Symbrenthia lilaea khasiana</i> (Moore, [1875])	Common Jester	Common	-
234	<i>Hypolimnas bolina jacintha</i> (Drury, 1773)	Great Eggfly	Common	-
235	<i>Doleschallia bisaltide indica</i> Moore, 1899	Autumn Leaf	Not Rare	-
236	<i>Kallima inachus inachus</i> (Boisduval, 1846)	Orange Oak Leaf	Not Rare	-R

237	<i>Rhinopalpa polynice birmana</i> Fruhstorfer, 1898 (IWPA SchII)	Wizard	Rare	Endemic
A.	Family: Hesperidae			
i.	Subfamily: Coeliadinae			
238	<i>Bibasis sena sena</i> (Moore, [1866]) (IWPA1972 Sch II)	Orange-tail Awl, <i>Bibasis sena sena</i>	-	
239	<i>Bibasis oedipodea belesis</i> (Mabille, 1876)	Branded Orange Awlet	-	
240	<i>Choaspes xanthopogon</i> (Kollar, [1844]) (syn. <i>C. similis</i> Evans, 1932)	Similar Awlking	Endemic	
241	<i>Hasora badra badra</i> (Moore, [1858])	Common Awl	-	
242	<i>Hasora chromus</i> (Cramer, [1780])	Common Banded Awl	-	
243	<i>Hasora taminatus</i> (Hübner, 1818)	White-banded Awl	-	
ii.	Subfamily: Pyriginae			
244	<i>Gerosis sinica narada</i> (Moore, 1884)	White Yellow-breast Flat	Not Rare	Endemic
245	<i>Coladenia agni agni</i> (de Nicéville, [1884])	Brown Pied Flat	Rare	Endemic
246	<i>Capilia zennara</i> (Moore, (1866])	Pale Striped Dawnfly	Very Rare	Endemic
247	<i>Capila pieridoides</i> (Moore, 1878)	White Dawnfly	Rare	Endemic
248	<i>Celaenorrhinus nigricans</i> (de Nicéville, 1885)	Small-banded Flat	Not Rare	-
249	<i>Celaenorrhinus andamanicus hanna</i> Evans, 1949	Andaman Yellowbanded Flat	Very Rare	Endemic ??
250	<i>Darpa pteria dealbata</i> (Distant, 1886)	Snowy Angle	Rare	Endemic
iii.	Subfamily: Hesperinae			
251	<i>Spialia galba</i> (Fabricius, 1793)	Indian Skipper	Common	-
252	<i>Ampittia maroides</i> de Nicéville, [1896]	Scarce Bush Hopper	Rare	Endemic
253	<i>Aeromachus stigmata obsoleta</i> (Moore, 1878)	Veined Scrub Hopper	Not Rare	-
254	<i>Aeromachus jhora creta</i> (deNicéville, 1885)	Grey Scrub Hopper	Rare	Endemic
255	<i>Halpe sikkima</i> Moore 1882	Sikkim Ace	Very Rare	Endemic
256	<i>Halpe kumara</i> de Nicéville, 1885	Plain Ace	Not Rare	Endemic
257	<i>Potanthus ganda</i> Fruhstorfer, 1911	Sumatran Dart	-	-
258	<i>Udaspes folus</i> (Cramer, [1775])	Grass Demon	Common	-
259	<i>Hyarotis adrastus</i> (Stoll, [1780]) (IWPA1972 Sch IV)	Tree Flitter	Not Rare	-
260	<i>Suada swerga swerga</i> (de Nicéville, [1884])	Grass Bob	Not Rare	Endemic
261	<i>Scobura isota</i> (Swinhoe, 1893)	Khasi Forest Bob	Rare	Endemic
262	<i>Scobura cephaloides</i> (de Nicéville, [1889])	Large Forest Bob	Rare	Endemic
263	<i>Scobura phidita</i> (Hewitson, [1866])	Malay Forest Bob	Rare	Endemic
264	<i>Suastus gremius</i> (Fabricius, 1798)	Small Indian Palm Bob	Common	-
265	<i>Gangara thyraxis</i> (Fabricius, 1775)	Giant Redeye	Not Rare	-
266	<i>Erionota thrax thrax</i> (Linnaeus, 1767)	Palm Redeye	Not Rare	-
267	<i>Matapa cresta</i> Evans, 1949	Fringed Branded Redeye	-	-
268	<i>Caltoris kumara kumara</i> (Moore, 1878)	Blank Swift	-	-
269	<i>Baoris pagana</i> (de Nicéville, 1887)	Figure of-8 Swift	Not Rare	Endemic
270	<i>Caltoris cormasa</i> (Hewitson, 1876)	Full-stop Swift	Rare	Endemic
271	<i>Caltoris cahira carina</i> (Evans, 1937)	Colon Swift	Rare	Endemic
272	<i>Caltoris plebeia</i> (de Nicéville, 1887)	Tufted Swift	-	Endemic
273	<i>Caltoris brunnea caere</i> (de Niceville, 1891)	Dark-branded Swift	Not Rare	Endemic
274	<i>Pelopidas sinensis</i> (Mabille, 1877) (IWPA1972 Sch IV)	Chinese Branded Swift	Common	-
275	<i>Pelopidas mathias mathias</i> (Fabricius,	Small Branded Swift	Common	-

	1798)			
276	<i>Polytremis minuta</i> (Evans, 1926)	Baby Swift	Very Rare	Endemic
277	<i>Salanoemia sala</i> (Hewitson, [1866])	Maculate Lancer	Very Rare	Endemic
278	<i>Plastingia naga</i> (de Nicéville, [1884])	Silver Spotted Lancer	Rare	Endemic
279	<i>Hidari bhawani</i> deNicéville, [1889]	Veined Palmer	Very Rare	Endemic
280	<i>Isma</i> sp. Distant, 1886	-	-	-
B. Family: Papilionidae				
i. Subfamily: Papilioninae				
281	<i>Papilio alcmenor alcmenor</i> C. &R. Felder, [1864]	Redbreast	Not Rare	-
282	<i>Papilio clytia</i> Linnaeus, 1758	Common Mime	Not Rare	-
283	<i>Troides helena cerberus</i> (C. &R. Felder, 1865)	Common Birdwing	Not Rare	-
B. Family: Pieridae				
i. Subfamily: Pierinae				
284	<i>Delias acalis pyramus</i> (Wallace, 1867)	Redbreast Jezebel	Not Rare	-
285	<i>Delias descombesi descombesi</i> (Boisduval, 1836)	Red spot Jezebel	Not Rare	Endemic
286	<i>Delias agostina agostina</i> (Hewitson, 1852)	Yellow Jezebel	Not Rare	Endemic
287	<i>Catopsilia pyranthe minna</i> (Herbst, 1792)	Mottled Emigrant	Common	-
288	<i>Pieris napi montana</i> Verity, 1908	Greenveined White	Not Rare	-
289	<i>Appias libythea</i> (Fabrcius, 1775) (IWPA1972 Sch IV)	Striped Albatross	Rare	Endemic
290	<i>Appias lalage lalage</i> (Doubleday, 1842)	Spot Puffin	Not Rare	-
C. Family: Riodinidae				
i. Subfamily: Nemeobiinae				
291	<i>Abisara fylla</i> (Westwood, 1851)	Dark Judy	Common	-
292	<i>Abisara echerius</i> (Stoll, [1790])	Straight Plum Judy	Common	-
293	<i>Dodona henrici</i> Holland, 1887	White Punch	Very Rare	Endemic
D. Family: Lycaenidae				
i. Subfamily: Curetinae				
294	<i>Curetis acuta</i> Moore, 1877	Acute Sunbeam	-	-
ii. Subfamily: Miletinae				
295	<i>Spalgis epius</i> (Westwood, 1852)	Apefly	Not Rare	-
iii. Subfamily: Theclinae				
296	<i>Arhopala bazaloides</i> (Hewitson, 1878) (IWPA SchII)	Tamil Oakblue	Rare	Endemic
297	<i>Arhopala fulla ignara</i> Riley & Godfrey, 1921 (IWPA1972 Sch II)	Spotless Oakblue	Rare	Endemic
298	<i>Arhopala perimuta perimuta</i> (Moore, [1858])	YellowdiscTailless Oakblue	Not Rare	Endemic
299	<i>Arhopala emolpus eumolpus</i> (Cramer, [1780])	Green Oakblue	Not Rare	-
300	<i>Arhopala atrax</i> (Hewitson, 1862)	Indian Oakblue	Common	-
301	<i>Arhopala athada apha</i> deNiceville, 1895	Vinous Oakblue	Very Rare	Endemic
302	<i>Arhopala dispar dispar</i> Riley & Godfrey, 1921	Frosted Oakblue	Rare	Endemic
303	<i>Arhopala anarte</i> (Hewitson, 1862)	Magnificent Oakblue	Very Rare	Endemic
304	<i>Arhopala arvina ardea</i> (Evans, 1932) (IWPA1972 Sch I)	Purple Brown Tailless Oakblue	Very Rare	Endemic
305	<i>Arhopala ammonides</i> (Doherty, 1891)	Dark Bushblue	Rare	Endemic
306	<i>Arhopala ariel</i> (Doherty, 1891) (IWPA1972	Chocolate Bushblue	Very Rare	Endemic

Sch I)				
307	<i>Arhopala birmana</i> (Moore, [1884])	Burmese Bushblue	Not Rare	Endemic
308	<i>Arhopala aberrans</i> (deNicéville, [1889])	Pale Bushblue	Rare	Endemic
309	<i>Flos adriana</i> (deNicéville, [1884])	Variegated Plushblue	Not Rare	Endemic
310	<i>Simiskina phalena harterti</i> (Doherty, 1889) (IWPA Sch	Broad-branded Brilliant	Very Rare	Endemic
311	<i>Ticherra acte acte</i> (Moore, [1858])	Blue Imperial	Not Rare	-
312	<i>Sinthus nasaka amba</i> (Kirby, 1878) (IWPA1972 Sch II	Narrow Spark	Rare	Endemic
313	<i>Sinthus chandrana grotei</i> (Moore, [1884]) (IWPA1972 Sch II)	Broad Spark	Not Rare	Endemic
314	<i>Rapala manea schistacea</i> (Moore, 1879)	Slate Flash	Common	-
315	<i>Rapala iarbus iarbus</i> (Fabricius, 1787)	Common Red Flash	Common	Endemic
316	<i>Rapala rosacea</i> (de Nicéville, [1889])	Rosy Flash	Rare	Endemic
317	<i>Catapaecilma major emas</i> Fruhstorfer, 1912	Common Tinsel	Not Rare	-
318	<i>Tajuria maculata</i> (Hewitson, 1865)	Spotted Royal	Not Rare	Endemic
319	<i>Rachana jalindra indra</i> (Moore, [1884]) (IWPA1972 Sch II)	Banded Royal	-	-
320	<i>Creon cleobis</i> (Godart, [1824])	Broadtail Royal	Not Rare	-
321	<i>Dacalana penicilligera</i> (de Nicéville, 1890)	Double Tufted Royal	Not Rare	Endemic
322	<i>Horaga onyx onyx</i> (Moore, [1858]) (IWPA1972 Sch II)	Common Onyx	Not Rare	-
323	<i>Mota massyla</i> (Hewitson, 1869)	Saffron	Rare	Endemic
iv.	Subfamily: Lycaeninae			
324	<i>Heliophorus brahma</i> (Moore, [1858])	Golden Sapphire	Not Rare	Endemic
v.	Subfamily: Polyommatainae			
325	<i>Callenya melaena</i> (Doherty, 1889)	Metallic Hedge Blue	Rare	Endemic
326	<i>Callenya melaena melaena</i> (Doherty, 1889) (IWPA1972 Sch II)	Tiny Hedge Blue	Rare	Endemic
327	<i>Celatoxia marginata</i> (deNicéville, [1884])	Margined Hedge Blue	Not Rare	-
328	<i>Lycaenopsis transpectus</i> (Moore, 1879)	White-banded Hedge Blue	Not Rare	Endemic
329	<i>Udara selma cerima</i> (Corbet, 1937)	Bi-coloured Hedgeblue	Very Rare	Endemic
330	<i>Udara albocaerulea albocaerulea</i> (Moore, 1879) (IWPA1972 Sch II)	Albocaerulean	Rare	-
331	<i>Celastrina lavendularis limbata</i> (Moore, 1879)	Plain Hedge Blue	Not Rare	-
332	<i>Celastrina argiolus iyntheana</i> (de Nicéville, [1884])	Jynthea Hedge Blue	Not Rare	Endemic
333	<i>Celastrina argiolus</i> (Linnaeus, 1758)	Hill Hedge Blue	Common	Endemic
334	<i>Monodontides musina musinoides</i> (Swinhoe, 1910)	Swinhoe's Hedge Blue	Not Rare	Endemic
335	<i>Nacaduba hermus nabo</i> Fruhstorfer, 1916	Pale Four-Lineblue	Not Rare	Endemic
336	<i>Nacaduba beroe gythion</i> Fruhstorfer, 1916	Opaque Six-Lineblue		-
337	<i>Ionolyce helicon merguiana</i> (Moore, 1884) (IWPA1972 Sch II)	Pointed Lineblue	Not Rare	Endemic
338	<i>Nacaduba dana</i> (de Nicéville, [1884])	Dingy Lineblue	Not Rare	-
339	<i>Chilades pandava</i> (Horsfield, [1829])	Plains Cupid	Common	-
340	<i>Jamides alecto eurysaces</i> (Fruhstorfer, 1916)	Metallic Cerulean	Common	-
341	<i>Jamides bochus bochus</i> (Stoll, [1782])	Dark Cerulean	Common	-
342	<i>Zizeeria karsandra</i> (Moore, 1865)	Dark Grass Blue	Common	-

343	<i>Lampides boeticus</i> (Linnaeus, 1767) (IWPA1972 Sch	Peablu	Common	-
344	<i>Syntarucus plinius</i> (Fabricius, 1793)	Zebra Blue	Common	-
345	<i>Una usta usta</i> (Distant, 1886) (IWPA1972 Sch II)	Singleton	Rare	Endemic
E.	Family: Nymphalidae			
i.	Subfamily: Charaxinae			
346	<i>Charaxes solon sulphurous</i> (Rothchild, 1899)	Black Rajah	Rare	Endemic
347	<i>Polyura schreiber assamensis</i> (Rothchild, 1899) (IWPA1972 Sch I)	Blue Nawab	Very Rare	Endemic
ii.	Subfamily: Satyrinae			
348	<i>Herona marathus</i> Doubleday, [1848] (IWPA1972 Sch II)	Pasha	Not Rare	Endemic
349	<i>Enispe euthymius euthymius</i> (Doubleday, 1845)	Red Caliph	Not Rare	Endemic
350	<i>Amathuxidia amythaon</i> (Doubleday, 1847)	Ko-hi-noor	Rare	Endemic
351	<i>Thaumantis diores</i> Doubleday, 1845	Jungle glory	Not Rare	Endemic
352	<i>Cupha erymanthis</i> (Drury, [1773])	Rustic	Common	-
353	<i>Discophora sondaica</i> zal Westwood, 1851	Common Duffer	Common	Endemic
354	<i>Discophora timora timora</i> Westwood, [1850]	Great Duffer	Not Rare	Endemic
355	<i>Faunis canens arecsilas</i> Stichel, 1933	Common Faun	Common	Endemic
356	<i>Ypthima fusca</i> Elwes & Edwards, 1893	Assam Threering	Not Rare	Endemic
357	<i>Ragadia crito de Nicéville</i> , 1890 (IWPA1972 Sch II)	Dusky-Striped Ringlet	Rare	Endemic
358	<i>Elymnias pealii</i> Wood-Mason, 1883 (IWPA1972 Sch I)	Peal's Palmfly	Very Rare	Endemic
iii.	Subfamily: Heliconiinae			
359	<i>Acraea violae</i> (Fabricius, 1793)	Tawny Coster	Common	-
360	<i>Argyreus hyperbius</i> (Linnaeus, 1763)	Tropical Fritillary	Not Rare	-
iv.	Subfamily: Limentidinae			
361	<i>Euthalia lubentina lubentina</i> (Cramer, [1777]) (IWPA1972 Sch IV)	Gaudy Baron	-	-
362	<i>Euthalia telchinia</i> (Ménétrés, 1857) (IWPA1972 Sch I)	Blue Baron	Very Rare	Endemic
363	<i>Euthalia alpheda jama</i> (C. & R. Felder, [1867])	Streaked Baron	Not Rare	Endemic
364	<i>Limenitis daraxa</i> (Doubleday, [1848])	Green Commodore	Not Rare	Endemic
365	<i>Neptis nashona</i> Swinhoe, 1896	Less Rich Sailer	Rare	Endemic
366	<i>Neptis soma soma</i> Moore, 1858 (syn. <i>Neptis yerburyi sikkima</i> Evans, 1924) (IWPA1972 Sch II)	Sullied Sailer (Yerbury's Sailer)	Not Rare	Endemic
367	<i>Pantoporia sandaka davidsoni</i> Eloit, 1969	Extra Lascar	-	-
368	<i>Pantoporia dindinga</i> (Butler, 1879)	Grey-lined Lascar	Very Rare	Endemic
369	<i>Pantoporia assamica</i> (Moore, 1881)	Assamese/Conjoined Lascar	Very Rare	Endemic
370	<i>Parthenos sylvia</i> (Cramer, [1776])	Clipper	Not Rare	-
v.	Subfamily: Bibiliinae			
371	<i>Ariadne ariadne</i> (Linnaeus, 1763)	Angled Castor	Common	-
vi.	Subfamily: Apaturinae			
372	<i>Mimathyma ambica ambica</i> (Kollar, [1844])	Indian Purple Emperor	Not Rare	-

373	<i>Hestina nama nama</i> (Doubleday, 1844)	Circe	Not Rare	-
vii. Subfamily : Nymphalinae				
374	<i>Kaniska canace canace</i> (Linnaeus, 1763)	Blue Admiral	-	Endemic
375	<i>Vanessa indica indica</i> (Herbst, 1794)	Indian Red Admiral	Common	-
Odonates				
Sl. No.	Common Name	Scientific Name		
1	Shivalik Clubtail	<i>Anisogomphus occipitalis</i>		
2	Common Clubtail	<i>Ictinogomphus rapax</i>		
3	Shiva Clawtail	<i>Onychogomphus biforceps</i>		
4	Ganga Clawtail	<i>Onychogomphus risi</i>		
5	Common Hooktail	<i>Paragomphus lineatus</i>		
6	Rusty Darner	<i>Anaciaeschna jaspidea</i>		
7	Parakeet Darner	<i>Gyanacantha bayadera</i>		
8	Fulvous Forest Skimmer	<i>Neurothemis fulva</i>		
9	Asiatic Blood Tail	<i>Lathrecista asiatica</i>		
10	Trumpet Tail	<i>Acisoma panorpoides</i>		
11	Scarlet Marsh Hawk	<i>Aethriamanta brevipennis</i>		
12	Little Blue Marsh Hawk	<i>Brachydilax sobrina</i>		
13	Emerald-banded Skimmer	<i>Cratilla lineata</i>		
14	Ruddy Marsh Skimmer	<i>Crocothemis servilla</i>		
15	Ruddy Meadow Skimmer	<i>Neurothemis intermedia</i>		
16	Ground Skimmer	<i>Diplacodes trivialis</i>		
17	Pied Paddy Skimmer	<i>Neurothemis tullia</i>		
18	Brown-backed Red Marsh Hawk	<i>Orthetrum chrysis</i>		
19	Blue Marsh Hawk	<i>Orthetrum glaucum</i>		
20	Green Marsh Hawk	<i>Orthetrum sabina</i>		
21	Blue-Tailed Forest Hawk	<i>Orthetrum triangulare</i>		
22	Crimson-tailed Marsh Hawk	<i>Orthetrum pruinum</i>		
23	Stellate River Hawk	<i>Onychothemis testacea</i>		
24	Blue-tailed Yellow Skimmer	<i>Palpoleura sexmaculata</i>		
25	Wandering Glider	<i>Pantala flavescens</i>		
26	Rufous Marsh Glider	<i>Rhodothemis rufa</i>		
27	Common Picture Wing	<i>Rhyothemis variegata</i>		
28	Iridescent Stream Glider	<i>Zygonyx iris</i>		
29	Brown Dusk Hawk	<i>Zyxomma petiolatum</i>		
30	Crimson Marsh Glider	<i>Trithemis aurora</i>		
31	Coral-Tailed Cloud Wing	<i>Tholymis tillarga</i>		
32	Crimson Marsh Glider	<i>Trithemis aurora</i>		
33	Brown Dusk Hawk	<i>Zyxomma petiolatum</i>		
34	Ruddy Meadow Skimmer	<i>Neurothemis intermedia</i>		
35	Stream Glory	<i>Neurobasis chinensis</i>		
36	Northern White Darlet	<i>Agriocnemis lacteola</i>		
37	Pigmy Dartlet	<i>Agriocnemis pygmaea</i>		
38	Black Marsh Dart	<i>Onychargia atrocyana</i>		
39	Torrent Dart	<i>Euphaea ochracea</i>		

40	Spreadwing Damselfly	<i>Lestes praemorsus</i>
41	Coromandel Marsh Dart	<i>Ceriagrion coromandelianum</i>
42	Black-tailed Marsh Dart	<i>Ceriagrion fallax</i>
43	Rusty Marsh Dart	<i>Ceriagrion olivaceum</i>
44	Blue Grass Dartlet	<i>Pseudagrion microcephalum</i>
45	Black Bambootail	<i>Prodasineura verticalis</i>
46	Emerald Echo	<i>Echo margarita</i>
47	Peacock Jewel	<i>Rhinocypha fenestrella</i>
48	Emerald Prince	<i>Rhinocypha unimaculata</i>
49	Blue Bayadera	<i>Bayadera indica</i>

v) List of other biota in Digboi division, Assam

The Digboi forest division is rich in other biota as well. List of other biota found in this division is shown in table 6.

Table 6: List of lichen found in Dibrugarh Division, Assam.

Lichens					
S.N	Botanical name	Family	Growth form	Substratum	Abundance
1.	<i>Bacidia incongruens</i>	<i>Ramalinaceae</i>	Crustose	Bark	Rare
2.	<i>Buellia alboatra</i>	<i>Caliciaceae</i>	Crustose	Bark	Rare
3	<i>Calopadia fusca</i>	<i>Ectolechiaceae</i>	Crustose	Leaves	Common
4	<i>Caloplaca bassiae</i>	<i>Teloschistaceae</i>	Crustose	Bark	Rare
5	<i>Chiodecton leptosporum</i>	<i>Roccellaceae</i>	Crustose	Bark	Common
6	<i>Chrysothrix chlorina</i>	<i>Chrysothricaceae</i>	Leprose	Bark	Rare
7	<i>Cladonia coniocraea</i>	<i>Cladoniaceae</i>	Fruticose	Soil and rocks	Rare
8	<i>Coccocarpia palmicola</i>	<i>Coccocarpiaceae</i>	Foliose	Bark	Rare
9	<i>Collema pulcellum</i>	<i>Collemataceae</i>	Foliose	Bark	Rare
10	<i>Cryptothecia striata</i>	<i>Arthoniaceae</i>	Crustose	Bark and rocks	Common
11	<i>Dirinaria aegialita</i>	<i>Caliciaceae</i>	Foliose	Bark and rocks	Common
12	<i>Glyphis duriuscula</i>	<i>Graphidaceae</i>	Crustose	Bark	Common
13	<i>Graphis duplicata</i>	<i>Graphidaceae</i>	Crustose	Bark	Common
14	<i>Graphis scripta</i>	<i>Graphidaceae</i>	Crustose	Bark	Common
15	<i>Haematomma puniceum</i>	<i>Haematommataceae</i>	Crustose	Bark	Common
16	<i>Heterodermia diademata</i>	<i>Physciaceae</i>	Foliose	Bark and rock	Rare
17	<i>Lecanora indica</i>	<i>Lecanoraceae</i>	Crustose	Bark	Common
18	<i>Leptogium azureum</i>	<i>Lecanoraceae</i>	Crustose	Bark	Common
19	<i>Mazosia phyllosema</i>	<i>Roccellaceae</i>	Crustose	Leaves	Common
20	<i>Parmotrema crinitoides</i>	<i>Parmeliaceae</i>	Foliose	Bark and rock	Common
21	<i>Pertusaria quassiae</i>	<i>Pertusariaceae</i>	Crustose	Bark	Common
22	<i>Phaeographina caesioradians</i>	<i>Graphidaceae</i>	Crustose	Bark	Common
23	<i>Phaeographis platycarpa</i>	<i>Graphidaceae</i>	Crustose	Bark	Common
24	<i>Pseudopyrenula pupula</i>	<i>Trypetheliaceae</i>	Crustose	Bark	Common
25	<i>Strigula antillarum</i>	<i>Strigulaceae</i>	Crustose	Leaves	Common
26	<i>Strigula elegans</i>	<i>Strigulaceae</i>	Crustose	Leaves	Common

27	<i>Strigula smaragdula</i>	<i>Strigulaceae</i>	Crustose	Leaves	Common
28	<i>Tricharia vainioi</i>	<i>Gomphillaceae</i>	Crustose	Leaves	Common
29	<i>Trichothelium annulatum</i>	<i>Trichotheliaceae</i>	Crustose	Leaves	Common
30	<i>Trypethelium eluteriae</i>	<i>Trypetheliaceae</i>	Crustose	Bark	Rare
Algae					
Group		Genus			
Cyanophyceae		a) Chroococcus,			
		b) Oscillatoria,			
		c) Phormidium,			
		d) Lyngbya,			
		e) Anabaena			
		f) Microcoleus			
		g) Pseudanabaena			
Zygnematophyceae		a) Mesotaenium,			
		b) Sprigya			
Ulvophyceae		a) Ulothrix			
Chlorophyceae		a) Chlamydomonas,			
		b) Chlorella,			
		c) Haematococcus			
		d) Oedogonium			
		e) Gonium			
Bacillariophyceae		a) Pinnularia,			
		b) Navicula			
Euglenoidae		a) Euglena			

List of macrofungi recorded in Jeypore reserve forest with uses and ecological relationship				
Sl. No.	Fungi	Family	Ecological relationship	Utilization
1	<i>Agaricus arvensis</i>	Agaricaceae	Saprophyte	Edible
2	<i>Lycoperdon pyriforme</i>	Agaricaceae	Mycorrhizal	Edible
3	<i>Coprinus disseminatus</i>	Agaricaceae	Saprophyte	Non edible
4	<i>Amanita pantherina</i>	Amanitaceae	Mycorrhizal	Non edible
5	<i>Auricularia auricula-judae</i>	Auriculaceae	Dead wood	Edible, Medicinal
6	<i>Boletus badius</i>	Boletaceae	Mycorrhizal	Non edible
7	<i>Cantharellus lateritius</i>	Cantharellaceae	Saprophyte	Edible
8	<i>Craterellus</i> sp.	Cantharellaceae	Saprophyte, dead wood	Edible
9	<i>Clavaria</i> sp.	Clavariaceae	Saprophyte, dead & decaying wood	Non edible
10	<i>Ganoderma lucidum</i>	Ganodermataceae	Parasitic	Medicinal
11	<i>Ganoderma applanatum</i>	Ganodermataceae	Parasitic	Medicinal
12	<i>Ramaria</i> sp.	Gomphaceae	Saprophyte, dead wood	Edible
13	<i>Laccaria bicolor</i>	Hydnangiaceae	Mycorrhizal	Non edible
14	<i>Phellinus gilvus</i>	Hymenochaetaceae	Parasitic	Non edible
15	<i>Marasmius androsaceus</i>	Marasmiaceae	Saprophyte, plant debris	Non edible
16	<i>Pleurotus</i> sp.	Pleurotaceae	Dead wood	Edible

17	Panus fulvus	Polyporaceae	Dead and decaying wood	Edible
18	Earliella scabrosa	Polyporaceae	Dead wood	Non edible
19	Lentinus sp.	Polyporaceae	Dead wood stumps	Edible, medicinal
20	Microporus xanthopus	Polyporaceae	Dead wood	Medicinal
21	Pycnoporus sanguineus	Polyporaceae	Saprophyte, Dead wood	Non edible
22	Trametes versicolor	Polyporaceae	Wood decaying	Medicinal
23	Lactarius hygrophoroides	Russulaceae	Mycorrhizal	Edible
24	Russula amoena Mycorrhizal	Russulaceae		Edible
25	R. delicata	Russulaceae	Mycorrhizal	Edible
26	R. pectinata	Russulaceae	Mycorrhizal	Edible
27	R. nobilis	Russulaceae	Mycorrhizal	Edible
28	Schizophyllum commune	Schizophyllaceae	Dead wood	Edible, medicinal
29	Scleroderma sp.	Sclerodermataceae	Mycorrhizal	Edible
30	Xylaria polymorpha	Xylariaceae	Dead wood	Non edible

List of mushroom species having medicinal uses

Sl No.	Mushroom species	Utilization
1	Ganoderma lucidum	Promotes health and longevity, lowers the risk of cancer and heart disease and boosts the immune system.
2	Ganoderma applanatum	Antioxidant, hypoglycemic and antihypertension
3	Microporus xanthopus	To stop a child from breast feeding
4	Xylaria polymorpha	To stop a child from bed wetting
5	Schizophyllum commune	Anti-candida, anti-tumor and anti-viral properties, antitumor, anticancer and immunomodulating activities
6	Auricularia auricula-judae	anti-diabetic, antitumor, antihypertensive, anti-inflammatory, immunomodulatory and antibacterial agents
7	Trametes versicolor	immunomodulatory and anti-cancer effects
8	Pycnoporus sanguineus	Biodegrading textile dyes and lignosulphonates arthritis, gout, styptic, sore throats, ulcers, tooth aches, fevers, hemorrhages and antibacterial
9	Phellinus gilvus	Antiinflammatory, antitumor, antioxidant, antihepatotoxicity
10	Marasmius androsaceus	Tendon relaxation, pain alleviation and antihypertension
11	Lentinus sp.	Protect from cancer, environmental allergies, fungal infection, frequent flu and colds, bronchial inflammation, heart disease, hyperlipidemia, hypertension, infectious disease, diabetes, hepatitis and regulating urinary inconsistencies



VOLUME 1

PART I



SUMMARY OF FACTS ON WHICH PROPOSALS ARE MADE

CHAPTER 1

THE TRACT DEALT WITH

1.1 Name and situation

This Working Plan covers fourteen RFs and six PRFs of the Digboi Division. Digboi Forest Division was created in the year 1960 bifurkating the erstwhile Lakhimpur Forest Division. Digboi Forest Division is situated between 27°15' to 27°30' North latitude and 95°18' to 96° East longitude, covering an area of **59377.16 hect** of RFs and **2464.15 hect** PRFs. Total geographic area of the Digboi Division is 1310 sq. km. The forest cover of the Division is 86.2 per cent. And it houses diversified species of flora and fauna. It falls within the civil jurisdiction of Tinsukia and part of Dibrugarh District covering the entire Margherita civil sub-division, part of Tinsukia civil sub-division and part of Dibrugarh civil sub-division.

Boundary of the Division:

North:	Southern boundary of Doom Dooma Division and South West boundary of Arunachal Pradesh
East	Southern boundary of Arunachal Pradesh
South	Nampong, Changlang and Deomali Forest Divisions of Arunachal Pradesh and Joypur RF of Dibrugarh Forest Division in Assam
West	Dibrugarh Forest Division

The maps prepared with geographical coordinates recorded at the site are maintained in the GIS Cell (REWP) Guwahati for reference purposes. Table 1.1 shows the administrative set up of Digboi Forest Division. These forests are covered within Survey of India topo sheets on 1:50,000 scale, survey sheet Numbers. 83 (M7, M8, M10, M11, M12, M14, M15, M16) and 92 (A3). These sheets are recorded in the office of the DFO, who is responsible for the administration of these forests. Compartment wise detail area and perimeter is provided in Annexure I. Reserve forest map and the road map of the Division is provided in the Appendix. The Division Head Quarter is near the Digboi town, while Range Head Quarters are located at various places.

Table 1.1 Administrative setup of the Digboi Division forests.

Name of the Range	R.F.	Block	Comptt.	Area (Ha.)
Digboi Range	Digboi East	Digboi	Whole	56.98
	Digboi West	VI	9 & 10	271.31
		VII	1,2&3	553.85
	Bogapani	Bogapani	Whole	109.09
	UDR (West)	Makum	126 to 137	2233.36
		IV	1 to 11	1208.07
		VI	1 to 8	1128.25
		VII	4 to 5	207.75
		VIII	1 to 5	776.98
		IX	1 to 7	949.03
		X	1 to 7	989.49
	UDR (East)	Bogapani	1 to 25	6305.85
Lakhipathar Range	UDR (West) RF	Makum	5, 7, 8; 87 to 125 & 138	8077.99

Saraipung	UDR (West)	Makum	139 to 143	1052.15
		I	1 to 6	697
		II	1 to 10	1080.13
		III	1 to 10	1098.77
Margherita West Range	UDR (West)	V	1 to 5	512.82
		XI	1 to 4	503.85
		XII	1 to 3	375.09
		XIII	1 to 8	991.13
		XIV (A)	Whole	269.91
		XIV (B)	1 to 3	598.38
		XIV (C)	1 to 5	665.19
	Dirok R.F.	Dehing	1 to 7	2375.90
		Lekhajan	4(Lekhajan)	155.721
	Dirok 1 st addition	1 st addition	8 to 10	620.38
	Makumpani	Makumpani	Whole	383.0
	1 st add to Makumpani	1 st add to Makumpani	Whole	55.0
Lekhapani Range	Lekhapani RF	Lekhapani	Whole	1419.72
	Tirap RF	Tirap	1 to 3	1532.97
	1 st add to Tirap	1 st add to Tirap	whole	3025.0
	Tipong RF	Tipong	Whole	391.18
	Paharpur RF	Paharpur	Whole	66.0
	Saleki	Saleki	whole	1700.0
Jagun Range	Tinkopani RF	Tinkopani	1 to 5	3417.43
	Namphai RF	Namphai	1 to 5	1751.25
	Kotha RF	Kotha	Whole	1071.29

Note: The whole Bogapani block comes under the forest village. 1to 5 compartment under Namphai RF under Namphai block and the whole compartment of Kotha block under Kotha RF is included under Namphai 1st addition.

According to the 2011 census, Digboi Town Committee has a population of 21,736 of which 10,964 are males while 10,772 are females. The district has a population density of 350 people per square kilometre. It has a sex ratio of 982 females for every 958 males. Population growth rate in 2011 is 5.76%. Average literacy rate is 92.08 % higher than state average of 72.19 %.

1.2 Configuration of the Ground

The forests under Digboi Forest Division are situated on the foothills of Patkai Range. The terrain is plain to low hills. The region is flat with a gradual slope from the East Arunachal hills to the west. The altitude in the Division ranges from 94 above msl near the North-Eastern corner of Dehingmukh RF to 510 above msl at the highest point Dehing Patkai. River Buridehing, Tirap, Dirok, Dibru and numerous other small streams keeps the terrain well drained.

1.3 Geology, Rock and Soil

A fairly thick group of sedimentary rocks occurs in this Division, ranging in age between Eocene and Pleistocene and are exposed mainly along the foot hills bordering the southern part. The eastern part of the Division and the valley of the Brahmaputra River are covered by thick alluvial deposits belonging to sub-recent and recent periods.

The Brahmaputra valley is of a nature of a “ramp valley” developed during the simultaneous upheavals of the Himalayas on the north and northeast and the Patkai ranges on the south and southeast. The thick sedimentary rocks of the Tertiary period have been buckled and overthrust due to the tectonic forces

directed towards south from the Himalayas and to the northwest from the Shan plateau, Burma. Eventually the tertiary rocks along the Patkai ranges were structurally disposed along several folded anticlines, often cut off by several parallel imbricating thrusts viz. Naga thrust, Haflong - Disang thrust and Margherita thrust.

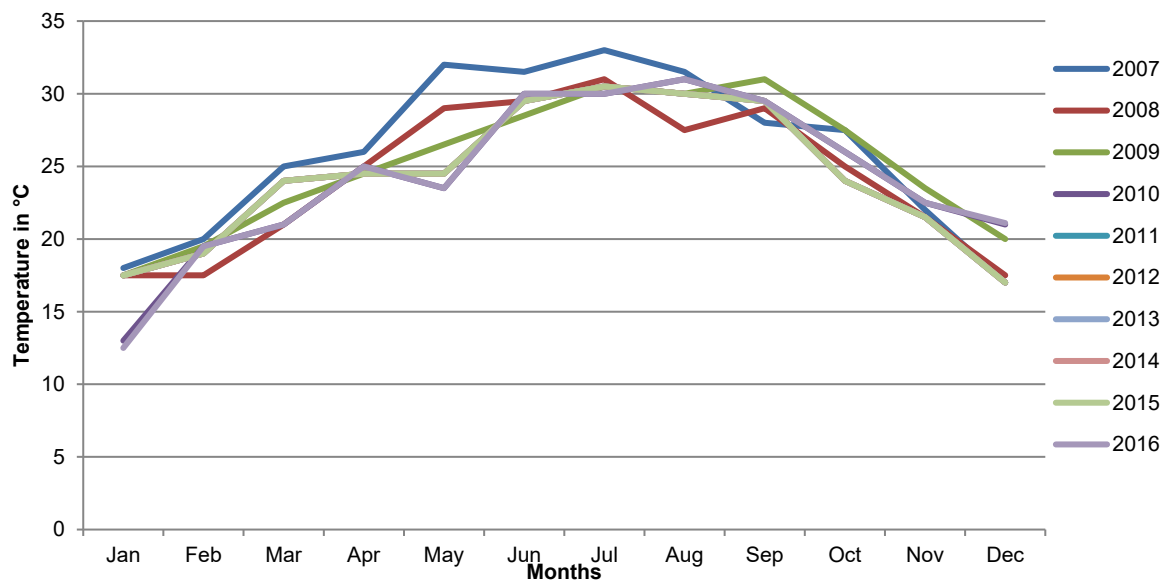
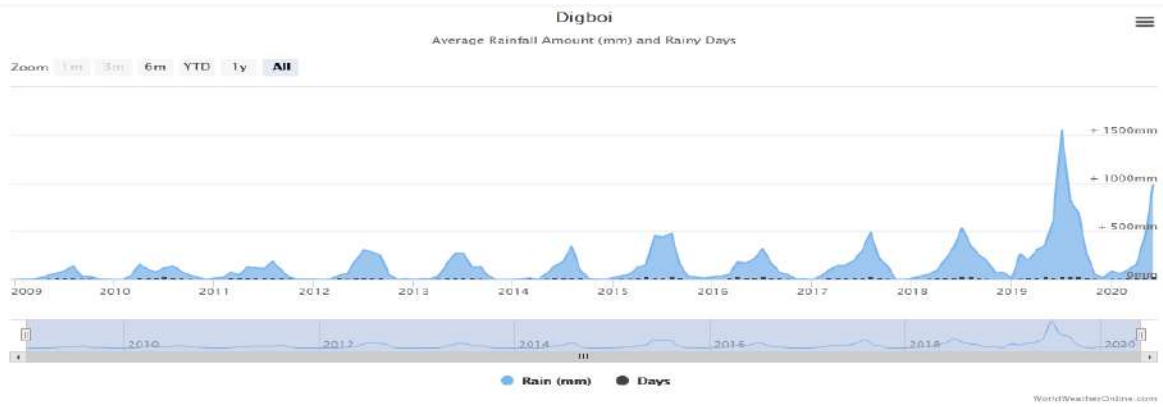
Naga thrust passes along the northern edge of the Jaipur-Tipam-Digboi range of hills bordering the alluvial plains of Brahmaputra on the north. The next important one is the Haflong Disang thrust which runs east-northeast along the northern base of the Namsang-Barduria hills, south of Jaipur and continue further eastward along the southern boundary of the Makum coal-field. In between the above two, there is another thrust known as the Margherita thrust running along the northern boundary of the Makum coalfield. The thrust eventually merges with Disang thrust near Dirak towards the west.

The Digboi region is in the foothills of Patkai Range & consists of upper tertiary rocks with Tipam sand stone which is characterized by oil and coal deposits. The soil formation in most of the tracts can be mostly attributed to alluvial deposits brought down by the river Buridehing. The soil is deep reddish in colour and occurs over the older geological formation. The soil types are sandy to clayey and acidic in nature (pH value being 5.5). The alluvial deposits is characterized by the shallow surface layer of silty loam not exceeding about 2 to 3 feet in depth and of grey colour with subsoil of coarse sand often mixed with pebbles and boulders. The alluvial deposits of the Dehing River is characterized by its coarse nature and reddish colour.

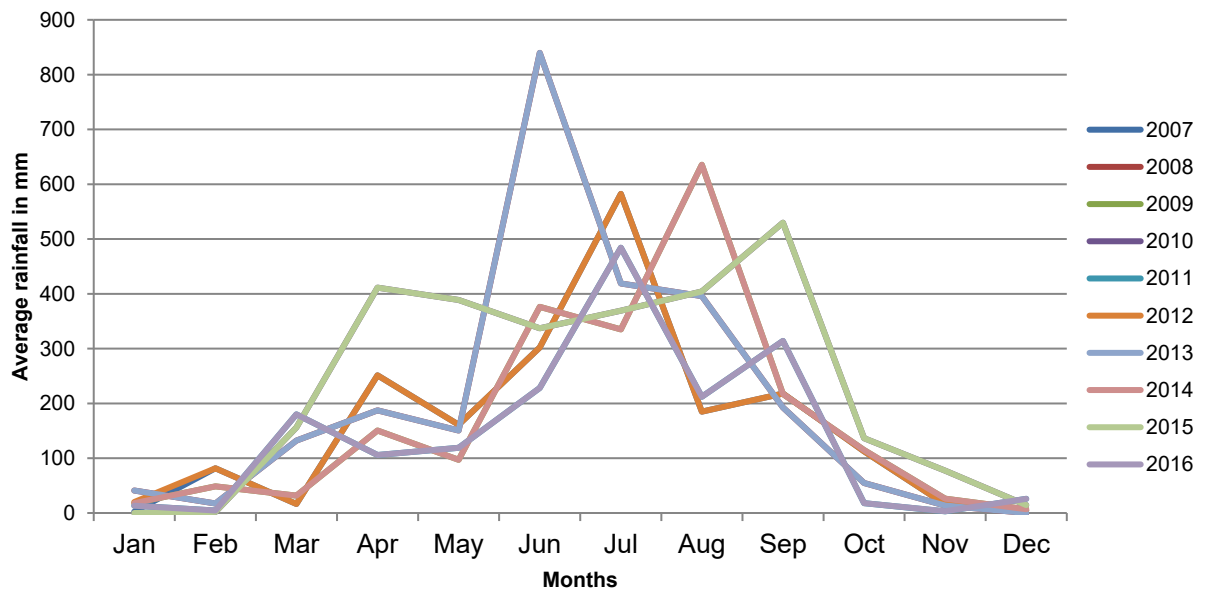
1.4 Climate

With the Sub-tropical monsoon climate, Digboi Division is temperate (summer max. 35–38 °C and winter min. at 6–8 °C) and experiences heavy rainfall and high humidity. High humidity and high rainfall is the characteristic feature of the forests in this Division. The climate is characterised by heavy monsoon downpours reducing summer temperatures and affecting foggy nights and mornings in winters, frequent during the afternoons. Spring (March–April) and autumn (September–October) are usually pleasant with moderate rainfall and temperature. The hottest months are May, June, July and August and the coldest months are December and January.

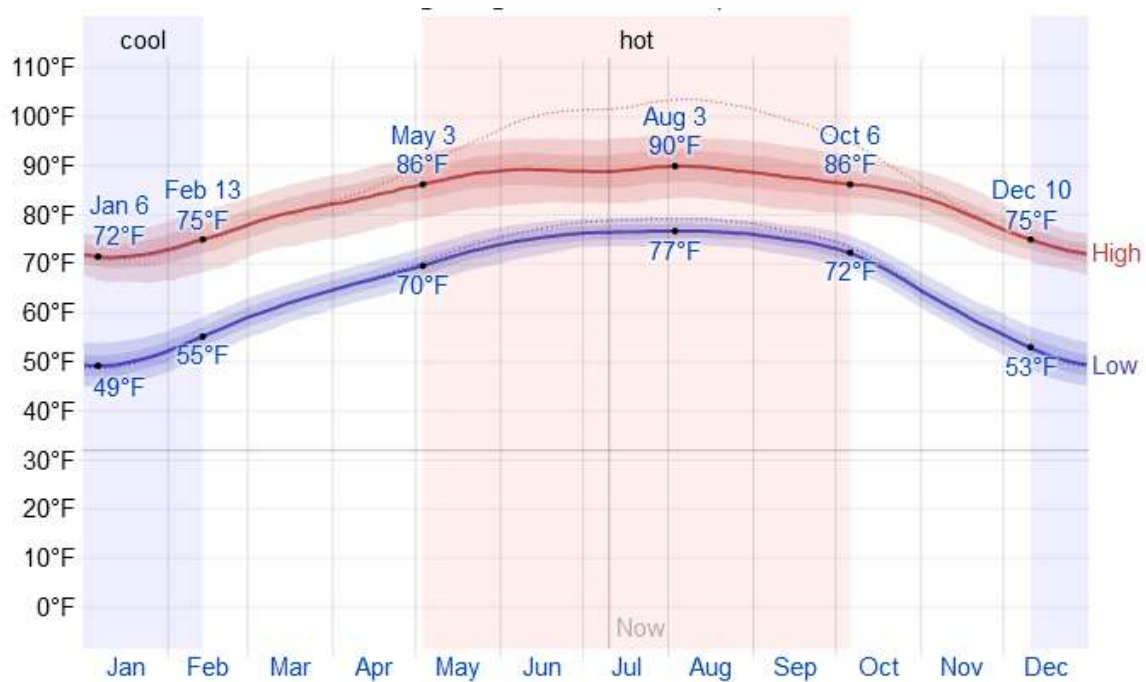
The Division is endowed with high rainfall during all the months in the year. The rainfall is distributed more or less throughout the year. The average annual rainfall is 2499 mm. The bulk of precipitation takes place during the period of April to September. The rainfall pattern shows that the month of July receives the highest amount of rainfall and the month of December receiving the lowest.



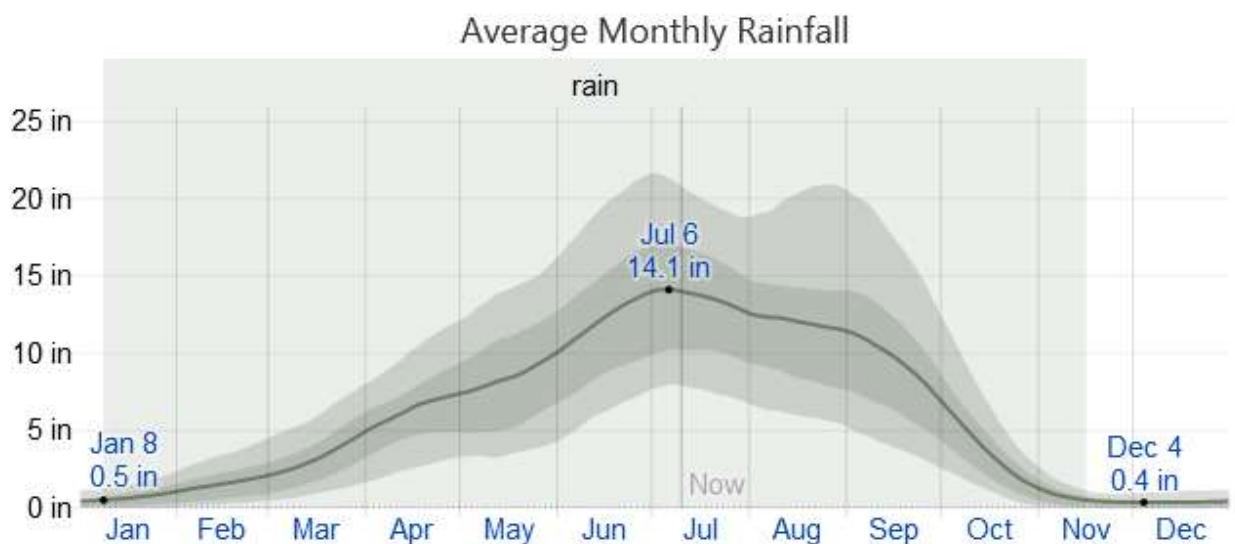
Monthly mean temperature (°C) from 2005 - 2016 and the average trend in Digboi Division, Assam.



Monthly mean rainfall (mm) from 2007 - 2016 and the average trend in Digboi Division, Assam.



The daily average high (red line) and low (blue line) temperature, with 25th to 75th and 10th to 90th percentile bands. The thin dotted lines are the corresponding average perceived temperatures.



The average rainfall (solid line) accumulated over the course of a sliding 31-day period centered on the day in question, with 25th to 75th and 10th to 90th percentile bands.



The percentage of time spent at various humidity comfort levels, categorized by dew point.

CHAPTER 2

MAINTENANCE / INCREASE IN THE EXTENT OF FOREST & TREE COVER

2.1 Area of Forests under different Legal Classes

The reserved forests have been constituted under the relevant provisions of the Assam Forest Regulation, 1891 and the Indian Forest Act, 1972. The details of forest area under different legal class with notifications are shown in table 2.1.

Table 2.1: Notified forest area under different legal classes in Digboi division, Assam

Sl. No	Reserve Forest / PRF	Notified area (Ha)	Diverted (ha)	Total area (Ha) as per reserve register	Govt. Notification number and Date
RESERVE FORESTS (RFs)					
1	Bogapani RF	96.2	0	96.20	No. 2673 R dt. 23-07-1929
2	Digboi West RF	956.8	0	921.44	No. 295 R dt. 02-02-1926
			3.36		No. 1203 RS dt. 09-04-1936
			32.0		No. 4237 GJ dt. 29-09-1937
3	Digboi East RF	162.0	0	69.36	No. 295 R dt. 02-02-1926
			38.28		No. 1203 RS dt. 09-04-1936
			54.36		No. 3218 GJ dt. 21-07-1937
4	Dirok R.F.	3006.0	0	3682.14	No. 1792 R dt. 18-05-1929
	1 st addition Dirok R.F.	676.14	0		Final Govt. Notification No. FRS /163 /94 /57 dt. 18-07-1996
5	Kotha RF	1120.0	0	1120.0	No. FOR/SETT/138/59/39 dt. 21-03-1963
6	Lekhapani RF	1380.0	0	1380.0	No. FOR/SETT/791/68/7 dt. 31-12-1968
7	Makumpani RF	477.2	0	477.2	No. FOR/SETT/172/66/17 dt. 14-12-1968
8	Namphai RF	744.0	0	744.0	No. 3819 R dt. 12-11-1934
	-do- 1 st addition	1348.0	0	1348.0	No. FOR/SETT/447/57/18 dt. 17-11-1959
9	Paharpur RF	166.0	0	166.0	No. FRS/16/99/16 dt. 17-12-1959
10	Tirap RF	1437.6	0	1437.6	No. 2628 R dt. 29-08-1933
11	Tipong RF	440.0	0	440.0	No. 3818 R dt. 12-11-1934
12	Tinkopani RF	2997.0	0	2997.0	No. FOR.172/56/23 dt. 27-07-1959
13	Upper Dehing (E) RF	12910.0	0	13169.82	No. 5088 R dt. 31-10-1898
	-do- 1 st addition	259.82	0		No. FOR/SETT/388/64/16 dt. 17-12-1965
14	Upper Dehing (W) RF	26548.4		26548.4	No. 5088 R dt. 31-10-1898
15	Tirap RF	3025.0	-	3025.0	FRM.14/2021/Pt/125 dt 05-01-2022
16	1 st add to Makumpani RF	55.0	-	55.0	FRM.14/2021/Pt/126 dt 05-01-2022
17	Saleki PRF	1700	-	1700	FRM.14/2021/Pt/124 dt 05-01-2022
	TOTAL RF's	54725.16	128	59377.16	
PROPOSED RESERVE FORESTS (PRFs)					
1	Tipong PRF	2020.0	-	2020.0	Pre. Notification No. FRS.163/94/82dt. 01-12-1999
2	Dewasali PRF	220.0	-	220.0	Pre. Notification No. FRS.66/72/2 dt. 06-04-1972
3	Dalai PRF	224.15	-	224.15	Pre. Notification No. FRS. 163/94/66dt. 18-07-1996
	Total PRF's	8484.15	-	2464.15	

2.2 Forest Area under different Working Circles

Forest areas under different Working Circles covered under the purview of this Working Plan are shown in Table 2.2. The compartment wise area allocated under different working circles is elaborated under the individual Working Circles chapters mentioned in Part II of the working plan. Consolidated allocation of working circles is shown in Annexure IC. Figure 2.2 visually shows allocation of forest area under different working circles.

Table 2.2: Areas allotted to different Working Circles

S. No.	Name of the working circle/ over lapping circle	Name of RFs (Compartment Nos)	Total Area of RF's (Ha)	Total areas allocated from the RF's into the Working Circles (Ha)
1.	Joint Forest Management Working Circle	Bogapani (1) Dirak (4(Lekhajan)) Namphai (1,3,4,5) Tirap (3) Upper Dehing EB (22,44,55,56, FV) Upper Dehing WB (5, 7, 103, 114, 126, 127, 128, 129, 130, 131, VI(6), VI(8), XIV(A), FV)	41970.62	8326.999
2.	Forest Protection Working Circle	Digboi WB {(VII)2} Upper Dehing EB (38, 40) Upper Dehing WB (102,117)	36106.15	3681.054
3.	Plantation and Regeneration Working Circle	Digboi EB (1) Digboi WB (1); (II)24; (III)3,4,5,6; (IV)6,7,8,11; (VI)3,4; (VII)4; (VIII)1,2,3; (X)5,7; (XII)1; (IX)2,5; Dirak RF (1,2,3,4,5,6,7,8,9,10) Kotha (1) Lekhapani (1) Namphai (2) Tinkopani (1,2,3,4,5) Tipang (1) Tirap (1,2) Upper Dehing EB (1,2,3,4,5,6,7,8,9,10,11,12, 13,14,15,16,17,18,19,20,21,22,23,24,25,26, 27, 28,29,30,31,32,33,34,35,36,37, 38, 39,40, 41,42,43,44,45,46,47,48,49, 50, 51,52,53,54) Upper Dehing WB {8,88 to 125; 132 to 143; (I) 1 to 6; (II) 1 to 20; (III) 2,7,8,9; (IV) 1,2,3,4,5,9,10; (IX) 3,4,6,7; (V) 1 to 5; (VI) 1,2,5,7; (VIII) 4,5; (X) 1,2,3,4,6; (XII) 2,3; (XIII) 1 to 6; (XIV) B1 to 3, C1 to 5	49174.01	41598.141
4.	Soil and Moisture Conservation (Overlapping) Working Circle	Upper Dehing EB (34) Upper Dehing WB (87)	35281.28	253.932 Additional 1996.05 for riparian buffer area
5.	NTFP Forest Produce and Bamboo (overlapping) Working Circle	Bogapani, Digboi East RF, Digboi West RF, Dirak RF, Kotha RF, Lekhapani RF, Namphai RF, Tinkopani RF, Tirap RF, Upper Dehing East RF and Upper Dehing West RF	47940.24	3248.43
6.	Wildlife Management and Biodiversity Conservation (Overlapping) Working Circle	Upper Dehing Reserve Forest (West Block) and Dirak RF	27021.48	7972.39

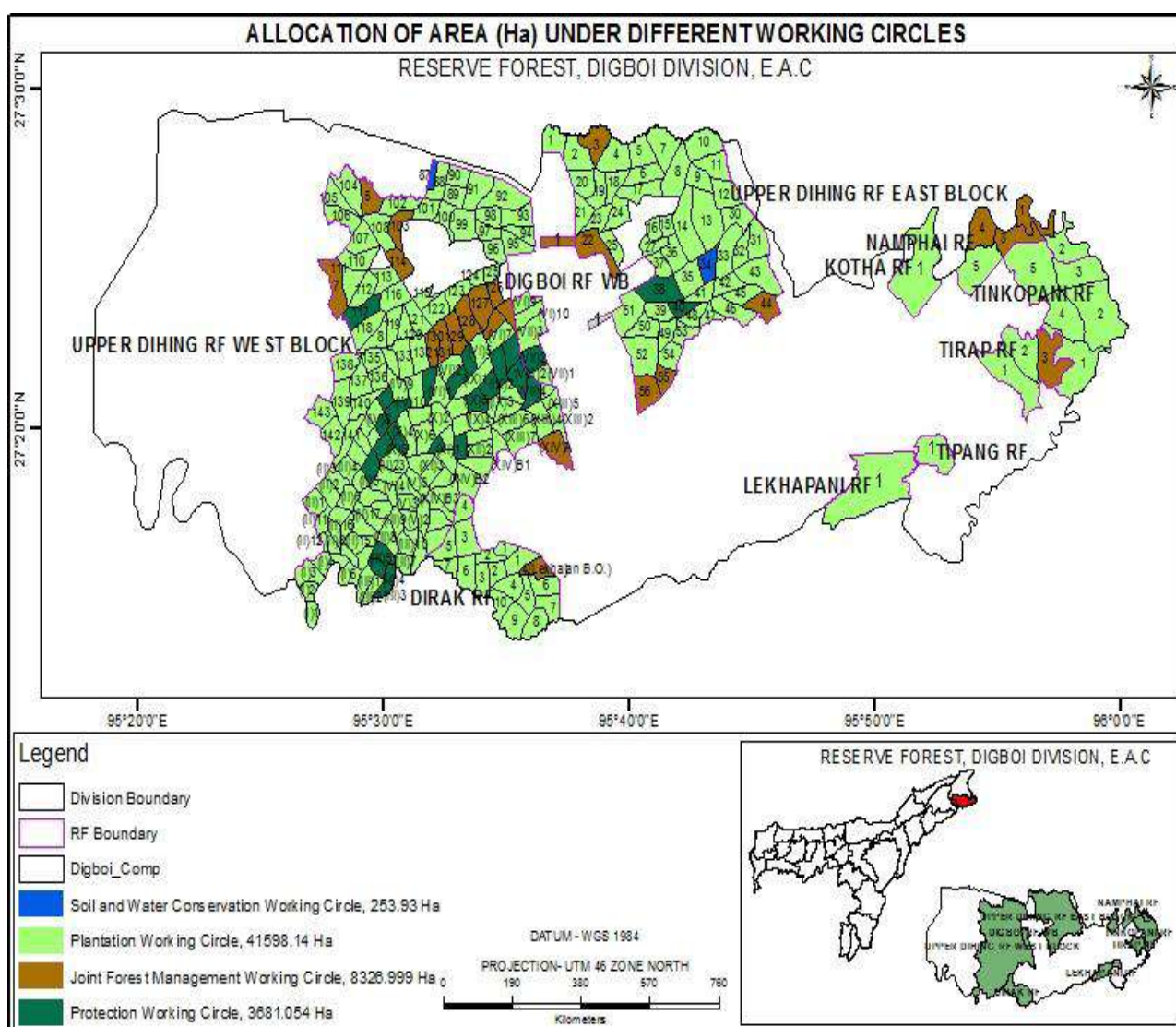


Figure 2.2: Map showing allocation of forest areas under different working circles, Digboi division.

2.3 Percentage of forest with secured boundaries:

The boundaries of the RFs and PRFs are either demarcated by artificial lines, roads, railway lines or paths or by natural streams, rivers. Most of the boundaries are with artificial lines are not very clear. The boundary marks/ pillars are damaged, shifted or removed. There are civil villages on the fringes of some of the RFs and PRFs. Out of a total of during the tenure of the working plan secured boundaries pillars constructions has been proposed. Out of a total length of interstate boundary of 127.6 km with Arunachal Pradesh, 116.25 km has natural boundaries and the remaining 11.35 km has artificial boundary. Statement showing the reserve forest wise length of Assam and Arunachal Pradesh interstate border is provided in Table 2.3.

Table 2.3: Length (km) of Assam and Arunachal Pradesh interstate border of Digboi division.

RF/PRF	Location	Boundary	Length	Range
Namphai RF	Jagunghat to Namchik	Natural	25.00	Jagun
Tinkopani RF	Namchik ti Tirap R.	Natural	13.75	Jagun
Tirap/Tipong RF	Along Tirap R.	Natural	16.50	Lekhapani
Tipong PRF	Between Tirap R. & Kapug Nala	Artificial	01.85	Lekhapani
-do-	Along Kapug Nala	Natural	04.00	Lekhapani
-do-	Along Tipong R.	Natural	41.50	Lekhapani
Lekhapani RF	Lekhapani RF	Artificial	08.25	Lekhapani
Saleki PRF	Along Lekhapani and Deopani nala	Natural	13.00	Lekhapani
Makumpani RF	Along Makumpani R.	Natural	05.70	Margherita West
Dirok RF 1 st Edn	Along Dirok R.	Natural	03.50	Margherita West
Dirok RF	-do-	Natural	15.00	Margherita West
UDRF West block	Along Buridehing R.	Natural	06.80	Margherita West & Soraipung
Civil area	Koriapani Nala to Jagunghat	Artificial	11.50	Jagun
Civil area	Namtok	Artificial	01.25	Margherita West

2.4 Land Use, Land Use Change and Forestry (LULUCF)

Cartosat satellite imagery of 2.5 m resolution at two time points 2005-2006 and 2015-2016 was analyzed and RS/GIS tools applied to map LULUCF. There are visible changes detected in land use, land use change and forestry in Digboi division. Area details at two time points under each LULC categories is provided in Table 2.4.a. Increase or decrease in the extent of LULUC categories at two time points is shown graphically in Figure 2.4.b. The change analysis matrix is shown in table 2.4.c. Detail LULC maps developed at the two time points is shown in Figure 2.4.d.

Table 2.4.a: Area details under different LULCF categories of Digboi division at two time points.

LULC categories	Year 2005 - 2006	Year 2015 - 2016	LULUCF
Agriculture Cropland	25521.6	21070.0	4451.6
Agriculture Plantation (Tea garden)	20934.9	20033.8	901.1
Built Up	3032.0	5608.0	-2576
Forest (Evergreen / Semi evergreen)	55592.6	55089.4	503.2
Forest (Scrub Forest)	4707.6	3045.4	1662.2
Forest (Tree Clad Area)	17507.0	20972.3	-3465.3
Grassland and Grazing land	169.2	822.4	-653.2
Shifting Cultivation	1.0	52.0	-51
Wasteland	0.0	921.8	-921.8
Waterbodies (Lake / Pond)	6.4	17.5	-11.1
Waterbodies (Reservoir / Tank)	3.3	9.4	-6.1
Waterbodies (River / Stream)	2722.0	2816.9	-94.9
Wetlands (Inland-Natural)	1225.4	963.8	261.6
Total Area Ha	131422.8	131422.8	

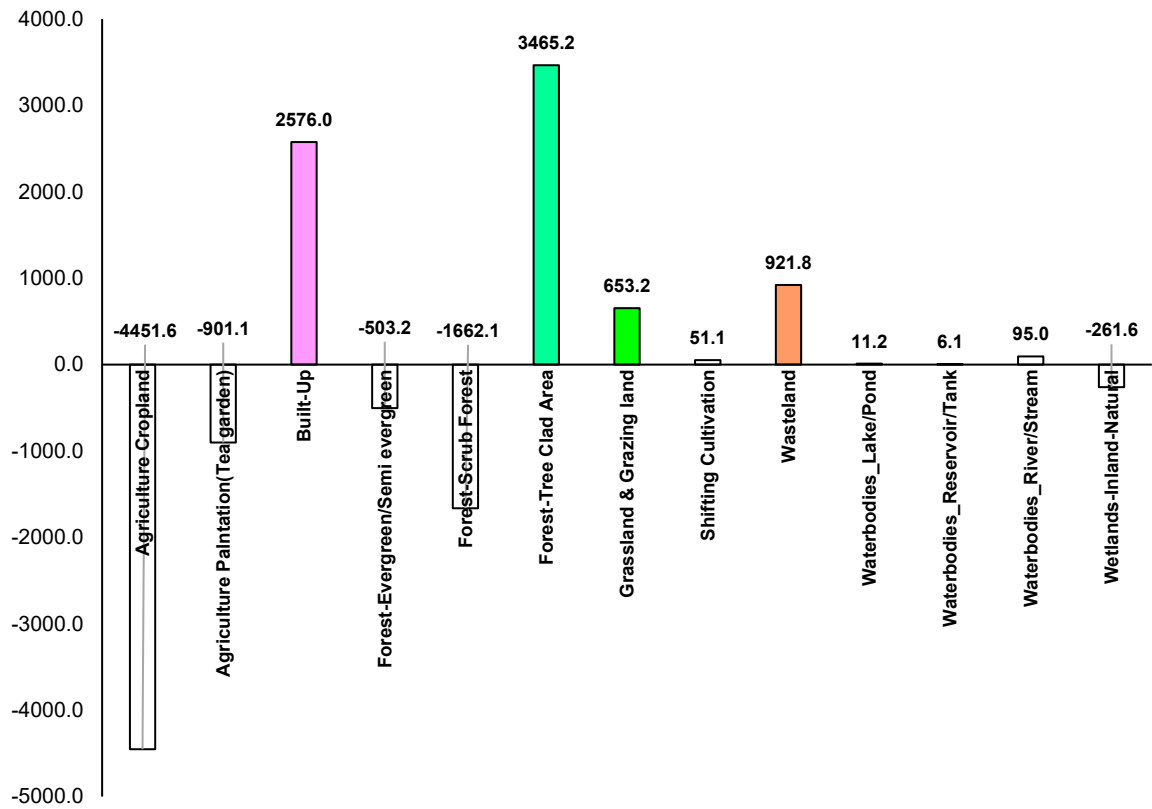


Figure 2.4.b: Graph showing extent of changes (Ha) in LULC detected between 2006-2006 and 2015-2016 at Digboi division.

Table 2.4.c: Digboi Division LULC matrix of two time points 2005-2006 and 2015-2016.

LULC2005-06 / 2015-2016	Agriculture Cropland	Agriculture Plantation (Tea garden)	Built Up	Forest - Evergreen / Semi evergreen	Forest - Scrub Forest	Forest - Tree Clad Area	Grassland & Grazing land	Shifting Cultivation	Wasteland	Lake/ Pond	Reservoir /Tank	River / Stream	Wetlands (Inland-Natural)	Grand Total
Agriculture Cropland	19788.77	426.54	735.15	38.66	721.91	2172.28	321.11	-	789.53	-	0.04	175.68	351.88	25521.55
Agriculture Plantation (Tea garden)	355.98	18181.29	551.00	621.15	18.97	1107.91	0.03	-	12.87	-	-	14.53	71.15	20934.89
Built Up	6.71	4.10	2754.65	4.55	-	260.35	0.08	-	-	-	0.05	1.52	-	3032.01
Forest Blank	-	-	-	5.58	25.45	-	-	-	-	-	-	0.02	-	31.05
Forest - Evergreen / Semi evergreen	49.55	88.94	202.06	54174.40	389.78	521.82	5.91	0.29	0.18	17.54	-	141.57	0.57	55592.61
Forest - Scrub Forest	145.73	497.05	69.33	16.18	1805.43	2053.02	2.16	47.84	3.34	-	-	35.75	0.67	4676.50
Forest - Tree Clad Area	606.54	792.84	1290.69	129.49	58.73	14560.72	5.16	-	15.19	-	-	37.79	9.88	17507.03
Grassland & Grazing land	0.81	-	-	-	-	0.47	156.17	-	-	-	-	11.71	0.06	169.21
Shifting Cultivation	-	-	-	0.27	-	-	-	0.69	-	-	-	-	-	0.96
Lake/Pond	-	-	0.06	-	-	-	-	-	-	-	6.29	-	-	6.35
Reservoir/ Tank	-	-	0.28	-	-	-	-	-	-	-	3.00	-	-	3.28
River/Stream	59.97	27.37	3.32	73.66	24.37	35.27	134.09	3.21	3.08	-	-	2351.14	6.51	2721.98
Wetlands (Inland-Natural)	55.93	15.69	1.48	25.44	0.79	260.43	197.72	-	97.58	-	-	47.24	523.11	1225.40
Grand Total	21069.99	20033.81	5608.03	55089.37	3045.43	20972.26	822.43	52.03	921.77	17.54	9.38	2816.95	963.83	131422.82

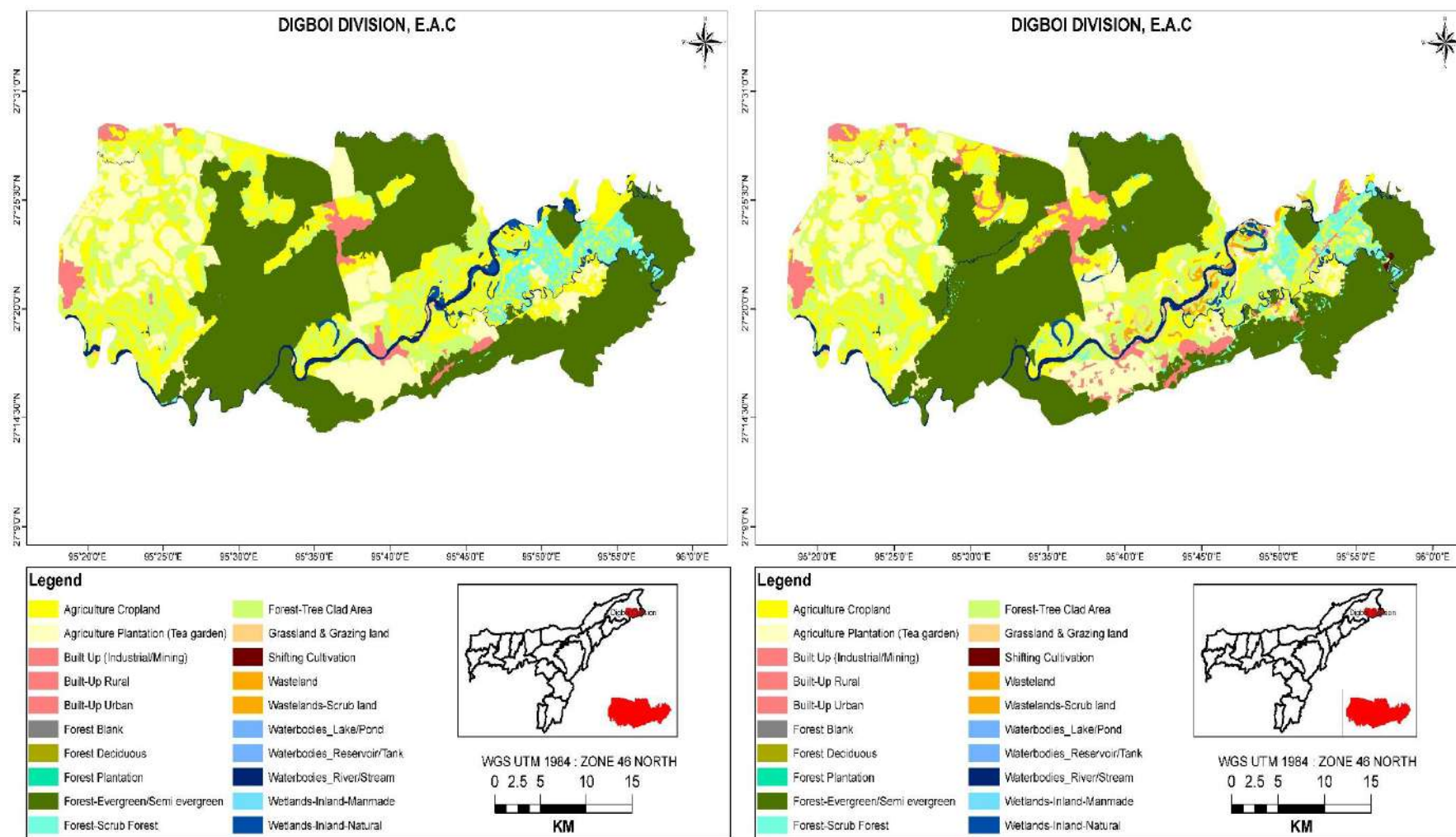


Figure 2.4.d: Land Use Land Cover Map of Digboi division in 2005-2006 and 2015-2016.

2.4.1 Encroachment

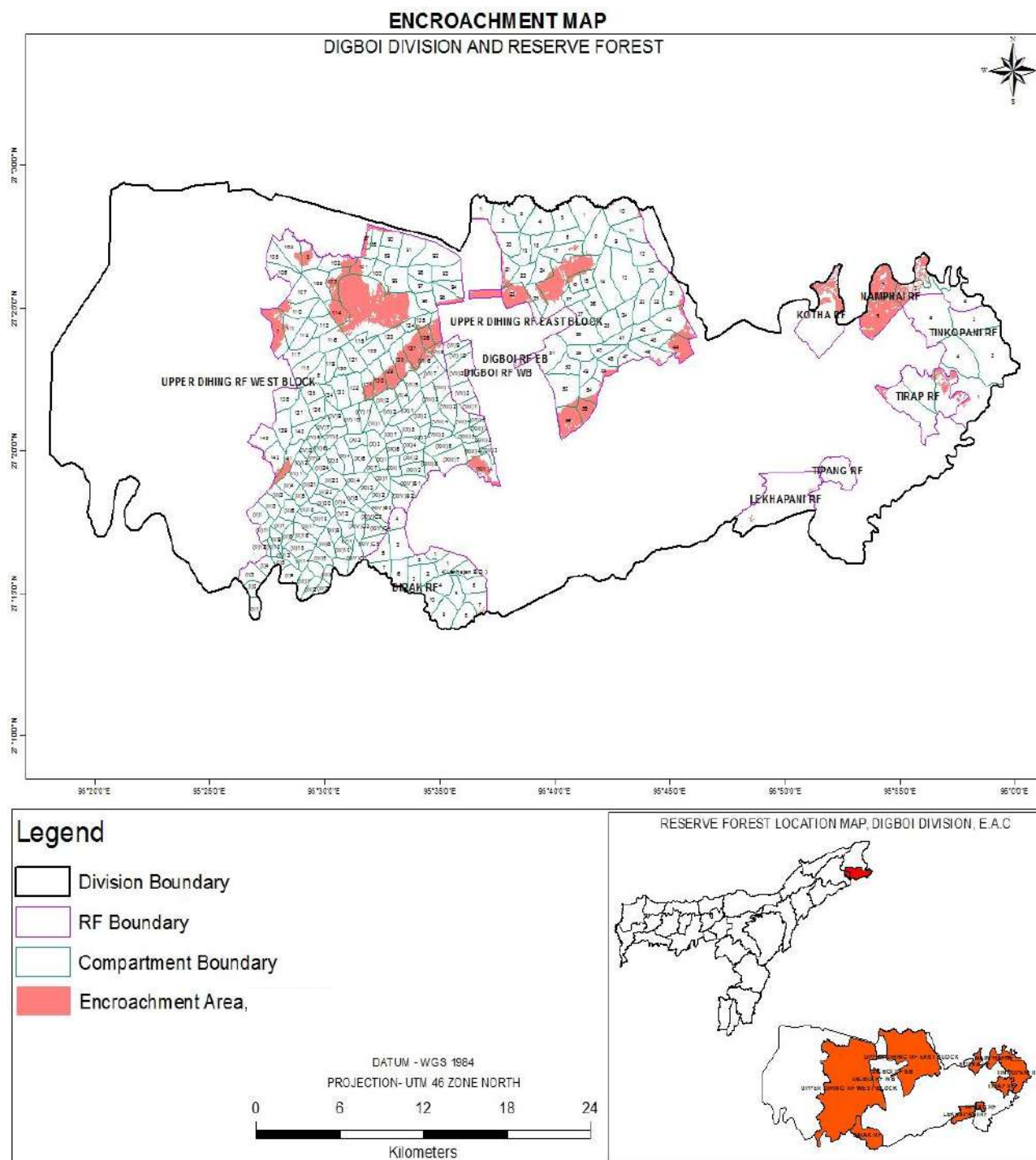
A total of 5,160.93 Ha (9.6%) [*Bogapani FV is not included*] is encroached in Digboi Division. Percent of reserve forest area within the Division encroached under agriculture and builtup rural is 71.43% and 12.34%, respectively. Tea garden (9.99%) and Built up urban area is 4.17%. RF wise encroached area statement under different landuses is shown in table 2.4.1 and encroachment map for the division is shown in Figure 2.4.1. The detailed coordinates of encroached areas are provided in Annexure III.

Table 2.4.1: Statement showing the status of encroached area Digboi division, Assam.

Name of the RFs	Area of RF / FV (Ha)	Agriculture Cropland (Ha)	Agriculture Plantation (Tea garden) (Ha)	Built-Up Rural (Ha)	Built-Up Urban (Ha)	Total encroachment (Ha)	Percent
Digboi RF EB	56.983	0.334	22.047			22.38	39.3
Digboi RF WB	825.158	14.846	1.169	41.852	13.838	71.71	8.7
Dirak RF	3151.996	6.000	14.138		4.475	24.61	0.8
Kotha RF	1071.29	57.639				57.64	5.4
Lekhapani RF	1419.72				1.158	1.16	0.1
Namphai RF	1751.25	259.001	7.282	148.171		414.45	23.7
Tinkopani RF	3417.434	2.564				2.56	0.1
Tipang RF	391.182				0.006	0.01	0.0
Tirap RF	1532.968	2.836	12.146			14.98	1.0
Upper Dihing RF East Block	13079.987	1159.581	137.921	113.927		1411.43	10.8
Upper Dihing RF West Block	27053.066	2261.371	331.951	346.493	200.182	3140.00	11.6
Total	53751.034	3764.171 (71.43%)	526.654 (9.99%)	650.443 (12.34%)	219.660 (4.17%)	5160.93	9.6

Note: Bogapani FV is not included in this table.

Figure 2.4.1: Map showing the areas of reserved forest encroached in Digboi division.



2.4.2 Diversion of Forests

A total of 164.34 hectare of reserve forest have been diverted to non-forestry purposes in the Digboi division. Statement of diverted areas of RFs in the division is shown in table: 2.4.2

Table: 2.4.2 Statement showing forest area diverted for non forestry purpose

Sl. No.	Name of RF	Area diverted (ha)	Year	GOI Letter no.	User Agency
1	Upper Dehing RF (WB)	4.961	1979	Not Traceable	Oil India Ltd, Duliagan
2		4.101	1979	Not Traceable	
3		5.200	1972	Not Traceable	
4		3.620	1980	Not Traceable	
5		2.760	1982	Not Traceable	
6		8.160	1982	FRS. 179/81/45, Dt. 2/4/82	
7		4.790	1983	Not Traceable	
8		1.910	1983	FRS.179/81/45, Dt. 2/4/82	
9		3.53	1984	Not Traceable	
10		2.490	1984	FRS.179/81/45, Dt. 2/4/82	
11		1.560	1984	FRS.572/82/227, Dt.21/2/84 G-8(a)/6393-96, Dt.28/2/84	
12		1.87	1984	FRS.572/82/227, Dt.21/2/84 G-8(a)/6393-96, Dt.28/2/84	
13		2.29	1984	FRS.179/81/102, Dt. 23/4/84 G-7/28567-69. Dt.30/04/84	
14		2.29	1984	FRS.179/81/102, Dt. 23/4/84 G-7/28567-69. Dt.30/04/84	
15		2.50	1984	FRS.179/81/102, Dt. 23/4/84 G-7/28567-69. Dt.30/04/84	
16		2.39	1984	FRS.179/81/102, Dt. 23/4/84 G-7/28567-69. Dt.30/04/84	
17		1.47	1984	FRS.372/82/227,Dt. 21/2/84 G-8(a)/6393-96, Dt.28/2/84	
18		5.73	1984	FRS.164/84/35,Dt.28/9/84 G-8(a)/26029-32,Dt. 20/10/84	
19		2.63	1984	FRS.372/82/227,Dt. 21/2/84 G-8(a)/6393-96, Dt.28/2/84	
20		3.04	1985	FRS.24/84/63,Dt. 28/2/84 G-8(a)/26029-32,Dt. 20/10/84	
21		2.88	1985	FRS.185/84/87,Dt.27/10/84 G-8(a)/28393-96 Dt.20/10/84	
22		1.73	1985	FRS.185/84/87,Dt.27/10/84 G-8(a)/28393-96 Dt.20/10/84	Oil India Ltd, Duliagan
23		5.74	1985	FRS.324/88/24,Dt. 26/9/84 G-8(a)/26029-32 Dt.21/11/84	
24		3.00	1985	FRS.185/84/87,Dt.27/10/84 G-8(a)/26029-32 Dt.21/11/84	
25		2.101	1985	FRS.285/84/54, Dt. 13/11/84 G-8(a)/28373-75 Dt.21/11/84	
26		2.50	1985	FRS.285/84/157, Dt. 31/12/84 G-8(a)/28373-75 Dt.21/11/84	

Sl. No.	Name of RF	Area diverted (ha)	Year	GOI Letter no.	User Agency
27		2.96	1985	FRS.285/84/54, Dt. 13/11/84 G-8(a)/28373-75 Dt.21/11/84	
28		2.00	1985	FRS.285/84/51, Dt. 13/11/84 G-8(a)/28373-75 Dt.21/11/84	
29		2.00	1985	FRS.285/84/51, Dt. 13/11/84 G-8(a)/28373-75 Dt.21/11/84	
30		2.00	1985	FRS.285/84/54, Dt. 13/11/84 G-8(a)/28373-75 Dt.21/11/84	
31		3.37	1985	FRS.285/84/51, Dt. 13/11/84 G-8(a)/28373-75 Dt.21/11/84	
32		2.214	1987	FRS.247/87/54, Dt. 9/11/87 B/G-8/16537, Dt.5/12/87	
33		2.425	1987	FRS.248/87/71, Dt. 9/11/87 B/G-8/16537, Dt.5/12/87	
34		1.53	1987	FRS.248/87/71, Dt. 9/11/87 B/G-8/16537, Dt.5/12/87	
35		1.69	1987	FRS.248/87/71, Dt. 26/9/87 B/G-8/16537, Dt.5/12/87	
36		2.101	1987	FRS.247/87/54, Dt. 9/11/87 B/G-8/16983, Dt.9/12/87	
37		2.37	1987	FRS.247/87/54, Dt. 9/11/87 B/G-8/16983, Dt.9/12/87	
38		2.16	1987	FRS.248/87/71, Dt. 9/11/87 B/G-8/16983, Dt.9/12/87	
39		2.00	1987	FRS.248/87/71, Dt. 9/11/87 B/G-8/16983, Dt.9/12/87	
40		2.05	1990	FRS.91/88/191, Dt. 18/10/89 B/G-8/4343, Dt. 14/4/90	Oil India Ltd, Duliagan
41		3.24	1990	FRS.91/88/191, Dt. 18/10/89 B/G-8/4343, Dt. 14/4/90	
42		1.89	1990	8-193/88-PC, Dt. 20/10/89 B/G-8/4343, Dt. 14/4/90	
43		1.84	1990	8-193/88-PC, Dt. 20/10/89 B/G-8/4343, Dt. 14/4/90	
44		2.10	1990	8-193/88-PC, Dt. 20/10/89 B/G-8/4343, Dt. 14/4/90	
45		7.00	1990	FRS.91/85/191, Dt. 10/11/90	
46		1.812	1994	FRS.220/92/65, Dt. 14/12/92 G-8(a)/Drilling location/11905-06, Dt. 6/10/94	
47		0.95	1998-1999	8-15-8/99/RONE-AS/2250-55, Dt. 3/3/99	
48		3.776	1999-2000	8-12-24/2003/RONE/As/626-27, Dt. 10/7/03	
49		2.00	1999	8-12-25/2003/RONE/As/628-29, Dt. 10/7/03	
50		2.280	1999	8-12-25/2003/RONE/As/624-25, Dt.10/7/03	

Sl. No.	Name of RF	Area diverted (ha)	Year	GOI Letter no.	User Agency
51		4.30	2003-2004	8-9/9/2004/RONE/As/2550-53, Dt. 16/3/04	
52		0.609	2007	3-ASB011/2006-SHI/2547-49, Dt. 2/11/06 B/G-8-2295-96, Dt. 8/2/07	
53		2.038	2007	3-ASB016/2005-SHI/707-09, Dt. 8/6/07 B/G-8100/Drilling/4667-68, Dt. 5/7/07	
54	Derok RF, Compt- 3	0.38	1990	8-91/89-AS, Dt. 3/1/90 G-8/Forest Land NEC/Derok/5824-25, Dt. 18/5/90	EEPWD Tinsukia NEC
55	Digboi RF, Compt- 1,2,3,9,10	9.780	1988	FRS.93/87/Pt/20, Dt. 11/5/88 G-7/132/KV/T12885, Dt. 21/7/89	EET&T Division ASEB, Tinsukia
56	Upper Dehing RF (EB)	2.58	1998-99	8-12-17/96/RONE-AS/2049-51, Dt. 26/12/96	M/S Oil India Ltd, Duliajan
57	Deomeli (Katlguri)	3.29	1999-2000	8-4-22/88/RONE-AS/454-57, Dt. 30/5/01	Powergrid NER, Jorhat
		164.34			

2.5 Threats to the Forest

The threats to the forest of Digboi division are listed below:

2.5.1 Encroachment: Almost all the Reserve Forests under this Division are surrounded by revenue villages and illegal removal of forest produces from these forests was a common occurrence in the past. As a result, the condition of the Reserve Forests got gradually worsened. However, the RFs are now showing improvement in terms of their growing stocks. Encroachment is the single largest cause of damage to the Reserve Forests. Constitution of Reserve Forests, subsequent additions, was allowed to be continued, resulting in difficulties in consolidation of the respective boundaries on the ground. As a result, the trend of encroachment inside Reserve Forests by the people of bordering villages is still widespread. Population in the villages has increased considerably and this has led to increased pressure on the reserve forests. Maximum damage of the forests may therefore be attributed to all these encroachments. Hence, to demarcate and consolidate the notified boundaries of the said RFs, immediate measures such as survey, demarcation, fixing of boundary pillars need to be taken up.

2.5.2 Deforestation: The other major factor that threatened the forest is deforestation. Upto late 1980s there have been extensive extraction of Nahor for meeting the heavy demand of railways sleepers. There have been extensive exploitation of Hollong, Mekai, Jutuli, etc. for plywood and other construction purposes like bridge etc. causing degradation of the forest.

2.5.3 Climber: *Mikania* is the main problem of these forests. They invade and cause damage to the seedlings. Their damage is heavy in open areas than in high forests. Other climbers also affect the

healthy growth of the trees. The greatest damage to these forests, however, is caused by the climbers. When severe in intensity, climbers can, by sheer physical suffocation, kill trees outright. However, in general, if they are less insidious, the damage they cause inhibition of crown development to such an extent as to cause a considerable loss of increment in the standing crop.

2.5.4 Epiphytes and Parasites: Most of the epiphytes occurring in these forests are harmless in nature except *Ficus*. *Ficus* damage which result in the ultimate death of the trees, however it is negligible. Among parasites, a number of fungii are found in these forests, living on dead trees but mention can be made of root fungus that attacks and often causes the death of Hollong, young and old trees alike.

2.5.5 Weeds: Weed growth is heavy in the operated areas and their root competition is injurious to the regeneration and planted seedling. The invasion of weeds is very rapid with any opening in the forests and effects regeneration by swamping it out unless prompt and effective measures are taken. *Mikania micrantha* occupies the space and spreads rapidly to form a mat and all shrubs and seedlings of tree species are covered and as a result, the seeds from the trees cannot reach the ground for further regeneration. On open patches at the boundary and adjacent to inspection paths *Lantana camara* is also observed. The wetlands are full with *Eichhornia* spp. and *Ipomea* spp. covers the adjacent areas.

2.5.6 Insects: Borer attack on Hollong logs is massive in this Division. In some places, borer causes damage to all the portions of a Hollong log even within a month. *Weevils* do a lot of damage to Hollong fruits. Sam and Hollong (*Dipterocarpus retusus*) seedlings are attacked by twig borer. Hollong fruits are attacked by a weevil, *Alcides cressers* and these accounts for the low percentage of germination of the otherwise plentiful seeds. But on the whole, the forests are immune from any large scale danger from any source as they have the security of a mixed crop which provides a very efficient check on large scale damage by the insects.

2.5.7 Animals: Elephants cause damage to plantations and nurseries. Deer cause damage to miscellaneous plantations eating up their shoots. Nahor (*Mesua Ferrea*) seeds are eaten by pigs. Birds such as parrot eat the seeds of Hollong and Mekai but its damage is negligible as most of the the half-broken seeds falls on the ground.

2.5.8 Human: Illegal removal of trees, encroachment, felling of trees for firewood are some of the anthropogenic activities affect adversely on forests of the Division.

2.5.9 Storm: Storm damage is caused mainly in the areas where the trees become solitary due to operation.

2.5.10 Grazing: Grazing causes damage to the forests near the human habitation by eating the tips of the seedlings and by trampling them and compacting the soil. Hollong (*Dipterocarpus retusus*) leaves are normally not eaten by cattle.

2.6 Distribution of different Forest Types

Area under forest cover (*excluding encroachment, wetlands, diversions, FRA*) is 45,991.49 Ha. The forests of this Division have been classified into the following forest types as per revised Champion and Seth's classification (1968) of Forest Types of India.

2.6.1 Assam Valley Tropical Wet Evergreen Forests (Dipterocarpus) (Type IB/CI)

The forest type occurring in this Division is Hollong-Nahor forests and this type corresponds to type IB/IC Assam Valley Tropical Wet Evergreen forest of Champion and Seth's revised classification of forest types. The Hollong–Nahor forests are characterized by large tall evergreen trees forming the bulk of the main canopy projecting above the general level and a large number of species forming an intimate mixture. Climbers, epiphytes, palms and canes are generally present. This type finds its best expression on the undulating high alluvial deposits of Dehing River with soil of considerable depth in the foothills along the south bank of the Brahmaputra.

2.6.2 Type I/EI, Reed Brakes

In wet shallows where the soil is permanently wet and usually fine clay, rich in humus, this type is found throughout the wet-evergreen and semi-evergreen forests. This type forms an impenetrable thorny thicket sometimes with few tall trees standing over it, sometimes without. The stems are trailing and may be 60 M or more long while some species are erect. The main species are *Calamus tenuis* and *Calamus latifolius*, creeping bamboo *Neohouzlana spp.* etc.

2.6.3 Type I/2SI Pioneer Euphorbiaceous Scrub

In many parts of the evergreen forests under this Division, wherever heavy fellings had taken place with wide opening in the canopy and left to natural growth, a very common occurrence in that such areas are taken over by quick growing but short lived species.

2.6.4 Type I/2B/CI Assam Alluvial Plains Semi Evergreen Forests

In moist areas in the Division, Dipterocarps are almost absent and the top and the middle canopies are held by the species *Artocarpus chaplasha*, *Alphonsea ventricosa*, *Castanopsis indica*, *Canarium* species, *Dillenia indica*, *Dysoxylum procerum*, *Magholia* species, *Mesua ferrea*, etc. The undergrowth and climbers are similar to the main forest type.

2.6.5 Tropical Seasonal Swamp Forests (4D/SSI)

In the swampy areas, a very even and dense forest with the canopy at about 20 M occurs. These may be classified as the Tropical Seasonal Swamp forests (4D/SSI) as per the classification of Champion and Seth. The presence of canes makes some areas almost impenetrable.

However, during the current field forest assessment survey it was observed that there has been a considerable change in the forest types in the division from the earlier forest types that were reported, as explained above. Presently only two forest types namely Hollong-Nahor forests - Assam Valley Tropical Wet Evergreen Forests (*Dipterocarpus*) (Type IB/CI) and Secondary Moist Bamboo Brakes (2/2S1) have

been reported. Assam Valley Tropical Wet Evergreen Forests (*Dipterocarpus*) (Type IB/CI) covers an area of 45992.47 ha whereas 418.85 ha is covered under Secondary Moist Bamboo Brakes (2/2S1). The forest type map of the Digboi division is shown in Figure 2.6a.

Area under each reserve forests were analysed for the canopy cover. Percent of forest area under the four-canopy density classes as per FSI namely <10% (*Scrubs*), 10% to 40% (*open forest*), 40% to 70% (*Moderately dense forest*) and areas under >70% canopy cover (*Very dense forest*) were delineated. Percent area under different canopy density classes is shown in the pie diagram. The density class map is shown in Figure 2.6b.

Figure 2.6a: Distribution of forest types in Digboi division.

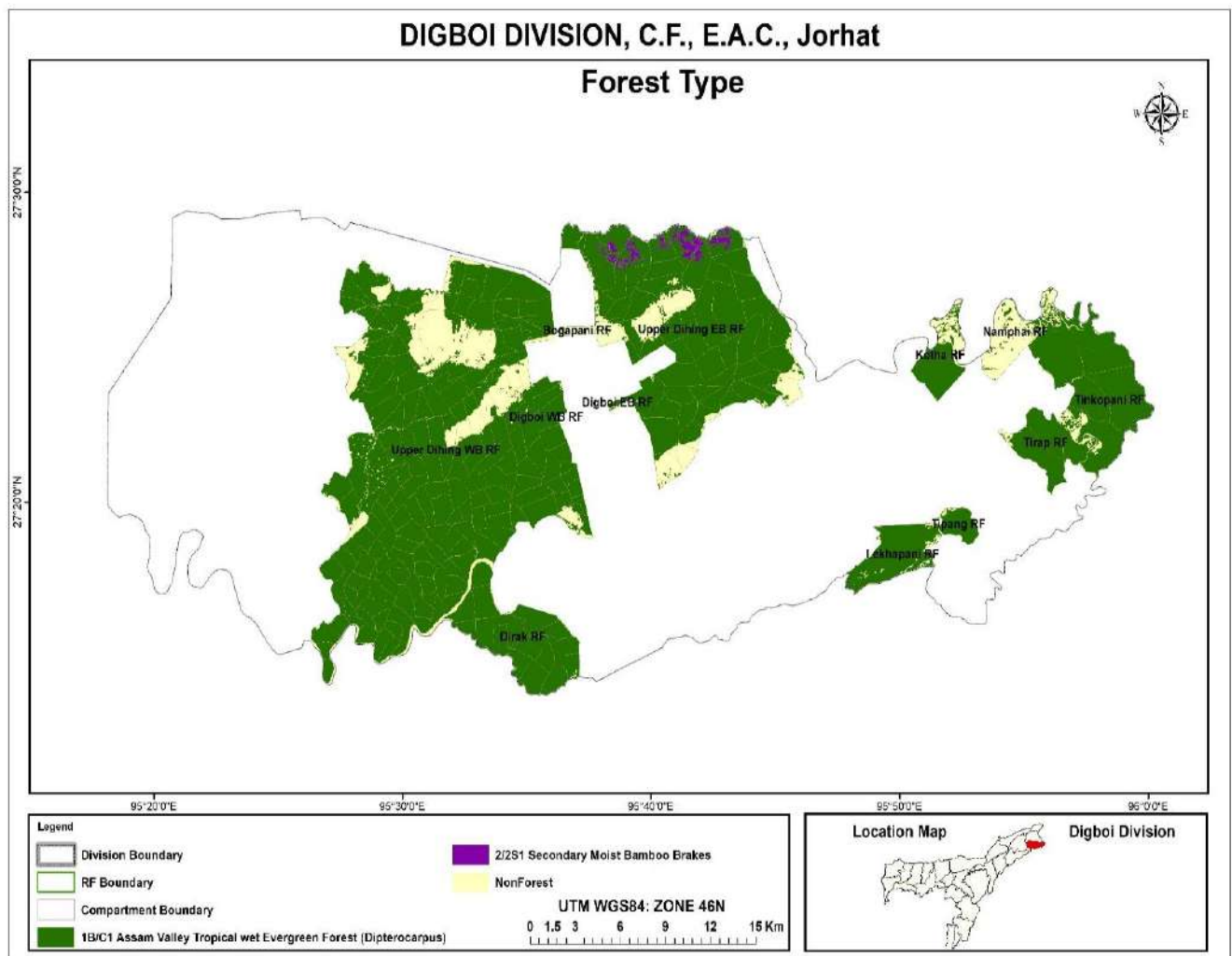
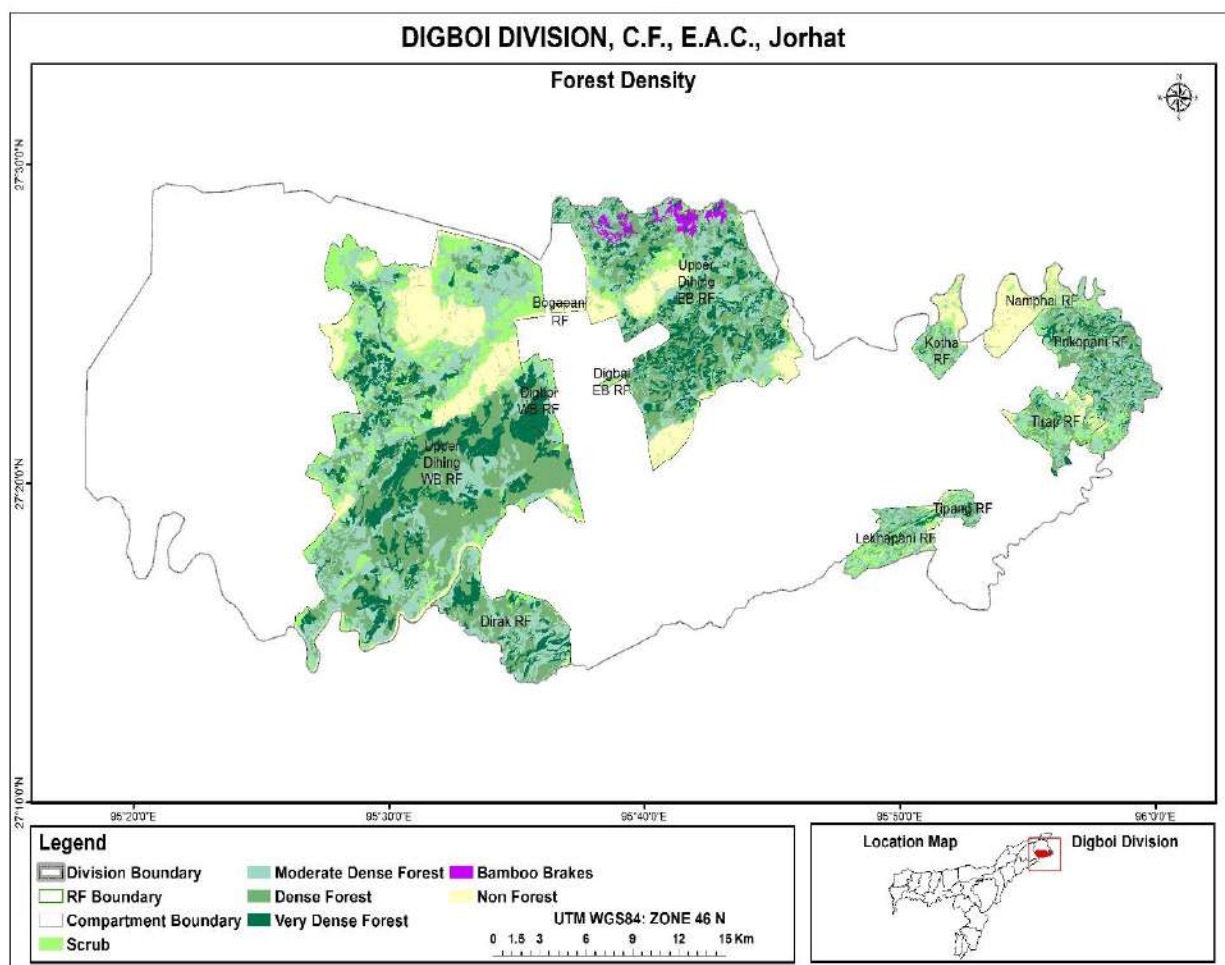


Figure 2.6b: Map showing the canopy density in Digboi division.



2.7 Tree Cover outside Forest Area

Trees outside forest (TOF) are the trees growing outside the recorded forest area in the division. A large part of the demand of the people in terms of timber, fuelwood, and resources is being met from outside forest areas and therefore assessment of TOF becomes imperative in this working plan. IRS P-6 LISS IV (5.8m) satellite images were geometrically rectified with the help of Survey of India topo sheets on 1:50,000 scale. Digitizing the green-wash area by taking them as proxy forest areas and masking them out carried out mapping of TOF areas. Map showing the tree outside forest areas in Digboi Division is shown in the figure 2.7. The total area of tree outside forest in Digboi division is 10,380.57 ha. Assessment of growing stock of trees outside forest is provided in the table 2.7.

Table 2.7: Status of growing stock of trees outside forest for Digboi division, Assam

S.No	Local name	Botanical name	Volume (m ³)
1.	Am	<i>Mangifera indica</i>	135.80
2.	Kathal	<i>Artocarpus integrifolius</i>	152.91
3.	Jamuk	<i>Syzygium cumini</i>	175.40
4.	Jalphai	<i>Elaeocarpus floribundus</i>	46.72
5.	Kadam/Raghu	<i>Anthocephalus indica</i>	78.93

6.	Letuku	<i>Baccaurea ramiflora</i>	0.45
7.	Gomari	<i>Gmelina arborea</i>	31.10
8.	Ajhar	<i>Lagerstroemia speciose</i>	21.70
9.	Nahor	<i>Mesua ferrea</i>	25.45
10.	Hilikha	<i>Terminalia chebula</i>	40.74
11.	Gohora	<i>Premna bengalensis</i>	40.74
12.	Amlakhi	<i>Terminalia nudiflora</i>	15.27
13.	Owtenga	<i>Dillenia indica</i>	8.77
14.	Hollong	<i>Dipterocarpus macrocarpus</i>	30.54
15.	Dimoru	<i>Ficus nervosa</i>	27.16
16.	Sationa	<i>Alstonia scholaris</i>	13.58
17.	Jati bah	<i>Bambusa tulda</i>	7 culms in each village
18.	Bholuka bah	<i>Bambusa balcooa</i>	5 culms in each village
19.	Areca nut	<i>Areca catechu</i>	10 to 20 no. of Areca nut tree in almost all households
20.	Orange orchards	<i>Citrus spp.</i>	Orange Garden in each F.V.

Map 2.7.1 shows patches of Trees outside forest (TOF) above 10 ha for Digboi Division. Out of a total of 10,380.57 ha of ToF, 46.6% (4844.29 ha) consisting of 158 patches, each of these patches are more than 10 ha have been delineated. This is carried out with an attempt for a better management of Unclassified State Forest (USF). The focus of USF is on production forestry to improve the rural economy through innovative forestry interventions and maintenance of the flow of ecosystem goods and services for the urban areas nearby the forest division. Detail area and coordinates of USF is shown in Vol-II.

2.8 Shifting cultivation: Shifting cultivation is not practiced in the fringe villages of the Digboi forest division.

Figure 2.7: Map showing Trees outside forest (TOF) for Digboi Division

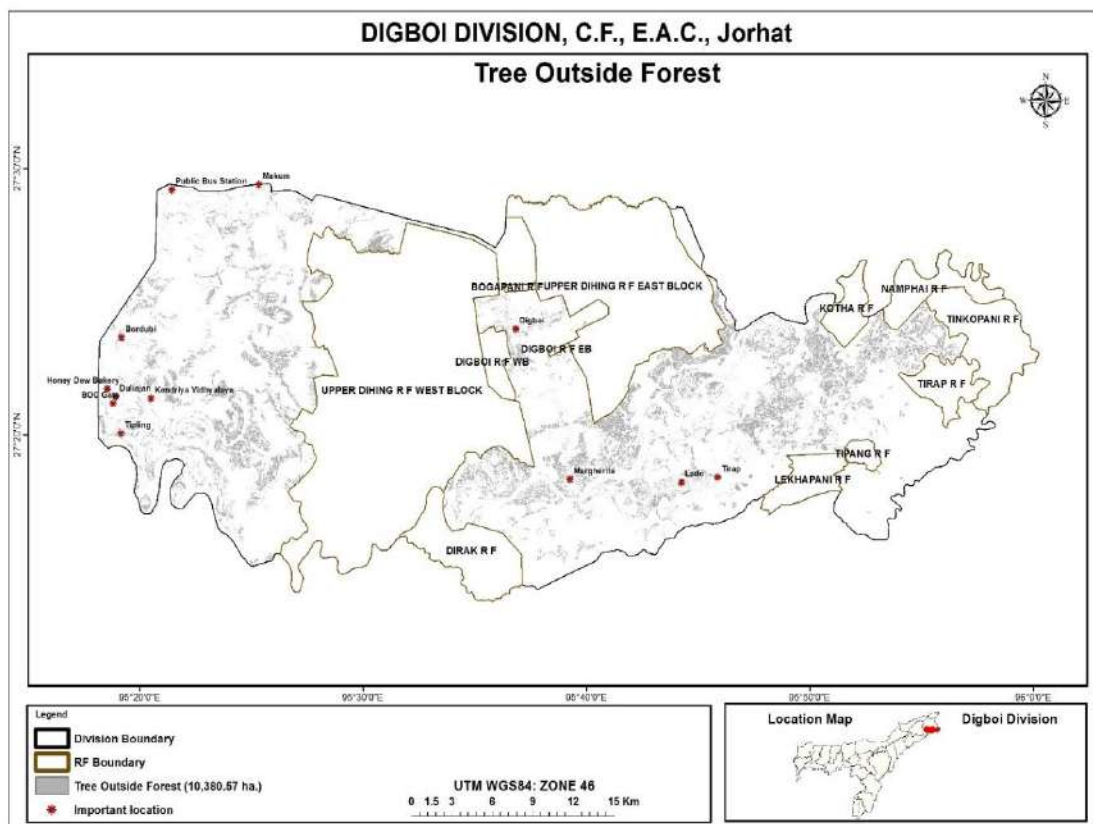
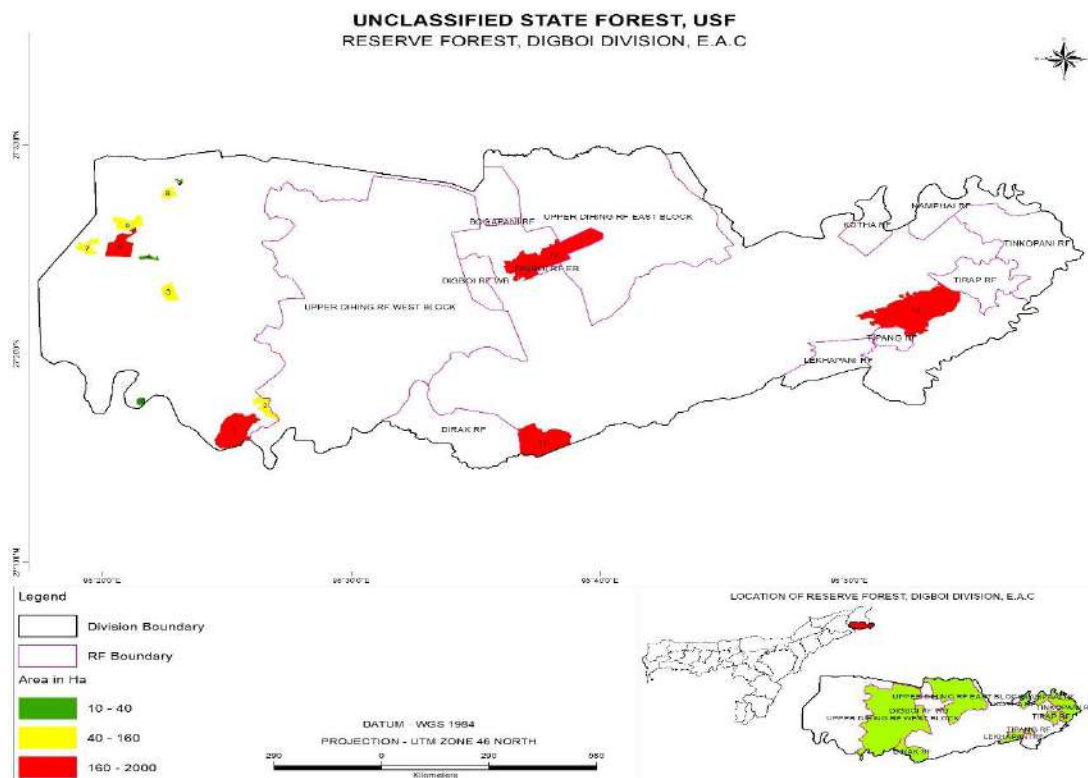


Figure 2.7.1: Map showing patches of USF of Digboi Division



CHAPTER 3

MAINTANENCE, CONSERVATION AND ENHANCEMENT OF BIODIVERSITY

3.1 Forest composition and distribution

Based on the vegetation survey and forest inventory and compartment descriptions, a summary of important trees and other species found in the area with their floristic composition and condition is described in the following sub sections.

The forests of Digboi division are of multi-storied type with five distinct canopy layers.

1st Canopy layer: This comprises of magnificent luxuriant growth of *Dipterocarpus* (Hollong) trees. Ecologically it is known as climatic climax species of this region. *Michelia champaca* (Tiasopa), *Ailanthus excelsa* (Borpat) etc. are found as its associates.

2nd Canopy layer: This layer mainly consists *Mesua ferrea* (Nahor) with *Artocarpus chaplasi*, *Amoora wallichii*, *Amoora rohitoka*, *Anthocephalus kadamba*, *Terminalia tomentosa*, *Terminalia belerica*, *Dysoxylum procerum*, *Tolauma hodgsoni*, *Trewia nudiflora*, *Chukrassia tabularis*, *Morus laevigata*, *Eugenia* species and many other common species.

3rd Canopy layer: It is mainly dominated by *Vatica lancofolia* (Morhal), *Lagerstroemia species* (Ajar), *Albizia lucida* (Maj), *Dillenia indica* (Owtenga), *Dillenia scabreua* (Bajiw) etc.

4th Canopy layer: It consists of mainly woody shrubs like Kaupat, Jora, Bogitora, etc. Palms like Geregu tamul, Tokopat, tree ferns, canes, woody climbers like *Derris oblonga*, *Tapiria hirsute*, *Mazonerurum cueullatum*, *Entada scanders*, *Thumbergia* spp. *Bauhinia vahlii*, etc. are more common.

5th Ground Flora: Various herbs and small shrubs like Bon moduriam, Bon posola, Dhopat tita, Digholoti, Surat, Heloch, Kasidoria, Patidoi, Ferns, etc. and grass like Ekora, Meghela, Elephant grass etc. are the most common flora comprising ground layer.

The main species found in these forests are *Dipterocarpus macrocarpus*, *Mesua ferrea*, *Michelia doltsopa*, *Shorea assamica*, *Terminalia myriocarpa* and *Artocarpus chama*.

3.1.2 Composition and Condition of the Crop

The forest type occurring in this division is Hollong-Nahor forests and this type corresponds to type IB/IC Assam Valley Tropical Wet Evergreen forest as per the Champion and Seth's revised classification of forest types. The Hollong – Nahor forests are characterized by large tall evergreen trees forming the bulk of the main canopy projecting above the general level and a large number of species forming an intimate mixture. Climbers, epiphytes, palms and canes are generally present. This type finds its best expression on the undulating high alluvial deposits of Dehing River with soil of considerable depth in the foothills along the south bank of the Brahmaputra.

3.1.3. Assam Valley Tropical Wet Evergreen Forests (Dipterocarpus) (Type IB/CI)

Reserved Forests of Digboi Division fall under this type. The total area under this forest type in the division is 45992.47 ha. These forests are characterised, being multi-storied, with dominant species as Hollong reaching a height of 50 metres and girth up to 7 metres. Another Dipterocarp, Mekai (*Shorea assamica*) also occupy the top canopy along with Hollong over limited localities, especially on slightly higher elevations with good drainage and found to occur in patches in Tinkopani, Lekhapani, Tipong and Dirok Reserved Forests and in Blocks II, VII, VIII, IX & X of UDRF (West Block). Other Reserved Forests are mainly occupied by Hollong-Nahor formations. Other species which are found to occur in the top canopy sporadically are Sopas, Dhuna, Sam, Jutuli, Amari, Barpat, etc. Hollong prefers well drained soil and its best expressions are found in old alluvium of Dehing River, namely, Tipong RF, UDRF, (W.B.) and Dirok RF.

The middle story is dominated by Nahor and Morhal. Other species found in the canopy are Hilikha, Jamuk, Selleng, Bandordima, Bhomora, etc.

Sometimes, there occurs a third story which is occupied by *Dendrocalamusharmiltonii*, *Bambusa pallida*, *Pseudostachyum polymorphum*, *Livinstonia jenkinsiana*, etc.

The undergrowth is composed of woody shrubs, like Gochbhedeli, Kasidoria, Osbeckia spp. Sorat, etc. Scitamineous shrubs like Kaupat, Bogitora, etc. palms such as gerugatamul, Tokopat, etc, and Canes such as Jengu, Raidang, Hankabet, Lejai, etc.

Climbers are numerous and occur profusely in these forests. Common among them are *Mikania scandens*, *Thunbergia grandiflora*, *Tapiria hirsuta*, *Entada scandens*, *Mezoneurum cucullatum*, *Deriss oblonga*, *Bauhinia vahlii*, etc. Wherever there is a clearance, *Mikania* occupies the space and spreads rapidly to form a mat and all shrubs and seedlings to tree species are covered and as a result, the seeds from the trees cannot even reach the ground for further regeneration.

Regeneration of Hollong, Mekai and Nahor are found to be encouraging in these forests, but the height growth of Mekai being slow, established regeneration areas of Mekai are very few. Among other important species regeneration of Dhuna is common.

3.1.4 Type I/EI, brakes

In wet shallows where the soil is permanently wet and usually fine clay, rich in humus, this type is found throughout the wet-evergreen and semi-evergreen forests. This type forms an impenetrable thorny thicket sometimes with few tall trees standing over it, sometimes without. The stems are trailing and may be 60 m or more long while some species are erect. The main species are *Calamus tenuis* and *Calamus latifolius*, creeping bamboo *Neohouzlana* spp. etc. The total area under this forest type in the division is 418.84 ha.

3.2 Plant Species Diversity

Based on the vegetation survey, forest inventory and compartment descriptions, number of different trees species and DBH of each tree inside the sample plot was recorded. These were used to calculate basal area (square meter per hectare), density (trees per ha) and frequency (number of sample plots where trees are present) in relation to total plots observed. Relative values of density, frequency and basal area were then calculated. The Importance Value Index (IVI) was calculated by adding up relative values of density, frequency and basal area. Species diversity is an expression of community structure. The number of species in a community is referred to as species richness. The relative abundance of all species is called evenness. A community demonstrates a high species diversity if many equally or nearby equally abundant species are present. Communities with a large number of species that are evenly distributed are the most diverse. The relative values of density, frequency, basal area and IVI of important trees and shrubs per found in all the reserve forests of Digboi division are given in table 3.2.a

Table 3.2.a: Statement showing the total basal area, relative density, relative frequency, relative dominance and IVI of different species growing in the division

Name of Species	Total Basal area	Relative Density	Relative Frequency	Relative Dominance	IVI
<i>Accasia spp.</i>	0.06	0.01	0.03	0.01	0.05
<i>AesculusassamicaGriff.</i>	1.85	0.65	0.30	0.17	1.13
<i>Aglaia hiernii King</i>	1.80	0.11	0.20	0.17	0.48
<i>Aglaia spectabilis (Miq.) S.S. Jain & S.S.R. Bennet</i>	22.10	1.33	2.36	2.06	5.75
<i>Ailanthus integrifolia subsp. calycina (Pierre) Nootboom</i>	14.79	1.66	2.94	1.38	5.98
<i>Alangiumchinense (Lour.) Harms</i>	0.35	0.10	0.14	0.03	0.27
<i>Albizialebeck (L.) Benth.</i>	0.33	0.07	0.14	0.03	0.24
<i>Albizialucidior (Steud.)I.C.Nielsen</i>	3.35	0.32	0.61	0.31	1.24
<i>Albiziaprocera (Roxb.)Benth.</i>	0.54	0.21	0.30	0.05	0.57
<i>Alstoniascholaris (L.) R. Br.</i>	4.67	0.28	0.61	0.43	1.33
<i>Altingiaexcelsa Noronha</i>	3.73	0.20	0.41	0.35	0.95
<i>Aphaniarubra</i>	0.00	0.01	0.03	0.00	0.05
<i>ArtocarpuschaplashaRoxb.</i>	38.18	1.44	2.36	3.55	7.36
<i>Artocarpuslacucha Buchanan-Hamilton ex D. Don</i>	15.62	0.48	0.54	1.45	2.47
<i>Azadirachtaindica A. Juss.</i>	0.81	0.10	0.17	0.08	0.34
<i>BaccaurearamifloraLour.</i>	3.38	1.35	2.20	0.31	3.86
<i>Balakatabaccata (Roxb.) Esser</i>	40.11	2.48	3.28	3.73	9.49
<i>Bischofiajavanica Blume</i>	16.47	1.40	2.13	1.53	5.06
<i>Bombaxceiba L.</i>	0.71	0.13	0.24	0.07	0.43
<i>CallicarpamacrophyllaVahl</i>	0.49	0.07	0.14	0.05	0.25
<i>Cameliacaudata Wall.</i>	3.42	1.35	1.32	0.32	2.99
<i>CanariumbengalenseRoxb.</i>	16.20	2.12	2.94	1.51	6.56
<i>Caralliabrachiata (Lour.) Merr.</i>	0.70	0.03	0.07	0.06	0.16
<i>CaseariavarecaRoxb.</i>	0.02	0.01	0.03	0.00	0.05

Name of Species	Total Basal area	Relative Density	Relative Frequency	Relative Dominance	IVI
<i>Castanopsis indica</i> (Roxb. ex Lindl.) A.DC.	31.91	4.98	4.26	2.97	12.21
<i>Celtistetrandra</i> Roxb.	0.39	0.01	0.03	0.04	0.08
<i>Chisocheton cumingianus</i> (C.DC.) Harms. ssp. <i>balansae</i> (C.DC.) Mabb.	25.83	3.57	3.21	2.40	9.18
<i>Chrysophyllum roxburghii</i> G.Don	0.72	0.10	0.10	0.07	0.27
<i>Chukrasia tabularis</i> A. Juss.	1.24	0.14	0.34	0.12	0.59
<i>Cinnamomum bejolghota</i> (Buch.-Ham.) Sweet	0.12	0.04	0.03	0.01	0.09
<i>Cinnamomum glaucescens</i> (Nees) Hand.-Mazz.	1.47	0.07	0.10	0.14	0.31
<i>Cinnamomum tamala</i> (Buch.-Ham.) T. Nees & Eberm	2.82	0.55	1.11	0.26	1.93
<i>Cordia grandis</i> Roxb.	0.11	0.01	0.03	0.01	0.06
<i>Crateva magna</i> (Lour.) DC.	0.29	0.04	0.10	0.03	0.17
<i>Croton jaoufra</i> Roxb.	0.36	0.13	0.17	0.03	0.33
<i>Crypteronia paniculata</i> Blume	0.23	0.01	0.03	0.02	0.07
<i>Dalbergia assamica</i> Benth.	0.01	0.01	0.03	0.00	0.05
<i>Dillenia indica</i> L.	27.49	2.26	3.34	2.56	8.16
<i>Dillenia pentagyna</i> Roxb.	0.02	0.03	0.07	0.00	0.10
<i>Diospyros variegata</i> Kurz	0.24	0.07	0.10	0.02	0.19
<i>Dipterocarpus retusus</i> Blume	344.37	19.13	7.87	32.04	59.04
<i>Drimycarpus racemosus</i> (Roxb.) Hook. f. ex Marchand.	0.01	0.01	0.03	0.00	0.05
<i>Duabanga grandiflora</i> (DC.) Walp.	34.66	1.88	1.52	3.22	6.62
<i>Dysoxylum mollissimum</i> Blume	18.92	0.40	0.51	1.76	2.66
<i>Elaeocarpus floribundus</i> Blume	1.89	0.45	0.68	0.18	1.30
<i>Elaeocarpus sphaericus</i>	2.47	0.41	0.84	0.23	1.48
<i>Endospermum chinense</i> Benth.	7.39	0.68	0.84	0.69	2.21
<i>Engelhardtia spicata</i> Lechan ex Blume	0.18	0.01	0.03	0.02	0.06
<i>Erythrina stricta</i> Roxb.	0.90	0.13	0.27	0.08	0.48
<i>Erythrina variegata</i> L.	0.54	0.01	0.03	0.05	0.10
<i>Evodiameliaefolia</i> (Hance ex Walp.) Benth.	0.32	0.13	0.27	0.03	0.43
<i>Ficus heterophylla</i> L. f.	0.04	0.01	0.03	0.00	0.05
<i>Ficus hispida</i> L. f.	1.96	0.06	0.14	0.18	0.37
<i>Ficus racemosa</i> L.	6.13	0.65	1.18	0.57	2.40
<i>Garcinia cowa</i> Roxb. Ex Choisy	0.08	0.01	0.03	0.01	0.06
<i>Garcinia kydia</i> Roxb.	6.00	1.40	1.86	0.56	3.81
<i>Garcinia morella</i> (Gaertn.) Desr.	0.74	0.16	0.27	0.07	0.49
<i>Garcinia pedunculata</i> Roxb. Ex Buch. Ham	0.30	0.04	0.10	0.03	0.17
<i>Garcinia xanthochymus</i> Hook. f. ex T. Anderson	0.02	0.01	0.03	0.00	0.05
<i>Gmelina arborea</i> Roxb.	11.48	0.95	1.18	1.07	3.20

Name of Species	Total Basal area	Relative Density	Relative Frequency	Relative Dominance	IVI
<i>Gmelina sp.</i>	1.88	0.13	0.24	0.18	0.54
<i>Gynocardiaodorata R. Br.</i>	10.77	0.82	1.11	1.00	2.94
<i>Heteropanaxfragrans (Roxb.) Seem.</i>	0.19	0.04	0.10	0.02	0.16
<i>Horsfieldiaamygdalina (Wall.)Warb.</i>	2.69	0.28	0.57	0.25	1.11
<i>Hydnocarpuskurzii (King) Warb.</i>	2.62	0.35	0.41	0.24	1.00
<i>Khasiaclunaeoligocephala (Havil.) Ridsdale</i>	0.11	0.06	0.10	0.01	0.17
<i>KydiacalycinaRoxb.</i>	4.70	0.66	1.08	0.44	2.18
<i>Lagerstroemia speciosa (L.) Pers.</i>	6.90	1.03	0.61	0.64	2.28
<i>Lanneacoramandelic (Houtt.) Merr.</i>	0.90	0.04	0.10	0.08	0.23
<i>Leea indica (Burm. f.) Merr.</i>	2.08	1.09	0.91	0.19	2.19
<i>Litsea laeta (Nees) Hook. f.</i>	0.34	0.07	0.14	0.03	0.24
<i>Litsea monopetala (Roxb.) Pers.</i>	0.04	0.01	0.03	0.00	0.05
<i>Machilus gamblei King ex Hook. f.</i>	0.59	0.03	0.07	0.06	0.15
<i>Magnolia baillonii Pierre</i>	0.29	0.01	0.03	0.03	0.07
<i>Magnolia champaca (L.) Baill. ex Pierre</i>	42.10	3.56	3.51	3.92	10.99
<i>Magnolia griffithii Hook.f. & Thomson</i>	5.62	0.51	0.81	0.52	1.84
<i>Magnolia insignis Wall.</i>	0.54	0.03	0.07	0.05	0.15
<i>Magnolia kingii (Dandy) Figlar</i>	0.13	0.06	0.03	0.01	0.10
<i>Magnolia pterocarpa Roxb.</i>	27.15	3.29	2.77	2.53	8.58
<i>Mallotus nudiflorus (L.) Kulju & Welzen</i>	1.29	0.35	0.37	0.12	0.84
<i>Mallotus tetra coccus (Roxb.) Kurz</i>	3.70	0.76	1.18	0.34	2.29
<i>Mangifera sylvatica Roxb.</i>	2.24	0.30	0.64	0.21	1.15
<i>Mansonia dipikae Purkayastha</i>	0.52	0.08	0.17	0.05	0.30
<i>Meliosma pinnata (Roxb.) Maxim.</i>	3.50	1.23	1.25	0.33	2.80
<i>Meliosma simplicifolia (Roxb.) Walp.</i>	1.02	0.13	0.27	0.10	0.49
<i>Mesua ferrea L.</i>	48.77	5.18	4.83	4.54	14.55
<i>Meyna spinosa Roxb. ex Link</i>	0.05	0.03	0.07	0.00	0.10
<i>Michelia oblonga Wall. ex Hook.f. & Thomson</i>	1.36	0.16	0.34	0.13	0.62
<i>Misc</i>	4.71	0.99	0.74	0.44	2.17
<i>Morus macroura Miq.</i>	1.37	0.14	0.24	0.13	0.51
<i>Myristica augustifolia</i>	0.11	0.01	0.03	0.01	0.06
<i>Neolamarckia cadamba (Roxb.) Bosser</i>	4.86	0.45	0.64	0.45	1.55
<i>Olea dioica Roxb.</i>	2.15	0.07	0.10	0.20	0.37
<i>Oroxylum indicum (L.) Kurz</i>	0.47	0.20	0.37	0.04	0.61
<i>Phoebe cathia (D. Don) Kostermans</i>	1.29	0.27	0.37	0.12	0.76
<i>Phoebe goalparensis Hutch</i>	2.09	0.52	0.51	0.19	1.22
<i>Polygonum plebejum R. Br.</i>	0.16	0.01	0.03	0.02	0.06
<i>Premna bengalensis C.B. Clarke</i>	1.14	0.25	0.44	0.11	0.80

Name of Species	Total Basal area	Relative Density	Relative Frequency	Relative Dominance	IVI
<i>Premnamilleflora</i> C.B. Clarke	0.11	0.01	0.03	0.01	0.06
<i>Psidium</i> guajava L.	0.08	0.01	0.03	0.01	0.06
<i>Pterospermum</i> macerifolium (L.) Willd.	5.04	0.40	0.64	0.47	1.51
<i>Pterospermum</i> javanicum Jungh.	0.80	0.04	0.10	0.07	0.22
<i>Pterospermum</i> lanceifolium Roxb.	0.08	0.01	0.03	0.01	0.06
<i>Pyrus</i> communis L.	0.06	0.03	0.07	0.01	0.10
<i>Santalum</i> album L.	0.84	0.04	0.07	0.08	0.19
<i>Sapindus</i> saponaria L.	0.25	0.08	0.17	0.02	0.28
<i>Saurauia</i> roxburghii Wall.	0.05	0.01	0.03	0.00	0.05
<i>Schima</i> wallichii Choisy	28.83	8.13	1.99	2.68	12.80
<i>Shorea</i> assamica Dyer	17.26	1.17	1.32	1.61	4.09
<i>Spondias</i> pinnata (L. f.) Kurz	0.58	0.14	0.20	0.05	0.40
<i>Sterculia</i> villosa Roxb.	3.56	0.69	1.22	0.33	2.24
<i>Stereospermum</i> chelonoides (L.f.) DC	17.40	0.86	1.32	1.62	3.80
<i>Syzygium</i> cumini (L.) Skeels	3.21	0.93	1.28	0.30	2.51
<i>Syzygium</i> jambos (L.) Alston	0.49	0.06	0.14	0.05	0.24
<i>Tectona</i> grandis L.f.	1.52	0.21	0.07	0.14	0.42
<i>Terminalia</i> bellirica (Gaertn.) Roxb.	12.84	1.52	2.20	1.19	4.91
<i>Terminalia</i> catappa L.	0.11	0.03	0.07	0.01	0.11
<i>Terminalia</i> chebula Retz.	18.80	1.35	2.30	1.75	5.40
<i>Terminalia</i> myriocarpa Van Heurck & Müll. Arg.	18.18	0.96	1.25	1.69	3.90
<i>Tetrameles</i> nudiflora R. Br.	1.79	0.07	0.10	0.17	0.34
<i>Toona</i> ciliata M. Roem.	8.72	0.76	1.45	0.81	3.03
<i>Trema</i> orientalis (L.) Blume	0.16	0.06	0.07	0.02	0.14
<i>Vatica</i> lanceifolia (Roxb.) Blume	21.37	4.66	4.09	1.99	10.73
<i>Ziziphus</i> funiculosa Buch.-Ham. ex Wall.	0.80	0.07	0.17	0.07	0.31
	1074.73	100.00	100	100	300

Data revealed occurrences of tree species belonging to 124 different genera in the forests of this division. The most dominant family recorded in the division is Dipterocarpaceae. The other most frequently occurring families are Calophyllaceae, Fagaceae, Meliaceae and Magnoliaceae. *Dipterocarpus retusus* is the most frequently occurring species in the division, followed by *Mesua ferrea* and *Schima wallichii*.

Figure 3.2 indicates that *Dipterocarpus retusus* Blume (Hollong) has the IVI of 59.04, followed by *Mesua ferrea* L (14.55), *Schima wallichii* Choisy (12.80), *Castanopsis indica* (Roxb. Ex. Lindl.) A.DC. (12.21), *Magnolia champaca* (L.) Baill. Ex Pierre (10.99) and *Vatica lanceifolia* (Roxb.) Blume (10.73). Species recorded were screened for their uniqueness with references in the literature. *Shorea assamica* Dyer (4.09) an endemic species indicates that the species has been experiencing pressure against regeneration. Bhatghila and Jinari are two most critical RET species found in this division.

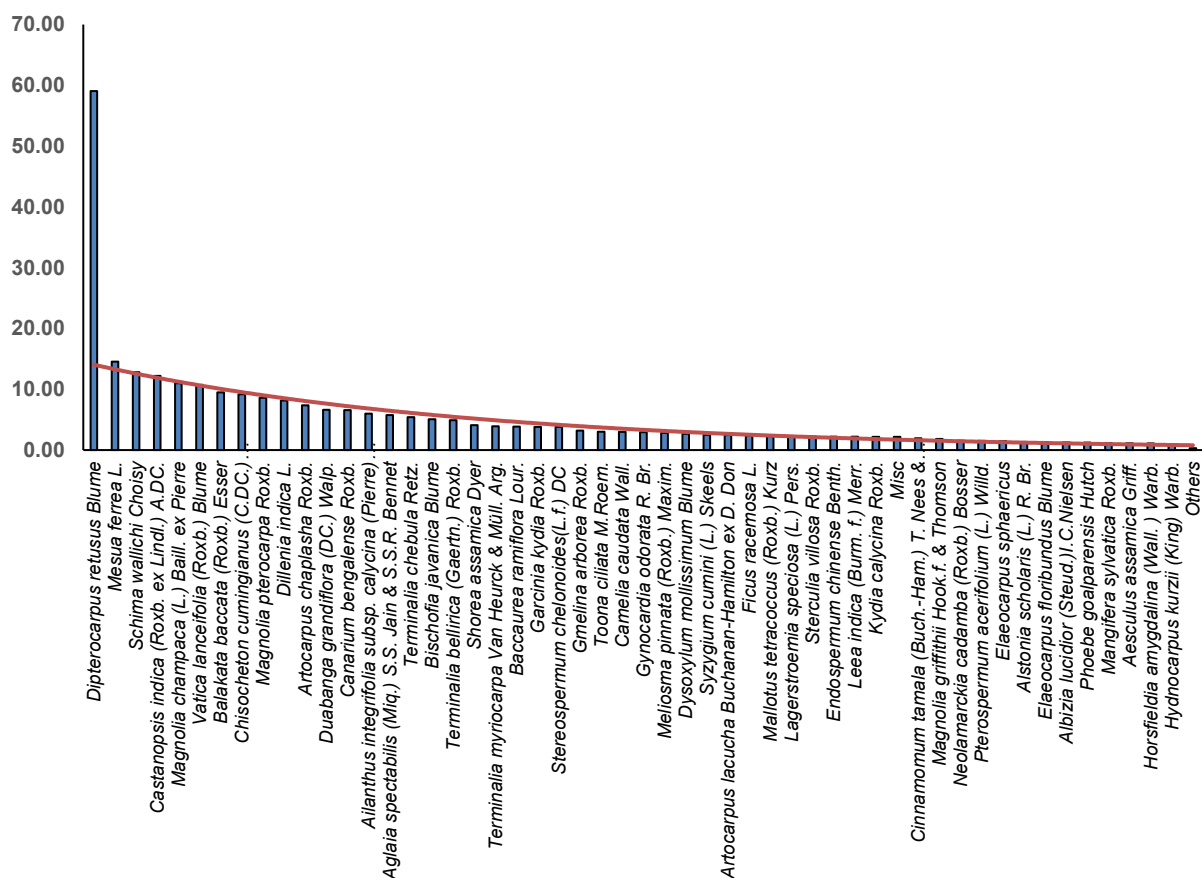


Figure 3.2.b: Importance value index for the major forest species of Digboi forest division.

3.3 Status of Biodiversity Conservation in Forests

The biodiversity of forests is declining rapidly due to land use change, climate change, invasive species, over-exploitation, and pollution. These are due to the adverse effects from various drivers. Encroachment, illegal felling for culturable land has posed threat to the forest flora as well as faunal biodiversity. The State has several rules and regulations such as Biological Diversity Act 2002, Assam Biodiversity Rules 2010, State Forest Policy 2004, National Forest Policy 1988, Draft Assam Bamboo and Rattan Policy 2003, National Biodiversity Action Plan 2008, Assam State Action Plan on Climate Change 2015-30, etc for providing legal support towards conservation of biodiversity. The strategies include protection and making efforts to restore original ecosystem and halt habitat fragmentation, degradation and loss and shrinking of genetic diversity, promotion of indigenous tree species, improving canopy density in the existing forests, promotion of natural regeneration, promotion, protection and preservation of bamboo and rattan, preparation of comprehensive flora and fauna species lists, management of funds for biodiversity conservation and enhancement related work, involvement of local communities and their livelihood development, etc.

There have not been any updates in the forest Working Plan in the past 29 years for the Division. Hence, information on management practices for maintaining species diversity or sustainable management practices followed in past years cannot be provided.

Table 3.3 shows identified critical species from biodiversity conservations perspective of Digboi division. During the tenure of this working plan prescriptions have been proposed for conservation and preservation of these species in this division.

Table 3.3: List of critical floral species found in Digboi forest division, Assam.

Vernacular Name	Botanical Name	Status
Trees		
Amol	<i>Myristica kingie</i>	Endangered
Amora	<i>Spomdius pimmata</i>	Endangered
Amsia	<i>Drimycarpus racemosus</i>	Endangered
Badam	<i>Mansonia dipikae</i>	Endangered
Bagiou	<i>Billemia scabrella</i>	Endangered
Bandordima	<i>Dysoxylum binectariferum</i>	Endangered
Barhamthuri	<i>Talauma hodghonii</i>	Endangered
Barun	<i>Craeteva nurvala</i>	Endangered
Bhatghila	<i>Oroxylum Indicum</i>	Rare
Bher	<i>Salix tetrasperma</i>	Threatened
Bhelkor	<i>Trewia nudiflora</i>	Endangered
Bhelu	<i>Tetrameles mudiflora</i>	Endangered
Bhumloti	<i>Symplocos spicata</i>	Rare
Bogijam	<i>Eugenia jambos</i>	Endangered
Borthekera	<i>Garcinia pedunculata</i>	Endangered
Dhuna	<i>Canarium bengalensis</i>	Endangered
Galranga	<i>Elaeocarpus rugosus</i>	Endangered
Gendhelipoma	<i>Dysoxylum hamiltonii</i>	Endangered
Gohora	<i>Premna dengalensis</i>	Endangered
Gaharisopa	<i>Magnolia griffithii</i>	Endangered
Gorumora	<i>Crypteronia paniculata</i>	Endangered
Ghogra, Makarisal, Naga-bhe	<i>Schima wallichii</i>	Endangered
Haludsopa	<i>Adina oliocephala</i>	Endangered
Haludsaki	<i>Endospermum chinensis</i>	Endangered
Hatipolia	<i>Pterospermum acerifolium</i>	Endangered
Hengunia	<i>Meliosma pimmata</i>	Endangered
Hollong	<i>Dipterocarpus macrocarpus</i>	Endangered
Jinari	<i>Podocarpus nerifolia</i>	Rare
Leluk	<i>Beilschmiedia bramdisii</i>	Endangered
Lamtem	<i>Gynocardia odorata</i>	Endangered
Leteku	<i>Baccaurea sapida</i>	Endangered
Lewa	<i>Engelhardtia spicata</i>	Endangered
Maskoita	<i>Callicarpa arborea</i>	Endangered
Maiphak	<i>Evodia meliaefolia</i>	Endangered
Morhal	<i>Vatica lanceaefolia</i>	Endangered

Vernacular Name	Botanical Name	Status
Motanahor	<i>Pterospermum lanceaefolium</i>	Endangered
Odal	<i>Sterculia villosa</i>	Endangered
Panikadam	<i>Hymenodictyon excelsum</i>	Endangered
Phulkata	<i>Styrax serrulatum</i>	Endangered
Tepor	<i>Garcinia xanphochymus</i>	Endangered
Thekera	<i>Garcinia Sp</i>	Endangered
SHRUBS		
Bajalbah	<i>Pseudospachyum polymorphum</i>	Endangered
Ramtamul	<i>Pinanga gracilis</i>	Endangered
Jatibet	<i>Calamus tenuis</i>	Endangered
Lejaibet	<i>Calamus floribundus</i>	Endangered
Tokopat	<i>Livistonia jenkinsiana</i>	Endangered

3.4 Status of Species Prone to over Exploitation

Under the present system in the Division, Hollong, Mekai and Nahar are prone to over exploitation. Due to high demand for these exceptionally good timber trees, mother trees are getting very scarce thereby threatening regeneration of these important forest tree species. Sustainable NTFP harvesting practices of non-timber forest produces doesn't exist.

3.5 Conservation of genetic resources

In situ conservation efforts laid out in this Division for the conservation and preservation of biodiversity is to be elaborated. Preservation plots have been laid out as one of the important means for conserving and protecting the existing biodiversity of important floral species as well as for assessing ecological changes occurring in such areas over a period of time. Details of research in this regard are given in 3.5.1.

3.5.1 Narlota at Upper Dihing Reserve Forest Area: 20.5 ha

Forest type: Assam Valley Tropical Wet Evergreen (*Dipterocarpus*)

Type: 1B/C1

Date of formation: 1980

Observation plots of different plant species (40 tree species) at Digboi arboretum and JFMC plantation at Digboi with a view to study the annual growth increment over the year (two times in each year) has been made. Experimental plantation of Dhuna, Bogipoma, Kadam and Simalu at Bogapani, Digboi in 0.25 ha has been carried out to study its growth model.

3.6 Fauna and their Habitats

The forests of this Division were originally very rich in wildlife including migratory birds. The RFs and Dehing-Patkai WLS harbours a rich variety of wildlife such as Elephant, Tiger, Leopard, Black Deer, Slow Panther, Clouded Leopard, Chinese Ponglin, Sloth Bear, Eastern Hollock Gibbon, Western Hollock Gibbon, Indian Bison, Sambar, Barking Deer, Slow Loris, Capped langur, Hollock Gibbon, Flying squirrel and different types of reptiles. The forest is very rich in Avifauna. Some of the important species of birds

are Drongos, Pheasants, Orioles, Jacanns, Wood Ducks, Eagles, Owl, Horn bills, Minivets etc. Number of migratory water birds visits the water bodies of the Division especially during the winter season.

The landscape itself is picturesque lying at the foothills of the mighty Himalayas. The rivers are fast flowing that carry huge volume of boulder, sand, clay and debris of eroded materials, roots and trunks of tree etc. The turbid rivers turn bluish during winter and provide shelter to large flock of migratory birds. The rivers are full of fishes like Mohaseer, Rohu, Bahu, Borali, Chitol, etc.

The division possesses an excellent habitat of Hoolock Gibbon, Eastern Hoolock (*Binopithecus leuconedes*) and Western Hoolock (*Binopithecus hoolock hoolock*). This primate requires habitat with tall trees. Fragmented forests makes this species vulnerable. Heavy biotic pressure together with absence of tall trees and fruit bearing species, encroachment, felling of trees, cultivation, grazing, poaching, etc. will possibly lead this already rare and endemic species to become locally extinct.

3.6.1 Dehing Patkai Elephant Reserve: Dihing Patkai Wildlife Sanctuary spreads over the districts of Dibrugarh and Tinsukia located on the foot hills of Patkai Range. The sanctuary was notified vide govt of Assam notification no. FRW-34/ 2003/ p t/ 6 dated 19/06/2004. It was constituted with 5669.49 ha. of forest area of Upper Dihing Reserved Forests (West Block), 30 42.5l ha. forest area of Dirak Reserved Forests & 2407.42 ha forest area of Jeypur Reserve Forests. Both the Upper Dihing Reserved Forests (West Block) and Dirak Reserved Forests fall under Digboi Forest Division in Tinsukia district, where as Jeypore Reserved Forests falls under Dibrugarh Forest Division in Dibrugarh district. The total area of the sanctuary is 11,119.42 ha (111.19 sq km).

The Dihing Patkai Wildlife Sanctuary is one of the prime habitats of primates, elephants and a few critically endangered species of animals and birds. The flagship species of the Dehing Patkai Wildlife Sanctuary is Hoolock gibbon (*Bimopethicus hoolock hoolock*), the only Western ape found in India. It is a Schedule-I species of Indian Wild Life protection Act 1972 and also Appendix-I of Endangered Species under CITES 1973. The Hoolock Gibbon is considered as an endangered animal based on the criteria A2ac, C2a (i) (Recent). This is also the prime habitat of Asiatic Elephant. Elephant estimation carried out in the month of March, 2017 where 196 nos. of elephants were found in Digboi Division. The elephant migrate to the forests under Digboi Forest Division from the forests of Arunachal Pradesh mostly through Dihing Patkai Wildlife Sanctuary. This is considered to be one of the vital corridors of Asian elephant in the region.

A total of 43 mammals have been recorded here; 17 carnivore species have been camera- trapped in the Dehing Patkai Wild Life Sanctuary & in the adjoining forests, the highest of any site in India (Mrs. Kashmira Kakoti). It is, in fact, is the first site in the world where photographs have confirmed 7 species of cats co-existing within one landscape. The five endangered mammal species in this landscape are the tiger, wild dog, elephant, hoolock gibbon and Gangetic dolphin; the endangered birds are the long-billed vulture (Critically endangered), white winged wood-duck and Greater Adjutant Stork. The Globally critically endangered tree *Vatica lanceaefolia* (Morhal) is among the plants of conservation importance.

Some of the common birds found in the forests are the Great White Billed Heron, Lesser Adjutant Stork, White Winged Wood Duck, Slender Billed Vulture, White Cheeked Hill Partridge. Primate census was carried out during 2009 recorded 2359 nos. of primate. This includes 256nos. of Hoolock gibbon under the Digboi Division. Moreover, it is a breeding ground of different species of reptiles and invertebrates. The Dihing Patkai Wildlife Sanctuary is classified as Assam Valley Tropical wet evergreen Forests. The evergreen forest cover has helped the primates for their livelihood. The P.A. is significant for three tier tree canopy. The top canopy is formed by *Dipterocarpus retusus* and *Shorea assamica* forests.

3.6.2 Distribution of wildlife: The forest of this Division harbours significant levels of bio-diversity and is rich in wildlife including migratory birds. Diverse migratory birds visit the water bodies located along wet lands during winter season. Dehing-Patkai is known world wide as the habitat for Deohanh "White-winged Wood Duck", an endangered avifauna declared as the "State bird of Assam". White-winged Wood Duck is a Critically Endangered Species whose population in the world is around 1000. Leopards often observed in this tract. There are some resident leopards in the large tea gardens situated near the Reserve Forests. Among other mammals, elephant is often sighted throughout the year. However, during the winter season, herds of wild elephant raid crops, destroy other property and even cause death to human life. Tiger sighting is rare. Hoolock gibbon is commonly found in Dehing-Patkai and Charaipung. Similarly, sightings of Slow Loris are also common.

3.7 Threats and Challenges to Wildlife:

The flagship species of the Digboi Division is the highly endangered White Winged Wood Duck (*Cairina scutulata*), and the flagship species of the Dehing Patkai Wildlife Sanctuary is Hoolock gibbon (*Bimopethicus hoolock hoolock*) both the Western and Eastern Hoolock gibbon (*Binopithecus hoolock* and *Hoolock leuconedys*), the only Western Ape found in India. Both are Schedule-I species under the Indian Wild Life (Protection) Act 1972 and also listed in the Appendix-1 of Endangered Species under CITES 1973. The White Winged Wood Duck is the 'State Bird of Assam' whose worldwide population is only 1200. The Hoolock Gibbon is considered as an endangered animal based on the criteria A2ac, C2a (i) (Recent). This is also the prime habitat of Asiatic Elephant and part of Dehing Patkai Elephant Reserve. The loss of dense forest, rapid land use change, expansion of tea estates, leaching of pollutants from the tea estates to the surrounding ecosystem and indeed encroachments posing threats to the wildlife and their habitat. Large tracts of forests lands are fragmented by National Highways and Railway tracks along with human settlements.

Butterflies and moths are found to be the easy victims during oil mining. The new National Highway (bypass) from Tingrai to Makum will certainly disturb the movement of the wild elephants. On the other hand, the existence of tea gardens poses threat for elephants having high risk of poisoning from chemicals. Many electrocution cases have been recorded in Digboi Division. These high voltage lines are very much detrimental for the Hoolock gibbons as they are fond of swinging. Poisoning, blasting and electrocution by generator are key factors causing wild animal deaths in the Division. Reduction in food and fodder for elephants has increased the man-elephant conflict in the plain area. Fishing incidences in

wetlands inside the RFs have disturbed the White Winged Wood Duck and gibbon population considerably.

Deaths due to animal attacks are an indicator of the impact of anthropogenic disturbance on wildlife habitat. Assam has had deaths due to attacks by Elephants, Tigers and Leopards. There were 62 such cases all over Assam officially recorded in 2003 and 48 in 2004. According to recent reports, there were 92 human deaths due to elephant attacks in Assam during 2015-16. The important faunal species requiring immediate interventions for conservation include Hollock gibbon, Royal Bengal Tiger, The clouded leopard, Pangolin, Himalayan Black Bear, The Elephant, Giant squirrel and white winged wood duck.

3.8 Protection and Management of Fauna:

No distinguished measure for protection and management of fauna was taken in the Division. However, in 2015-16, in aegis of APFBC the DFO constituted a forest and wildlife protection squad with a nomenclature, "Green Brigade" and comprising young boys and girls of the JFMCs. The Green Brigade was a volunteer organization except that logistics and other support were provided departmentally. The members of Green Brigades were imparted training in various aspects including protection measures and awareness campaigns. This group used to serve for the noble cause of protection and management of Wildlife. With fund received from APFBC, the "Green Brigade" was maintained simultaneously, with other development works that includes plantation etc. But due to fund got discontinued the maintenance of the Green Brigade was at halt. However, the members extend their helping hand in mitigating man animal conflicts etc. Anti depredation squad comprising frontline staffs and involving villagers of adjoining Reserve Forests was constituted to contain wildlife (elephant) depredation as well as to provide protection to the wildlife. Such Anti depredation squad & Joint Forest Management Committees are also entrusted to look into the movement of wild animals through the animal corridors connecting the different Reserve Forests. Recently, provisions have been made to pay the members of the Mobile Anti Depredation Squad and this has been found to be very effective.

Major depredation is caused by the elephants in the neighbouring villages of forests by damaging paddy crop and destroying dwelling houses during the period from October to February each year. Herds of elephants come out of forests in search of food and enter the crop fields and homestead of villages. Sometimes loss of human life is also caused by rogue elephants. Cattle lifting by tiger and leopard in the vicinity of forests are also reported from time to time. In the process, human encounters with tiger and leopard also take place, and loss of human life was also reported. To bring awareness of general public towards wildlife conservation and to motivate the affected people in this regard, there is scheme to provide compensation for loss of human life and causing permanent disability due to wildlife depredation.

CHAPTER 4

Maintenance and Enhancement of Forest Health and Vitality

4.1 Status of Regeneration:

Regeneration survey reveals that the major species namely *Dipterocarpus macrocarpus*, *Shorea asamica* and *Mesua ferrea*, which were once growing robustly are decreasing at a very fast rate now. Average regeneration of these species were found to be 16, 10 and 2 respectively. Decreasing forest area due to encroachments together with limitation of suitable environment for regeneration, these species are not showing encourageable regeneration. Absence of seed bearer (mother tree) is a reason for absence of natural regeneration in some patches. One more noticeable factor of decreased regeneration is that the forest floor have been covered with weeds, shrubs and creepers restricting the seeds to reach soil, consequential to failure of germination. Regeneration of NTFP species are also very poor. Few bamboo species regenerating naturally are also under tremendous biotic pressure. The regeneration areas require Protection from biotic interferences. The detail regeneration survey is shown in Annexure VIII. Number of sapling per hectare area in various compartments are given in table 4.1a and RF wise proportion of species composition are given in table 4.1b

Table 4.1a: Number of saplings/Ha. recorded in different compartments under different Ranges

Name of the Range	Compt. No	Saplings/Ha.
Digboi	1	477
	2	120
	3	110
	4	100
	10	100
	13	300
	14	1000
	19	375
	20	400
	22	795
	24	900
	25	1800
	30	785
	51	500
Jagun Range	1	152
	2	168
	3	180
	4	108
	5	157
Lekhapani		142
Margherita East	31	2210
	33	430
	35	390
	45	460
	46	390
	47	430

Margherita West	48	550
	56	4070
	1	200
	3	242
	4	273
	5	390
	6	193
	8	180
	9	195
	10	200

Table 4.1b: RF wise proportion of species composition

Species Name	Diameter Class (cm)						Total
	D1	D2	D3	D4	D5	D6	
DIGBOI EB RF							
Dipterocarpus retusus Blume	11.20	0.80	1.60	4.80	3.20	16.00	37.60
Tectona grandisL.f.	1.60	0.00	6.40	3.20	0.00	0.00	11.20
Castanopsis indica (Roxb. ex Lindl.) A.DC.	1.60	0.00	0.80	1.60	0.00	2.40	6.40
Baccaurea ramiflora Lour.	4.00	0.00	0.00	0.00	0.00	0.00	4.00
Mesua ferrea L.	4.00	0.00	0.00	0.00	0.00	0.00	4.00
Schima wallichChoisy	1.60	1.60	0.00	0.80	0.00	0.00	4.00
Dillenia indica L.	2.40	0.80	0.00	0.00	0.00	0.00	3.20
Meliosma pinnata (Roxb.) Maxim.	3.20	0.00	0.00	0.00	0.00	0.00	3.20
Misc	16.00	1.60	2.40	1.60	0.80	4.00	26.40
Total Composition (%) Digboi EB RF	45.60	4.80	11.20	12.00	4.00	22.40	100.00
DIGBOI WB RF							
Dipterocarpusretusus Blume	9.62	2.06	2.75	2.06	1.37	8.59	26.45
CanariumbengalenseRoxb.	6.53	2.41	1.37	0	0	0	10.31
Garcinia kydiaRoxb.	4.81	0.69	0.34	0	0	0	5.84
SchimawallichChoisy	4.81	1.03	0	0	0	0	5.84
Castanopsisindica (Roxb. ex Lindl.) A.DC.	4.47	0.69	0.34	0	0	0	5.5
Chisochetoncumingianus (C.DC.) Harms.ssp.balansae (C.DC.) Mabb.	3.78	1.03	0.34	0.34	0	0	5.49
Mesuaferrea L.	3.44	0	0.69	0	0	0.69	4.82
Baccaurearamiflora Lour.	2.06	0	0	0	0.69	0	2.75
ArtocarpuschaplashaRoxb.	0	0	0.34	0	0	2.07	2.41
Misc	14.09	3.79	5.15	2.06	1.03	4.47	30.59
Total Composition Digboi (%) WB RF	53.61	11.7	11.32	4.46	3.09	15.82	100
DIRAK RF							
Aglaia spectabilis (Miq.) S.S. Jain & S.S.R. Bennet	0	0.19	0.78	1.39	0.78	1.79	4.93
Ailanthus integrifolia subsp. calycina (Pierre) Nooteboom	0	0	0.78	0.39	0.78	0	1.95
Albizialucidior (Steud.)I.C.Nielsen	0.19	0	0.39	0	0	0	0.58
Altingiaexcelsa Noronha	0	0	0	0	0	0.39	0.39
ArtocarpuschaplashaRoxb.	0	0.19	0	0.19	0.39	0.78	1.55
Artocarpuslacucha Buchanan-Hamilton ex D. Don	0	0.19	0.19	0	0.19	0.39	0.96
Baccaurearamiflora Lour.	0.19	0.19	0	0	0	0	0.38

<i>Balakatabaccata (Roxb.) Esser</i>	0	0	0.58	0.19	0	0.39	1.16
<i>Bischofia javanica Blume</i>	0	0	0	0.58	0	1.17	1.75
Misc	7.8	4.87	24.17	19.1	8.38	22.03	86.35
Total Composition (%) Dirak RF	8.18	5.63	26.89	21.84	10.52	26.94	100
KOTHA RF							
<i>Lagerstroemia speciosa (L.) Pers.</i>	1.46	6.72	4.48	2.99	0.37	0	16.02
<i>Dipterocarpus retusus Blume</i>	1.87	2.24	2.24	2.24	0.37	0	8.96
<i>Magnolia pterocarpa Roxb.</i>	1.12	2.24	2.24	0.75	0	0	6.35
<i>Dillenia indica L.</i>	0.75	2.24	0.37	1.49	0.37	0	5.22
<i>Vatica lanceifolia (Roxb.) Blume</i>	2.24	0.75	0.75	1.12	0.37	0	5.23
<i>Castanopsis indica (Roxb. ex Lindl.) A.DC.</i>	0	0.37	1.12	2.24	0.75	0	4.48
<i>Ailanthus integrifolia subsp. calycina (Pierre) Nootboom</i>	0.75	0.37	1.87	0.75	0.37	0	4.11
<i>Canarium bengalense Roxb.</i>	0	0.75	0.75	2.24	0	0	3.74
<i>Duabanga grandiflora (DC.) Walp.</i>	0.37	1.12	1.87	0.37	0	0	3.73
Misc	16.79	4.48	13.43	4.85	1.49	1.12	42.16
Total Composition (%) Kotha RF	25.35	21.28	29.12	19.04	4.09	1.12	100
LEKHAPANI RF							
<i>Dipterocarpus retusus Blume</i>	0.36	0.35	3.93	4.29	2.5	5	16.43
<i>Vatica lanceifolia (Roxb.) Blume</i>	0.71	3.21	5	1.43	0.36	0	10.71
<i>Castanopsis indica (Roxb. ex Lindl.) A.DC.</i>	0.36	0	2.5	2.14	0.71	0.36	6.07
<i>Mallotus tetra-coccus (Roxb.) Kurz</i>	1.79	1.43	1.07	0	0.36	0.36	5.01
<i>Garcinia kydia Roxb.</i>	0.36	0	2.14	1.43	0.36	0	4.29
<i>Aglaia spectabilis (Miq.) S.S. Jain & S.S.R. Bennet</i>	0.36	0.36	0	1.07	0.71	1.43	3.93
<i>Baccaurea ramiflora Lour.</i>	2.5	0.71	0.71	0	0	0	3.92
<i>Balakatabaccata (Roxb.) Esser</i>	0.36	0.71	0.36	0.36	1.79	0.36	3.94
<i>Artocarpus chaplasha Roxb.</i>	0	0	0.71	0.71	0	1.43	2.85
Misc	3.93	3.21	15.36	9.64	3.57	7.14	42.85
Total Composition (%) Lekhapani RF	10.73	9.98	31.78	21.07	10.36	16.08	100
NAMP HAI RF							
<i>Dillenia indica L.</i>	4.17	3.33	0	0	0	0.83	8.33
<i>Duabanga grandiflora (DC.) Walp.</i>	0	1.67	3.33	1.67	0	1.67	8.34
<i>Dipterocarpus retusus Blume</i>	0.83	0	0.83	1.67	1.67	2.5	7.5
<i>Pterospermum acerifolium (L.) Willd.</i>	2.5	1.67	1.69	0	0.83	0.83	7.52
<i>Kydia calycina Roxb.</i>	4.17	0	0.83	0	0.83	0.83	6.66
<i>Bischofia javanica Blume</i>	0	2.5	0.83	0.83	0	1.67	5.83
<i>Mesua ferrea L.</i>	0	0.83	0.83	2.5	0.83	0	4.99
<i>Ailanthus integrifolia subsp. calycina (Pierre) Nootboom</i>	0	0	3.33	0.83	0	0	4.16
<i>Artocarpus chaplasha Roxb.</i>	1.67	0	0.83	1.67	0	0	4.17
Misc	10.83	9.17	12.5	5.83	4.17	0	42.5
Total Composition (%) Namphai RF	24.17	19.17	25	15	8.33	8.33	100
TINKOPANI RF							
<i>Dipterocarpus retusus Blume</i>	0	1.54	5.64	5.38	5.38	1.28	19.22
<i>Mesua ferrea L.</i>	0.77	2.31	2.56	0.51	0.26	0	6.41
<i>Shorea assamica Dyer</i>	0	1.28	2.56	0	2.05	0.26	6.15

<i>Artocarpuschaplasha</i> Roxb.	0.26	0.26	3.08	0.77	0.51	0.51	5.39
<i>Duabanga grandiflora</i> (DC.) Walp.	0.26	1.03	2.82	0.77	0.26	0.26	5.4
<i>Ailanthus integrifolia</i> subsp. <i>calycina</i> (Pierre) Nootboom	0.51	1.03	2.31	0.51	0.52	0.26	5.14
<i>Vaticalanceifolia</i> (Roxb.) Blume	2.05	1.79	0.51	0	0	0	4.35
<i>Bischofia javanica</i> Blume	0.51	0.51	1.79	0.77	0.26	0	3.84
<i>Canarium bengalense</i> Roxb.	0	1.54	1.28	0	0.77	0	3.59
Misc	6.92	7.95	15.38	7.44	1.79	1.03	40.51
Total Composition (%) Tinkopani RF	11.28	19.24	37.93	16.15	11.8	3.6	100
TIPANG RF							
<i>Dipterocarpusretusus</i> Blume	0	0	6.67	3.33	0.83	3.33	14.16
<i>Shorea assamica</i> Dyer	0	0.83	3.33	1.67	0.83	1.67	8.33
<i>Garcinia kydia</i> Roxb.	0.83	1.67	4.18	0.83	0	0	7.51
<i>Gmelina arborea</i> Roxb.	0	3.33	1.67	1.67	0.83	0	7.5
<i>Baccaurea ramiflora</i> Lour.	3.33	0.83	0.83	0	0.83	0	5.82
<i>Balakatabaccata</i> (Roxb.) Esser	0	0.83	0	4.17	0.83	0	5.83
<i>Chisocheton cumingianus</i> (C.DC.) Harms.ssp. <i>balansae</i> (C.DC.) Mabb.	0	0	3.33	0	0.83	0	4.16
<i>Duabanga grandiflora</i> (DC.) Walp.	0	0	1.67	1.67	0	0.83	4.17
<i>Ficus racemosa</i> L.	1.67	0.83	0	0	1.67	0	4.17
Misc	3.33	6.67	17.5	4.17	0.85	5.83	38.35
Total Composition (%) Tipang RF	9.16	14.99	39.18	17.51	7.5	11.66	100
TIRAP RF							
<i>Dipterocarpusretusus</i> Blume	0.51	2.04	3.57	0.51	1.53	5.61	13.77
<i>Vaticalanceifolia</i> (Roxb.) Blume	0.51	1.02	2.55	1.02	0.51	1.02	6.63
<i>Gmelina arborea</i> Roxb.	0	0.54	1.02	0.51	2.04	1.02	5.13
<i>Mallotus tetra-coccus</i> (Roxb.) Kurz	2.04	1.02	1.53	0.51	0	0	5.1
<i>Castanopsis indica</i> (Roxb. ex Lindl.) A.DC.	1.02	0	1.02	1.02	0.51	1.02	4.59
<i>Baccaurea ramiflora</i> Lour.	1.53	1.53	1.02	0	0	0	4.08
<i>Balakatabaccata</i> (Roxb.) Esser	0	0.51	1.02	2.04	0	0.51	4.08
<i>Ficus racemosa</i> L.	1.02	0.51	1.02	1.02	0	0	3.57
<i>Magnolia pterocarpa</i> Roxb.	0.51	0.51	1.53	1.02	0	0	3.57
Misc	5.61	6.12	11.22	7.65	5.1	13.78	49.48
Total Composition (%) Tirap RF	12.75	13.8	25.5	15.3	9.69	22.96	100
UPPER DEHING EB RF							
<i>Dipterocarpusretusus</i> Blume	3.8	1.45	1.92	1.24	1.41	5.42	15.24
<i>Schima wallichii</i> Choisy	7.57	3.26	2.22	0.54	0.13	0.07	13.79
<i>Castanopsis indica</i> (Roxb. ex Lindl.) A.DC.	3.36	1.14	0.81	0.47	0.17	0.37	6.32
<i>Magnolia pterocarpa</i> Roxb.	1.45	0.84	1.45	0.71	0.64	0.47	5.56
<i>Chisocheton cumingianus</i> (C.DC.) Harms.ssp. <i>balansae</i> (C.DC.) Mabb.	2.05	0.98	1.08	0.54	0.24	0.24	5.13
<i>Magnolia champaca</i> (L.) Baill. ex Pierre	0.54	0.34	0.94	0.44	0.37	0.5	3.13
<i>Mesua ferrea</i> L.	0.74	0.03	0.54	0.74	0.35	0.4	2.8
<i>Duabanga grandiflora</i> (DC.) Walp.	0.03	0.03	0.13	0.44	0.91	0.91	2.45
<i>Vaticalanceifolia</i> (Roxb.) Blume	1.04	0.37	0.67	0.27	0	0	2.35
Misc	17.02	7	7.1	4.17	2.39	5.55	43.23
Total Composition (%) Upper Dehing EB RF	37.6	15.44	16.86	9.56	6.61	13.93	100

UPPER DEHING WB RF							
<i>Dipterocarpusretusus</i> Blume	3.73	2.93	3.39	2.53	3.5	11.2	27.28
<i>Mesuaferrea</i> L.	1.49	1.04	2.01	1.44	1.03	1.03	8.04
<i>Vaticalanceifolia</i> (Roxb.) Blume	2.64	1.15	3.1	0.34	0.11	0	7.34
<i>Schimawallichi</i> Choisy	2.87	2.53	1.03	0.23	0.06	0.23	6.95
<i>Magnolia champaca</i> (L.) Baill. ex Pierre	1.44	0.4	0.86	0.8	0.34	0.52	4.36
<i>Castanopsisindica</i> (Roxb. ex Lindl.) A.DC.	1.55	1.03	0.75	0.57	0.17	0.11	4.18
<i>Balakatabaccata</i> (Roxb.) Esser	0.52	0.29	0.92	0.57	0.29	0.57	3.16
<i>Dilleniaindica</i> L.	0.52	0.46	1.03	0.4	0.23	0.29	2.93
<i>Chisochetoncumingianus</i> (C.DC.) <i>Harms.ssp.balsanae</i> (C.DC.) Mabb.	0.86	0.4	0.4	0.69	0.23	0.29	2.87
Misc	10.22	5.46	7.75	2.87	2.7	3.89	32.89
Total Composition (%) Upper Dehing EB RF	25.84	15.69	21.24	10.44	8.66	18.13	100

4.2 Area Affected by Forest Fire:

MODIS data was used to detect forest fires in the Division from January 1, 2004 to December 16, 2016. Forest fire assessment for 2015 and 2016 shows that Tinopani, Tirap and Lekhapani reported fire incidences. The forest fire incidences map based on MODIS data provided by FSI is shown in map (figure 4.2.a). The proposed fire line map of the division is shown in Appendix (page vi).

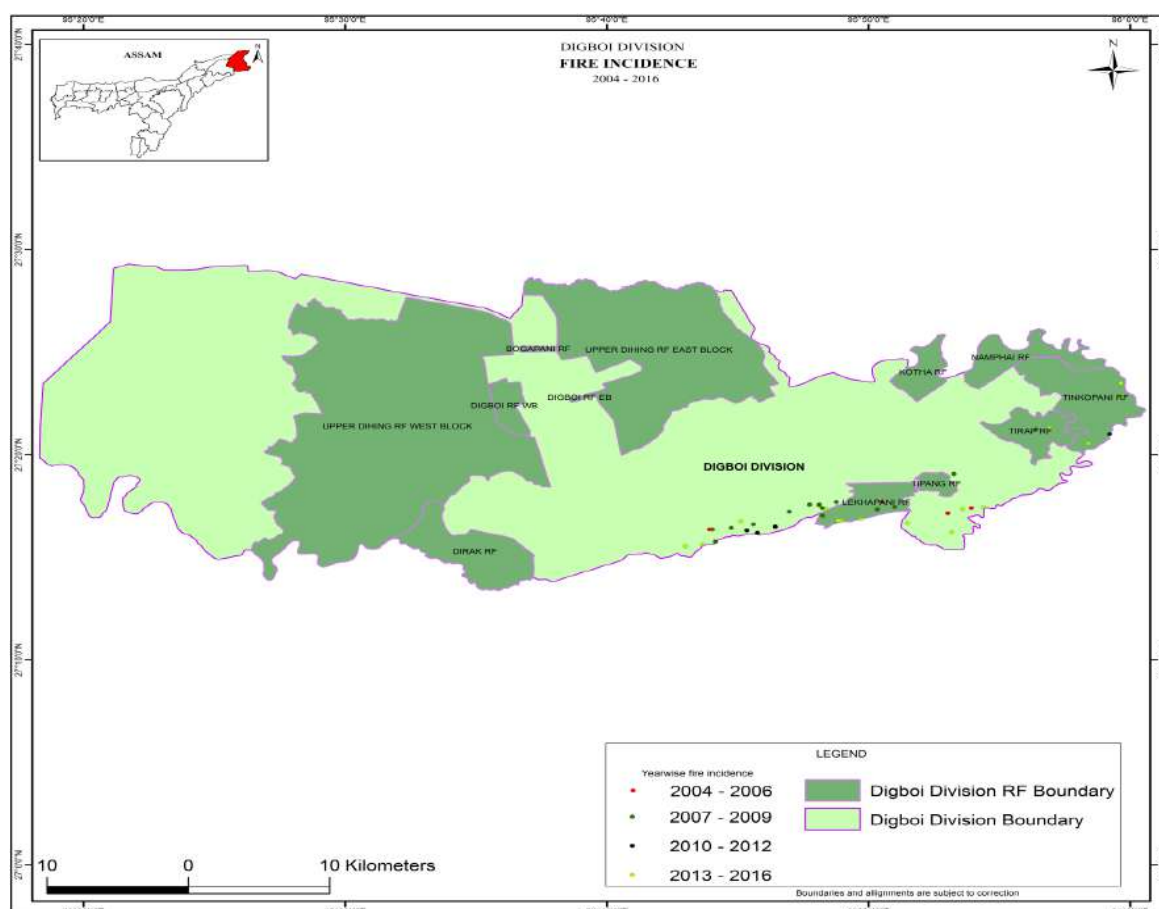


Figure 4.2.a. map showing forest fire incident in various places in different years

4.3 Area damaged by natural calamities:

There are occasional strong winds experienced in Digboi Forest Division. All Reserve Forests and Proposed Reserve Forest suffer from damage by such strong winds. Wind fallen trees are operated departmentally and put to sale through tender process. However, there is no data showing area damaged by natural calamities.

4.5 Lopping Practices:

In Digboi Forest Division, there is no such lopping of fodder except in the flood season. The NTFP collected are specially the thatch, broom stick, Ban Ada, Ban haldi etc. and hence no such damages by lopping.

4.6 Area infested by Invasives Weeds Species in Forests:

In Digboi Forest Division, weeds like *Mikania micrantha*, *Eupatorium odoratum*, *Acacia mearnsii*, *Ageratum conizoides*, *Cassia tora*, *Corchorus spp.*, *Ipomeas pp.*, *Eichhornia spp.*, *Solanum torvum*, and *Parthenium hysterophorus* are seen in open areas. It affects the young regeneration. However, there is no recorded data of area infested by invasive weed species.

4.7 Incidences of pest and diseases: Top dying, White blochas, Twig cutter and other unknown diseases are observed in the RFs of the Division.

4.8 Forest Degradation and its Drivers:

The major forest degradation drivers in Digboi Forest Division are as follows:

4.8.1 Encroachment: Encroachment is the biggest driver of forest degradation. Out of total 52135.58 hectare of forest land 5160.93 hectare (9.6%) have been encroached by the encroachers. Maximum of the area is used for agriculture and built up i.e., construction dwelling houses. Factors responsible for these encroachments are (i) Population increase leading to requirement of land for settlement and agriculture, (ii) Insurgent problem sequential by laxity from the department, (iii) Lack of plan, programme, and infrastructures. Ejection of these encroachments will be an uphill task and recovery of these encroached land will be very difficult. Following is the Reserve Forest wise area under encroachment.

Table: 4.8.1.a: Reserve Forest wise area under encroachment

Name of the RFs	Area of RF / FV (Ha)	Agriculture Cropland (Ha)	Agriculture Plantation (Tea garden) (Ha)	Built-Up Rural (Ha)	Built-Up Urban (Ha)	Total encroachment (Ha)	Percent %
Digboi RF EB	56.983	0.334	22.047			22.38	39.3
Digboi RF WB	825.158	14.846	1.169	41.852	13.838	71.71	8.7
Dirak RF	3151.996	6.000	14.138		4.475	24.61	0.8
Kotha RF	1071.29	57.639				57.64	5.4
Lekhapani RF	1419.72				1.158	1.16	0.1
Namphai RF	1751.25	259.001	7.282	148.171		414.45	23.7
Tinkopani RF	3417.434	2.564				2.56	0.1
Tipang RF	391.182				0.006	0.01	0.0

Tirap RF	1532.968	2.836	12.146			14.98	1.0
Upper Dihing RF East Block	13079.987	1159.581	137.921	113.927		1411.43	10.8
Upper Dihing RF West Block	27053.066	2261.371	331.951	346.493	200.182	3140.00	11.6
Total	53751.034	3764.171 (71.43%)	526.654 (9.99%)	650.443 (12.34%)	219.660 (4.17%)	5160.93	9.6

4.8.2 Illegal felling: Illegal felling of trees is one of the noticeable factors for forest degradation. Human populations living in and around Reserve Forests of the Division are involved in illegal felling of trees. A good quantum of timber could be seized during last years. Timber seized during last ten years are shown below:

Year	Volume (m ³)
2009-2010	262.169
2010-2011	420.632
2011-2012	61.66
2012-2013	432.096
2013-2014	433.428
2014-2015	41.231
2015-2016	2.267
2016-2017	26.849
2017-2018	393.75
2018-2019	33.361
2019-2020	77.395
Total	2184.838

4.8.3 Forest Offences: Detection of Forest offences is always a tip of iceberg. Reserve Forests, the open treasury devoid of any barrier or any kind of protection measure except a few forest staffs, are always being exploited by the surrounding human population. Illegal removal of minor minerals (sand, stone), timber, firewood, grazing, lopping are very common in all the Reserve Forests. The staffs could detect illegalities and register offences. Following is year-wise number of forest offences registered for offences e.g., illegal removal of timber, minor minerals etc. But this number of registered offences is a tip of iceberg. Actual illegal activities will be much more which results forest degradation.

Year-wise Number of forest offence in the division since 2009-10 to 2019-20

Year	Number of offences
2009-10	81
2010-11	36
2011-12	100
2013-14	18
2014-15	58
2015-16	99
2016-17	181
2017-18	119
2018-19	101
2019-20	109

4.8.4 Coal Mining: Open cast Coal mining is a major forest degradation driver. The North Eastern Coal Field (NECF) of Coal India Limited has lease hold area of 26.88 sq. km in the luxuriant tropical rainforests of Digboi Forest Division. These coal mines are located on the south-eastern side of Burhi-Dihing River, northwest of which has dense forests of Margherita East Range and further west was Digboi Range; there is an elephant corridor between Digboi Range and Margherita east Range. The coal mines are located in Lekhapani Range which is situated on the south east of Burhi-Dihing River. The Margherita East Range is located on the south west of Burhi-Dihing River. All the mines listed fall under Tipong, Lekhapani and Tikak forest Ranges. A network of streams, rivulets and rivers originate from the hilly terrains of these reserve forests. In other words these three reserve forests are watersheds and catchments. Some of the rivulets and rivers that pass through coal fields are: Namdang River (flowing besides Tikak OCP and Baragolai colliery, Ledo pani nallah flowing besides Ledo OCP, Tikak River flowing besides Lekhapani OCP and Tipong river flowing Tipong valley. These hill ranges used to harbour luxuriant 4-5 storeyed tropical rainforest biome with top layer occupied by lofty *Diptocarpus macrocarpus*, *Shorea assamia*, *Altingia excelsa*. The second storey is dominated by *Mesua ferrae*, *Dysoxylum*, *Terminalia*, *Litsea*, *Elaeocarpus* and *Vatica*. The third story is represented by *Dillenia*, *Mesua indica*, *Ardisia*, tree ferns and *Calamus* species. The fourth storey is represented by herbs such as *Musa* and *Dryopteris/Glechinia*. Epiphytic orchids and ferns are abundant and climbers and lianas are plentiful.



The region is home to hoolock gibbon, slow loris, pig-tailed macaque, stump-tailed macaque, capped langur, Asian elephant, Bengal tiger are just a few of the animal species living here. The Dehing Patkai Elephant Reserve hosts about 293 different species of birds, including slender-billed vulture, white-winged wood duck (the state bird of Assam), greater adjutant, lesser adjutant, greater spotted eagle, beautiful nuthatch, marsh babbler, tawny-breasted wren-babbler, yellow-vented warbler, and many other varieties. The most common reptiles found here are rock python, king cobra, Asian leaf turtle, monitor lizard.

The NECF with its headquarters at Margherita is at present extracting coal from the following 6 mines: (i) Baragolai underground mine, (ii) Tipong underground mine, (iii) Ledo underground mine, (iv) Tirap open cast mine, (v) Tikak open cast mine, and (vi) Ledo open cast mine. These coal mines cover 2688.16 hectares.

As far as the history goes Coal mining leases were initially awarded to AR & T (Assam Railway and Trading) Company by the Government in 1932. Through the Coal mining Nationalization Act 1973 the leases were renewed in 1973 and the Right, title and interest of the Owner had been transferred to the Central Government. Subsequently Coal Mine Authority Limited and then Coal India Limited was formed and the leases were transferred to the Government Company. As per the aforesaid Act & Rule the Coal mine leases namely 4 Sq.mile Coal mining lease and Namdang Coal grant mining lease stood vested with North Eastern Coal Fields (NECF), Coal India Limited Margherita from 1st may 1973 for a period of 30 years i.e. up to 30th April 2003. During that period the CIL had carried out mostly underground mining and also opencast mining, however later on underground mining was stopped. In the meantime Forest (Conservation)Act 1980 has been enacted in the year 1980 and therefore extension of existing mining lease or for granting new Coal mining lease falling in Forest land requires Forest clearance from the Central Government as per the provision of the said FC Act 1980.

The North Eastern Coalfield applied for EC for Tikak extension OCP (0.2 MTPA from 192 ha of ML area) Lekhapani OCP (0.25 MTPA from ML area of 235 ha). The EIAs based on TORs of both the projects were considered by EAC (T&C) in meetings held on 22-23, March 2010 and again on 17-18, October 2011 (Lekhapani case) and on 26-27 October 2010 and 17-18 October 2011 (Tikak Extension OCP). Both the projects are located in biodiversity rich tropical rainforests of upper Assam and since the area is known to be corridor for elephants (in fact Lekhapani Reserve forest including the proposed site of forest diversion also falls in Dehing-Patkai Elephant Reserve). Further, the mine water is acidic due to pyrite, and the run off from OBDs which contain shales is also acidic; this acid mine drainage contaminates ground water, surface water including rivers, and soils.

The North Eastern Coal Field (NEC) of Coal India Limited has already violated Forest Conservation Act 1980. As per office record and field inspection it appeared that the Tikak 98.59 Tikak OCP in Saleki PRF of Lekhapani Range under this division, which was an ongoing project granted prior to 1980 was expired on 30th April 2003 but the NECF, CIL continued Coal mining till November 2019 thereby it has broken an area of 60.27 ha out of 98.59 ha without renewal/due Forest Clearance from the Central Government and hence violated FC Act 1980. Action for Violation of FC Act 1980 by NECF, CIL Margherita is in progress.

W.I. Yatbon, Deputy Inspector General of Forests (C) Regional Office, Shillong in his Site Inspection Report on November 25, 2019 submitted to Ministry of Environment, Forest & Climate Change (MoEF&CC) revealed that “the area of 41.39 ha claimed to be unworked/fresh area has actually been broken of which 9 ha was mined and another 7 ha was cleared perhaps for further mining.”

Though the leased area is 98.59 hect, the area affected due to mining operation is much more. The runoff contaminated water that flows from the watershed and catchment areas to the rivers which inundates agriculture area and contaminates the soil. The acidic water besides contaminating forest soil, contaminates ground water also.

Apart from these, the roads connecting the lease areas have caused significant forest destruction. Movement of vehicles disturb the wild flora and fauna of this rich biodiversity.

Table: 4.8.4.a: Details of Stage-I approval granted by MoEFCC

Sl. No.	State Name	District	File No	Proposal name	Area applied	Area diverted	Proposal status
1	Assam	Tinsukia	8-05/2012-FC	Diversion of 235.00 Ha of Forest Land for Lekhapani Open cast Project of North Eastern Coalfields under Lekhapani Range of Digboi Division for Coal Mining by North Eastern Coalfields, Coal India Limited (A Public Sector Undertaking)	235	235	Stage-I approval granted on 29.03.2014 & Compliance report awaited from State Govt.
			8-61/2011-FC	Diversion of 72.00 Ha of Forest Land for the Tikok extension OCP & Lekhapani OCP to Saleki PRF area under Digboi Division in District Tinsukia	72	72	Stage-I approval granted on 26.03.2013 & Compliance report awaited from State Govt.
			8-34/2013-FC	Diversion of 98.59 Ha of Forest Land for the Tikok Opencast Project of North Eastern Coalfields Coal India Limited in Saleki PRF under Digboi Division	98.59	98.59	Stage-I approval granted on 26.12.2019 & Compliance report awaited from State Govt.

4.8.5 Oil Extraction: Oil India had established a number of oil rigs in the forests of the Division. Forest areas affected by the oil fields are shown as under.

User Agency	Location	place	Area (hect.)
Oil India	Borjan RF (483) ha UDRF (WB) (3297) ha	Hugrijan, Oil India	3780.00
	UDRF (WB) 11070 ha Digboi RF 520 ha UDRF (EB) 4647 ha	Doom Dooma, Block B&C	16167.00
	UDRF (EB)	Digboi Oil India	2300.00
	UDRF (EB)	Borhatjan, Oil India	427.00
		Sub Total	22674.00

Other forest degradation drivers and areas affected is given in table 4.8

Table 4.8: Statement showing drivers of degradation in Digboi division, Assam

Drivers of degradation	Name the area where visible	Severity (High/ Medium/ Low)	Area (indicative) sq. km
Fire wood extraction	Encroached areas	High	35
Grazing	Encroached areas	Medium	10
Mining of minor minerals	Mined area	Medium	12
Earth cutting	Encroached area	Low	2
Weed infestation	Open areas/gaps	Medium	10
Boundary conflicts	Along Arunachal border	Low	12
Agriculture expansion	Around the RFs	Low	20

Plantations (Tea estates)	Around the RFs	High	50
Fodder extraction	Near encroachments	Low	2

4.9 Pollution Control and Protection of Environment

Incidences, extent of forest land degradation due to pollution (soil, water, in some cases air) and the measures taken to mitigate them are detailed in this section. Statement showing extent of land degradation and mitigation measures taken in shown in table 4.9. A total of 2668.16 ha are being affected due to coal mining by Coal India and 22674 ha are affected because of oil extraction through Oil India. Another critical source of pollution is spraying of pesticides in the surrounding tea gardens. The inorganic chemical gets leached through the waterways and affects the wetlands of the division.

Table 4.9: Statement showing extent of land degradation due to pollution and mitigation measures

User Agency	Location	Pollution Type	Area Affected	Mitigation Measures Taken							
Coal India	Lekhapani RF Tipong RF Tipong PRF	Lekha-Tipong Mining Lease	1158.46	1. 55.298 ha Plantation under CAMPA Scheme (F.D) 2. 64 ha Compensatory Afforestation inside the RF area and (F.D) 3. 47.71 ha Compensatory Afforestation outside the forest area (F.D) Mine-wise number of tree saplings plantations till date are given below (for Coal India Ltd.)							
	Salaki PRF	4 sq Mile Mining Lease	1034.34								
	Salaki PRF	Namdang Coal Grand	136.36	Year	Boragolai Colliery UG	Tikok OCP	Tirap OCP	Tipong UG	Marg. SFP	Ledo OCP	Total Plantation
	Salaki PRF	Tirap Coal Grand	238.00	1987 to 2011-12	69,500	688,600	718,000	56,575	45,470	16,15	1,28,249
	Non-Forest Area	Ledo Mining Lease	101.00	2012-13	1,780	19,740	29,835	2,680		5,965	60,000
Sub Total			2688.16								
Oil India	Borjan RF (483) ha UDRF (WB) (3297) ha	Hugrijan, Oil India	3780.00	2013-14		1,500	5,660			1,500	8,660
	UDRF (WB) 11070 ha Digboi RF 520 ha UDRF (EB) 4647 ha	Doom Dooma, Block B&C	16167.00	2014 -15		1,000	5,000			600	6,600
	UDRF (EB)	Digboi Oil India	2300.00	2015-16		4,000					4,000
	UDRF (EB)	Borhatjan, Oil India	427.00								
Sub Total			22674.00		71,280	714,840	758,495	59,255	45,470	24,215	17,07,509
TOTAL			25342.16								

CHAPTER 5

CONSERVATION AND MAINTANECN OF SOIL AND WATER RESOURCES

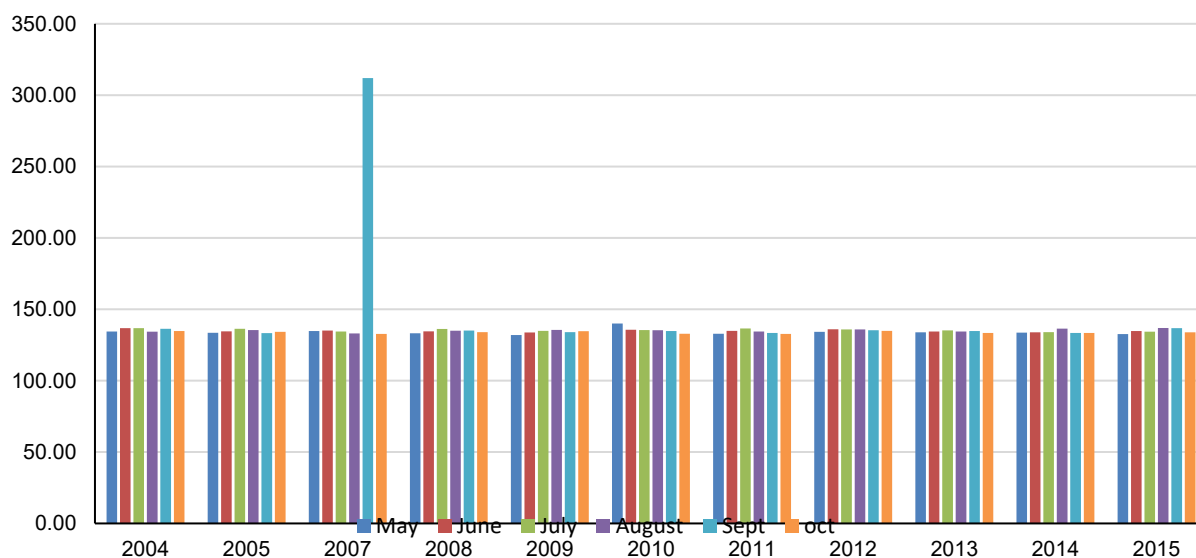
5.1 Area treated under soil and water conservation measures

No distinct soil and water conservation measure has been adopted so far in any part of the Division. However, restriction in felling as well as creation of plantations are indirectly helping in soil and water conservation.

5.2 Duration of water flows in the selected seasonal streams

The total area covered by the river/stream in the Division is 2894.70 ha of which 571.01 Ha falls within the RFs. River stream map of the Division is shown in figure 5.3.a. In this Division the River Burhi-Dihing flows from Naga-Patkai hill range in the south in the direction from east to west. The rivers are ephemeral in nature and carry huge quantities of water and sediment during rainy season and cause submergence of low lying areas. The monthly water level for the last ten years is shown in in the Figure 5.2.

Figure 5.2: Graph on the monthly water level (m) of the river Buridehing from 2004 to 2015



5.3 Wetland in Forest Areas

There are two major wetlands, namely, Mota Beel and Bor Beel, and many small water holes, water bodies within the RFs of this Division. Larger wetlands are located outside the RFs in the Tinsukia district.

The total area covered by the wetlands area of the Division is 1002.98 Ha of which 58.74 Ha falls within the RFs. Wetland map of the division is shown in figure 5.3.a.

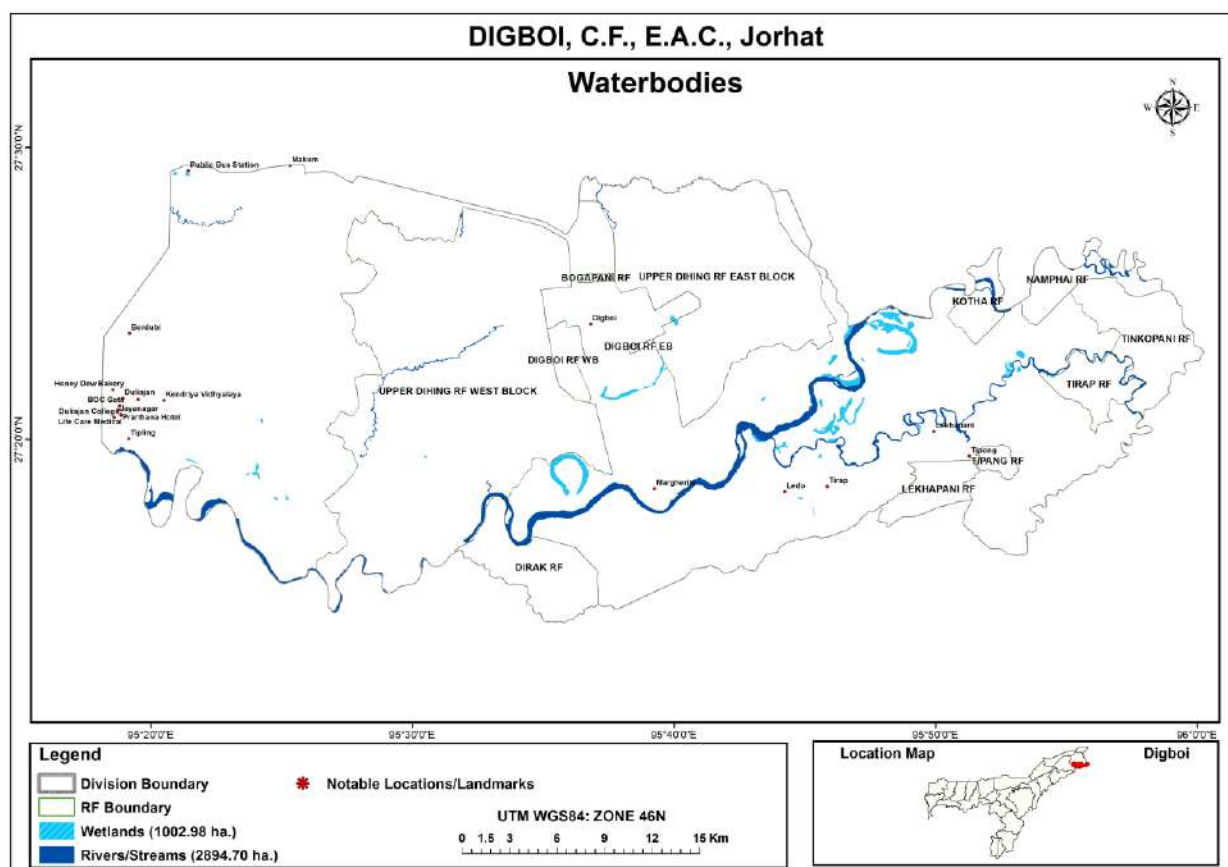


Figure 5.3.a map showing Wet lands in Digboi Division

5.4 Water Level in the Wells in Vicinity (5 kms) of the Forest Area

Due to its geographical location and quantum of the rainfall the major source of drinking and irrigation water is the surface water. In the village area the pond is the main source of water facility. Also, as per experts and local people opinion there is no such downfall in the ground water level of this Division. Depth to water level data shows that in most part of the district it is 2-4 m bgl (below ground level) while in some parts it is 4-6 m bgl (below ground level). The average water level as recorded from the wells lying in the vicinity of the forest area during lean months (November to February) is 12 m to 16 m, whereas water level in the wells during the rainy season is in the range of 2 m to 4 m. As the water level (DTW) is within 6 m bgl (below ground level) therefore, artificial recharge is not required for this district. High iron problem, specifically in hand pumps and water logged areas with water borne diseases during rainy days suggest to choose roof top rain water harvesting in specific areas but ground water recharging is not required for the district.

5.5 Status of Aquifers

On the basis of ground water exploration data of the Central Ground Water Board it can be inferred that in the northern part it is mainly a single aquifer system while in the southern part there is multi-aquifer system where individual aquifers are separated by thick clay layers. Thickness of aquifer increases from east to west.

Alluvial plain covers major part of the division. The aquifers are consisting of sands of various grades and are suitable for both shallow and deep tube wells. The water level study in the area shows no significant change of water level in the last 10 years. The details of aquifers found in the Division are shown in the table below.

Table 5.5:Details of aquifers in Digboi division, Assam

	Location	Water quality	Functionality
Aquifer system I	One lying above 60 ft. seam in the Tikak Parbat formation	Under unconfined condition	Not yet
Aquifer system II	Below 60 ft. seam in the Borgolai formation	Under confined condition and at places free flowing	-



CHAPTER 6

MAINTANANCE AND ENHANCEMENT OF FOREST RESOURCE PRODUCTIVITY

6.1 Growing Stock of Wood

The forest resource assessment methodology prescribed in the National Working Plan Code - 2014 was followed to conduct assessment of the total growing stock of trees and biomass. Gird based Systematic Stratified Random Sampling was carried out. Map of the sample plots is provided in figure 6.1.a Sample plots were laid out and observational assessment of site quality, tree species, composition, its health, density and crop age etc. were recorded in Plot Approach Form I. Blanks, important scattered trees, plantations raised were noted. Information on drivers of forest degradation, NTFP species, intensity of invasive species, faunal sights/ traces, microhabitats of wildlife were recorded.

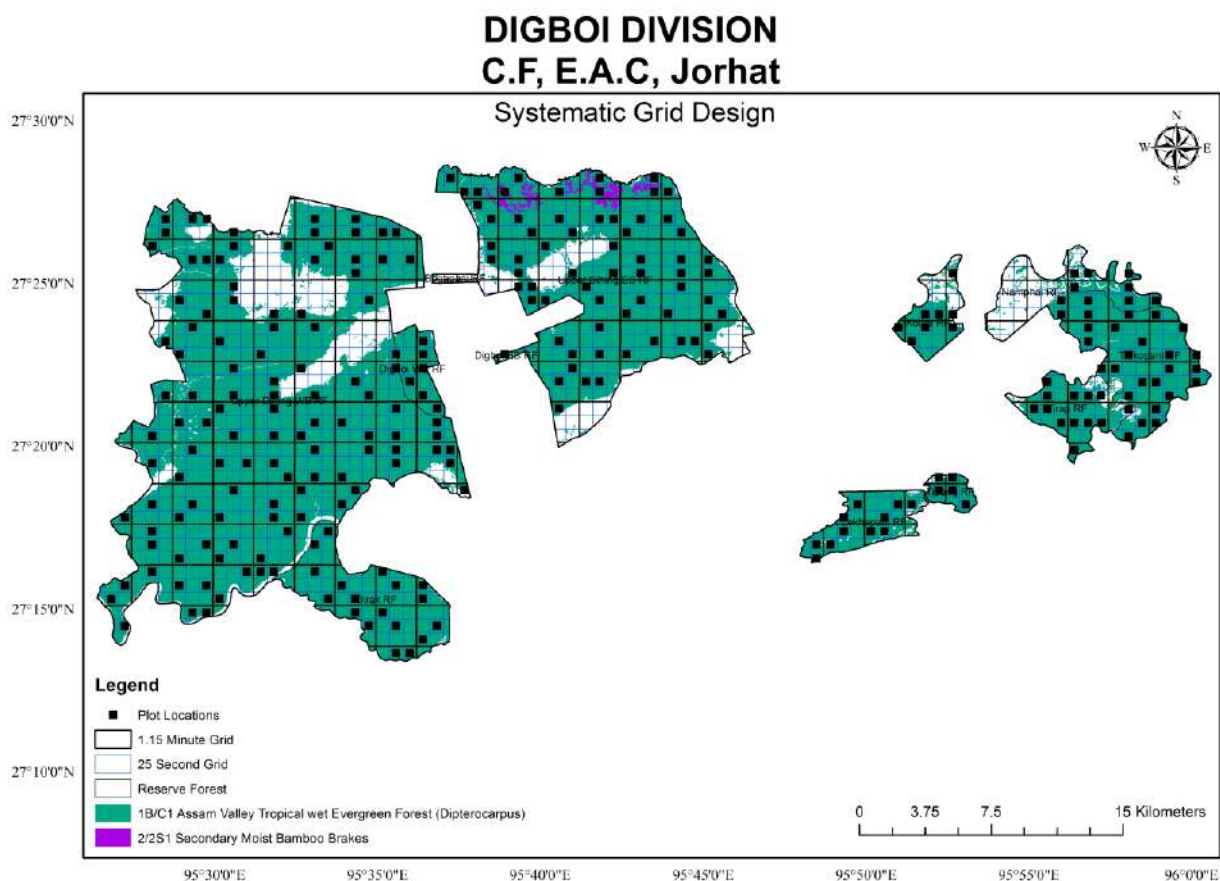


Figure 6.1.a: Map of the sample plots

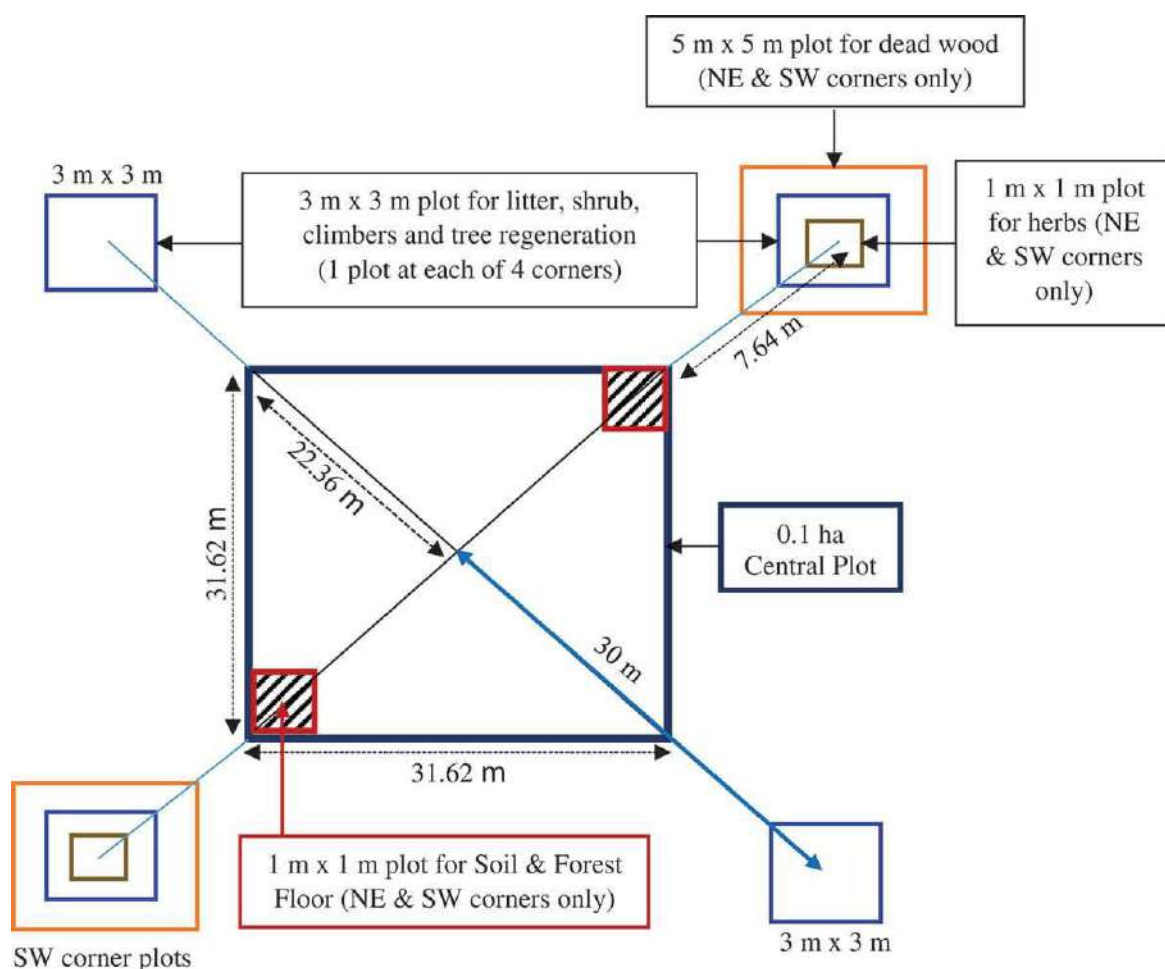


Figure 6.1.b Schematic representation of field enumeration plots (NE: North East, SW: South West)

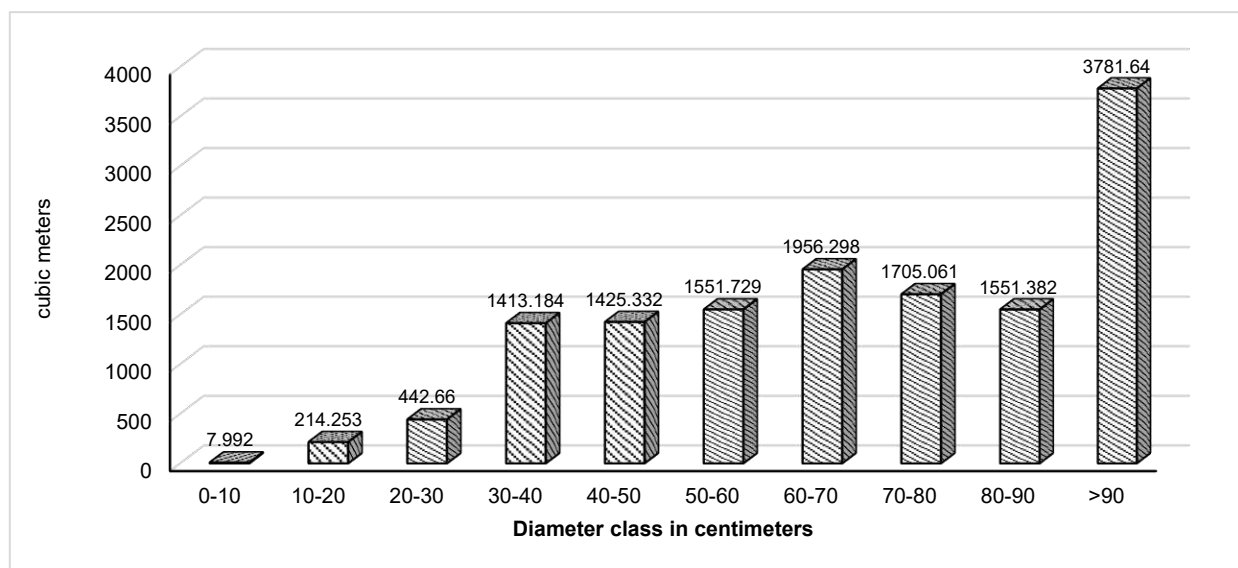
Forest inventory and analysis of growing stock is necessary to quantify tree growth and its sustainable utilization. Growing stock analysis is essential to calculate harvestable yield in the working plan. Mean annual increment is an important parameter for sustainable management of forest. Growing stock analysis is necessary to ensure sustain flow of income and ecosystem services to local communities considering conservation and ecological security.

Sample points were allocated by North East Space Application Center adopting the method as provided in the National Working Plan Code 2014. Plot designs are shown through 6.1.b. After navigating to each sample point using a hand held GPS, a square plot of 0.1 ha was laid measuring 22.36 m horizontal distance i.e. half of the diagonal in all the four directions. After checking the dimensions of the plot, latitude, longitude and altitude were recorded using the handheld GPS device. The main plot was used for recording the trees and bamboo stocking. The enumeration of trees was done by measuring the girth of each tree above 30 cm girth found in the sample plot. In case of bamboo, each clump was enumerated by taking its height, number of first, second and third year old culms, dried, congested culms and overall condition of the culms.

Information on regeneration status of forest species, injury to forest species, grazing incidence, fire incidence, soil type, gradient of slope etc. were gathered through visible evidences and recorded. Data of shrubs, climbers and regeneration status were recorded from all quadrats of 3m×3m laid out at a distance of 30 meters from the center of the main plot of 0.1ha at SE and NW directions. Data of herbs from all nested quadrats of 1m×1m laid within each quadrat of 3m×3m was collected and recorded in the plot enumeration form. The sample plot details are shown in Annexure IX.

The growing stock of different tree species in Digboi division, Assam is shown in Figure 6.1a shows distributions of growing stems in different class. Diameter class (cm) wise volume (cubic meters) of the important timber species in Digboi division is shown from figure 6.1.c. It denotes that the maximum growing stock (3781.64 cu.m.) is available in the dia class greater than 90 cm.

Figure 6.1.c: Diameter (centimeters) class wise growing stock (cubic meters) of Digboi division.



Contribution of the signatory species namely *Dipterocarpus retusus* Blumeto the total volume is 44%, *Mesua ferrea* L. and *Shorea assamica* Dyer contributes to 4% and 2%, respectively to the total growing stock volume (cu.m.) in the division. All other recorded species contribute to the remaining 50 per cent of the total timber volume.

Diameter class wise total number of stems of different tree species in Digboi division, Assam is shown in Figure 6.1b. The graph reveals that highest number of trees (1,73,829) is found in diameter class 10 - 20 cm, while the lowest number of stems (60,250) is recorded in diameter class 50 - 60 cm.

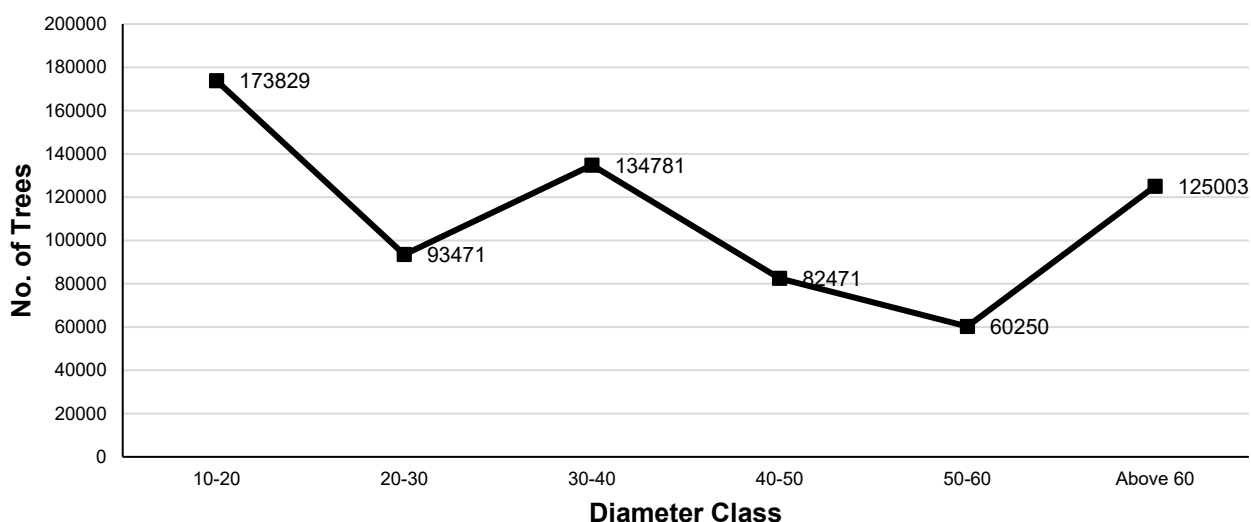


Figure 6.1.d: Number of trees in each diameter (centimeters) class of Digboi division.

However, it must be admitted that the forest is fairly balanced. Although quantification of the number of trees that can be accommodated in the higher diameter classes cannot be reflected by this graph yet keeping in line with the past management practices, current structure and composition of the forests in this division, it will be advisable to work out the forest with appropriate thinning in the lower diameter classes and gap fillings of the subsequent higher diameter class to change the shape of the present graph towards normal distribution of trees at all classes and species.

R.F wise growing stock of wood in cubic meter is shown in table 6.1.e. Compartment wise detail growing stock estimations is shown in figure 6.1.f

Table 6.1.e R.F. wise growing stock of wood in cubic meter

RF	GS (cu.m)
BOGAPANI RF	0.08
DIGBOI RF WB	51774.85
DIRAK RF	197430.8
KOTHA RF	9575.47
LEKHAPANI RF	31285.89
NAMPHAI RF	9665.81
TINKOPANI RF	62051.07
TIPANG RF	6913.62
TIRAP RF	36609.66
UPPER DIHING RF EAST BLOCK	795394
UPPER DIHING RF WEST BLOCK	826934.2

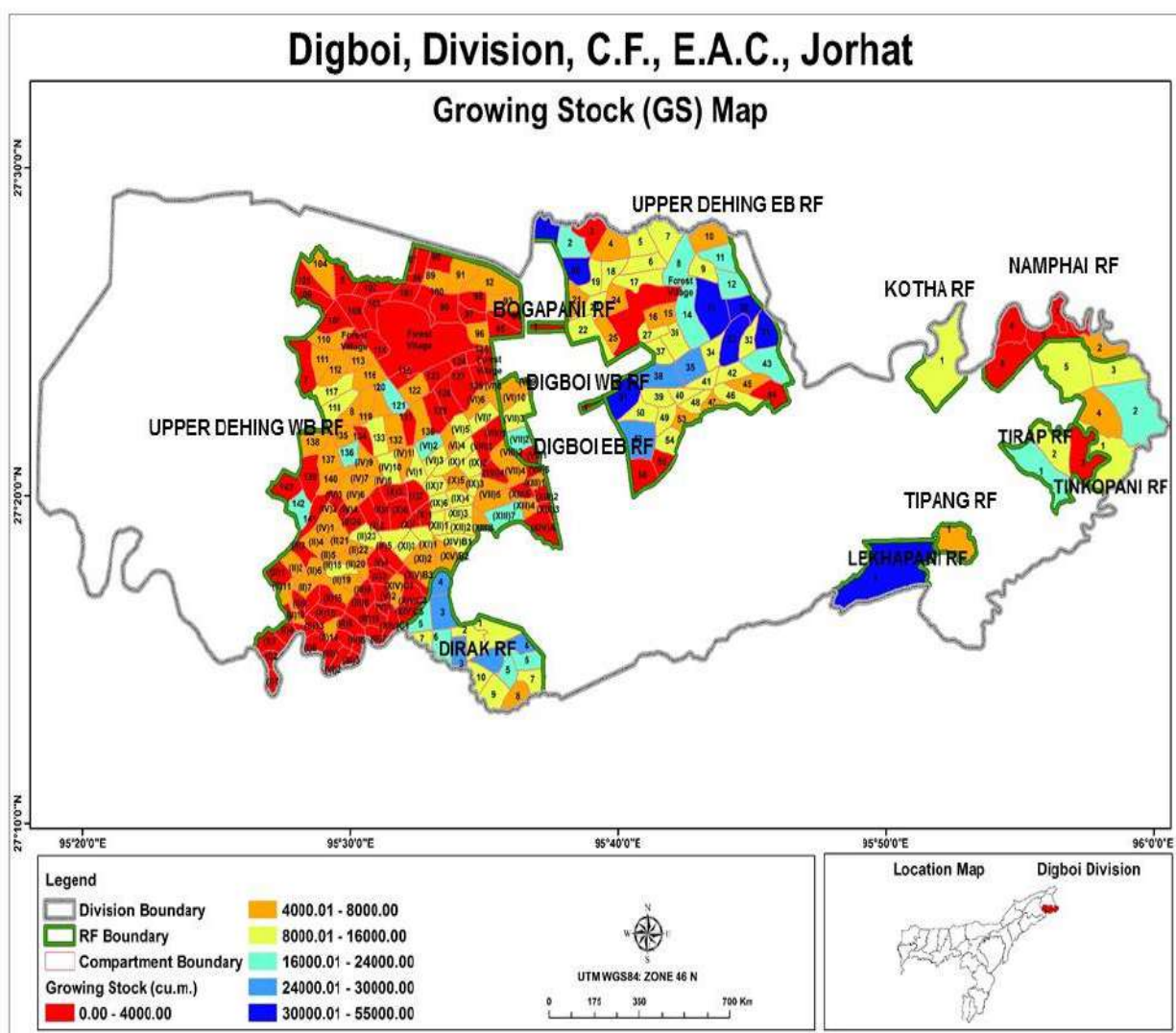


Figure 6.1.f: Digboi division map showing existing compartment wise growing stock (cu.m.)

Table 6.1.f: Compartment wise growing stock (cu.m./Ha.) of Digboi Division

Name of the RF	Compt. No.	(cu.m./Ha.)
Bogapani F.V.	1	0.00
Digboi R.F. East Block	1	51.00
Digboi R.F. West Block	1	269.00
Dirak R.F.	1	207.00
	2	227.00
	3	251.00
	4	286.00
	5	266.00
	6	221.00
	7	224.00
	8	26.00
	9	60.00

	10	81.00
	4(Lekhajan B.O.)	158.00
Kotha R.F.		9.00
Lekhapani R.F.		22.00
Namphai R.F.	1	3.00
	2	15.00
	3	11.00
	4	0.00
	5	0.00
Tinkopani R.F.	1	18.00
	2	18.00
	3	30.00
	4	13.00
	5	15.00
Tipang R.F.	1	18.00
Tirap R.F.	1	67.00
Upper Dehing R.F. East Block	1	192.00
	2	63.00
	3	5.00
	4	17.00
	5	63.00
	6	70.00
	7	38.00
	8	54.00
	9	72.00
	10	15.00
	11	71.00
	12	71.00
	13	63.00
	14	46.00
	15	60.00
	16	53.00
	17	36.00
	18	72.00
	19	53.00
	20	171.00
	21	35.00
	22	27.00
	23	51.00
	24	32.00
	25	35.00
	27	65.00
	30	147.00

	31	135.00
	32	71.00
	33	127.00
	34	72.00
	35	107.00
	36	69.00
	37	71.00
	38	72.00
	39	72.00
	40	71.00
	41	71.00
	42	72.00
	43	48.00
	44	8.00
	45	38.00
	46	37.00
	47	62.00
	48	66.00
	49	72.00
	50	72.00
	51	159.00
	52	67.00
	53	49.00
	54	50.00
	55	0.00
	56	6.00
Upper Dehing R.F. West Block	1	5866.00

6.2 Growing Stock of Bamboo

Bambusa tulda and *Dendrocalamus hamiltonii* are found in the Division. *B. tulda* is the major species in the division. These bamboo species are found in Upper Dehing East Block Reserve Forest. The growing stock of bamboo in Digboi division, Assam is shown in Table 6.2.

Table 6.2: Growing stock of bamboo in Digboi Division, Assam.

Reserve forest	Compartment	Area (ha)	Weight (ton)
Upper Dehing East Block	2	30.76	52.437
	3	31.52	27.941
	4	77.30	52.7101
	5	25.62	17.470
	7	133.38	227.546
	8	39.91	32.657
	10	74.14	111.221
	19	5.9	5.632

	20	0.24	0.130
Digboi FDA	-	315	315
Total		733.77	842.747

6.3 Increment in volume of identified timber species

Age-dia curve of the most important signatory species namely Hollong is shown in Figure 6.3. Volume (cu.m.) against dia of signatory and other important species namely hollong, Mekai, nahor and champa is shown in Appendix (pages xi and xii).

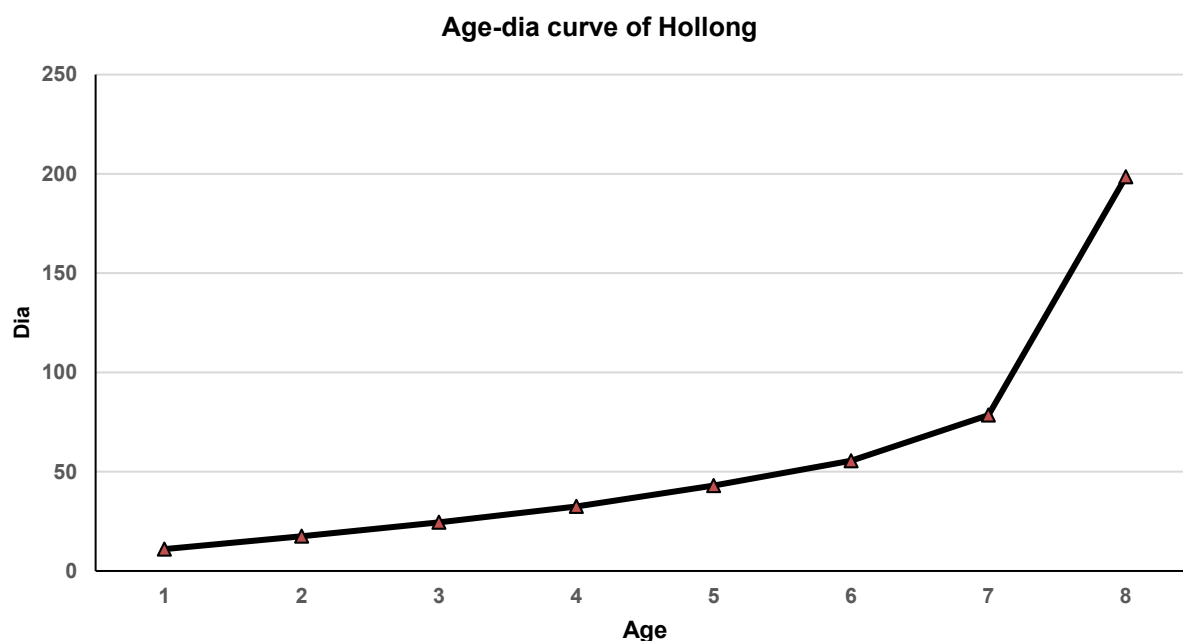


Figure 6.3: Increment curve of Hollong of Digboi division.

6.4 Efforts towards enhancement of forest productivity through quality plantation activities

Detailed survey was carried out to assess the areas under the plantation. About 5.99% of the total forest area has been brought under production forestry since 2004-2005 by raising quality plantation, however no forest land or any portion thereof has been cleared of trees which have grown naturally in that land or portion, for the purpose of using it for afforestation. Plantation through various schemes was carried out in Digboi Division to enhance forest productivity. Plantation activities were carried out in 3845.2984 ha of land. Plantation activities carried out for enhancing productivity is shown in table 6.4.

Table 6.4: Statement showing plantation activities for enhancing forest productivity

Year	Name of Scheme								Total (Ha)	Survival %
	CAMPA	ABY	NAP	RDF	APFBC	NARMIL	NBM	FVDS		
2004-2005	-	-	235	15	-	-	-	-	250	45
2005-2006	-	-	-	-	-	-	-	-	-	-
2006-2007	-	-	400	-	-	-	-	140	540	40
2007-2008	-	-	190	-	-	-	-	-	190	40
2008-2009	-	-	-	-	-	-	-	-	-	-

2009-2010	-	-	-	-	-	-	-	-	-
2010-2011	-	-	50	-	-	280	-	-	330
2011-2012	5.2984	-	-	-	-	415	-	-	420.29
2012-2013	-	-	-	-	-	-	100	-	100
2013-2014	-	10	-	-	300	-	30	-	340
2014-2015	50	-	-	-	975	-	-	-	1025
2015-2016	-	-	350	-	300	-	-	-	650
Total area									3845.29

6.5 Carbon stock

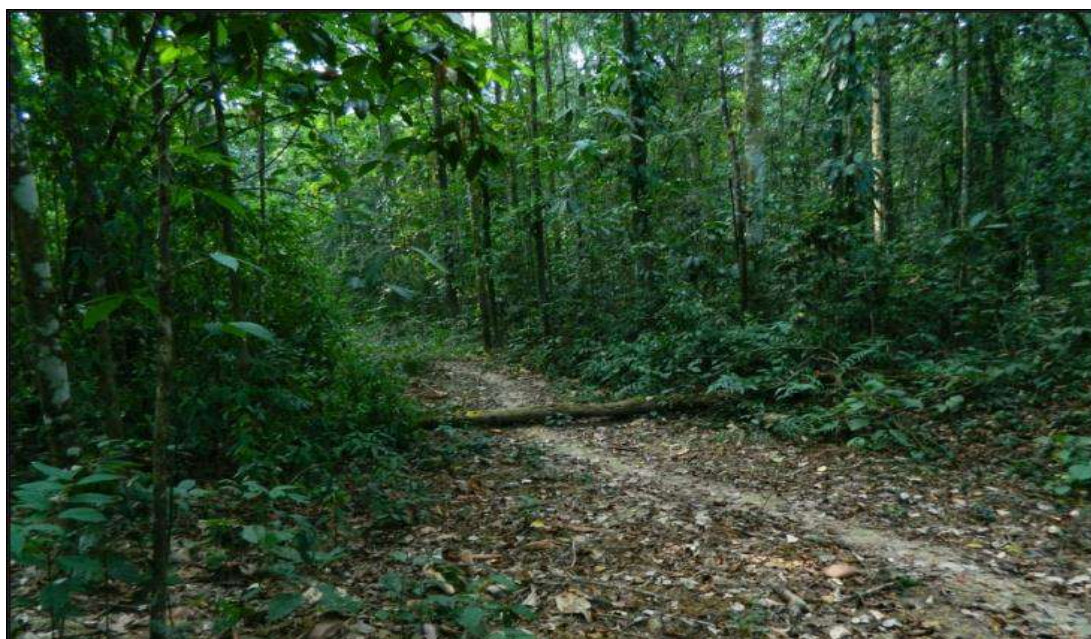
From the data collected through field forest assessment, the above ground biomass of individual trees have been calculated as per the allometric equations of FSI. For below ground biomass, biomass of litter, rhizomes and the soil is taken separately and added to the above ground biomass to arrive at the total biomass. The carbon stock is finally calculated using the biomass-carbon relationship applied by the FSI. Thus total carbon stock of these forests is arrived at 18,16,401.49 tons. This will be useful as a baseline to find out the carbon sequestration capacity of these forests and their management keeping in view this object in mind.

The forests in Digboi Division are exposed to deforestation and forest degradation which results in decreasing the carbon content of the forest area in the Division. Biomass studies for carbon stock assessment were carried out in the division by collecting samples from multiple forest plots. The preliminary carbon stock of Division showed that there is 35.47 tons of carbon per hectare in the living biomass in Digboi Division. Details of reserve forest and compartment wise carbon stock for Digboi division is shown in table 6.5. It was found that carbon content tons in Upper Dihing West reserve forest was highest (8,86,074.59 tons) followed Upper Dihing East reserve forest (4,74,304.51) and only 49.04 tons of carbon was recorded for Bogapani reserve forest. The carbon stock map of Digboi forest division is shown in Figure 6.5 and carbon stock for all the compartments of the division is shown in AnnexureXI.

Table 6.5: Statement showing carbon content dry weight of the species in Digboi

Reserve Forest	Compartments	Carbon (in tons)
BOGAPANI RF	1	49.04
DIGBOI RF EB	1	754.91
DIGBOI RF WB	(VI)10, (VI)9, (VII)1, (VII)2, (VII)3	31,619.62
DIRAK RF	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 4(Lekhajan B.O.)	1,39,076.12
KOTHA RF	1	24,098.37
LEKHAPANI RF	1	42,743.64
NAMPHAI RF	1, 2, 3, 4, 5	15,922.43
TINKOPANI RF	1, 2, 3, 4, 5	1,43,655.26
TIPANG RF	1	14,087.30
TIRAP RF	1, 2, 3	4,4015.69
UPPER DIHING RF EAST BLOCK	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 27, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56	4,74,304.51

UPPER DIHING RF WEST BLOCK	5, 7, 8, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, (I)1, (I)2, (I)3, (I)4, (I)5, (I)6, (II)1, (II)10, (II)11, (II)12, (II)13, (II)14, (II)15, (II)16, (II)17, (II)18, (II)19, (II)2, (II)20, (II)21, (II)22, (II)23, (II)24, (II)3, (II)4, (II)5, (II)6, (II)7, (II)8, (II)9, (III)1, (III)10, (III)2, (III)3, (III)4, (III)5, (III)6, (III)7, (III)8, (III)9, (IV)1, (IV)10, (IV)11, (IV)2, (IV)3, (IV)4, (IV)5, (IV)6, (IV)7, (IV)8, (IV)9, (IX)1, (IX)2, (IX)3, (IX)4, (IX)5, (IX)6, (IX)7, (V)1, (V)2, (V)3, (V)4, (V)5, (VI)1, (VI)2, (VI)3, (VI)4, (VI)5, (VI)6, (VI)7, (VI)8, (VII)4, (VII)5, (VIII)1, (VIII)2, (VIII)3, (VIII)4, (VIII)5, (X)1, (X)2, (X)3, (X)4, (X)5, (X)6, (X)7, (XI)1, (XI)2, (XI)3, (XI)4, (XII)1, (XII)2, (XII)3, (XIII)1, (XIII)2, (XIII)3, (XIII)4, (XIII)5, (XIII)6, (XIII)7, (XIII)8, (XIV)A, (XIV)B1, (XIV)B2, (XIV)B3, (XIV)C1, (XIV)C2, (XIV)C3, (XIV)C4, (XIV)C5	8,86,074.59
Total		18,16,401.49



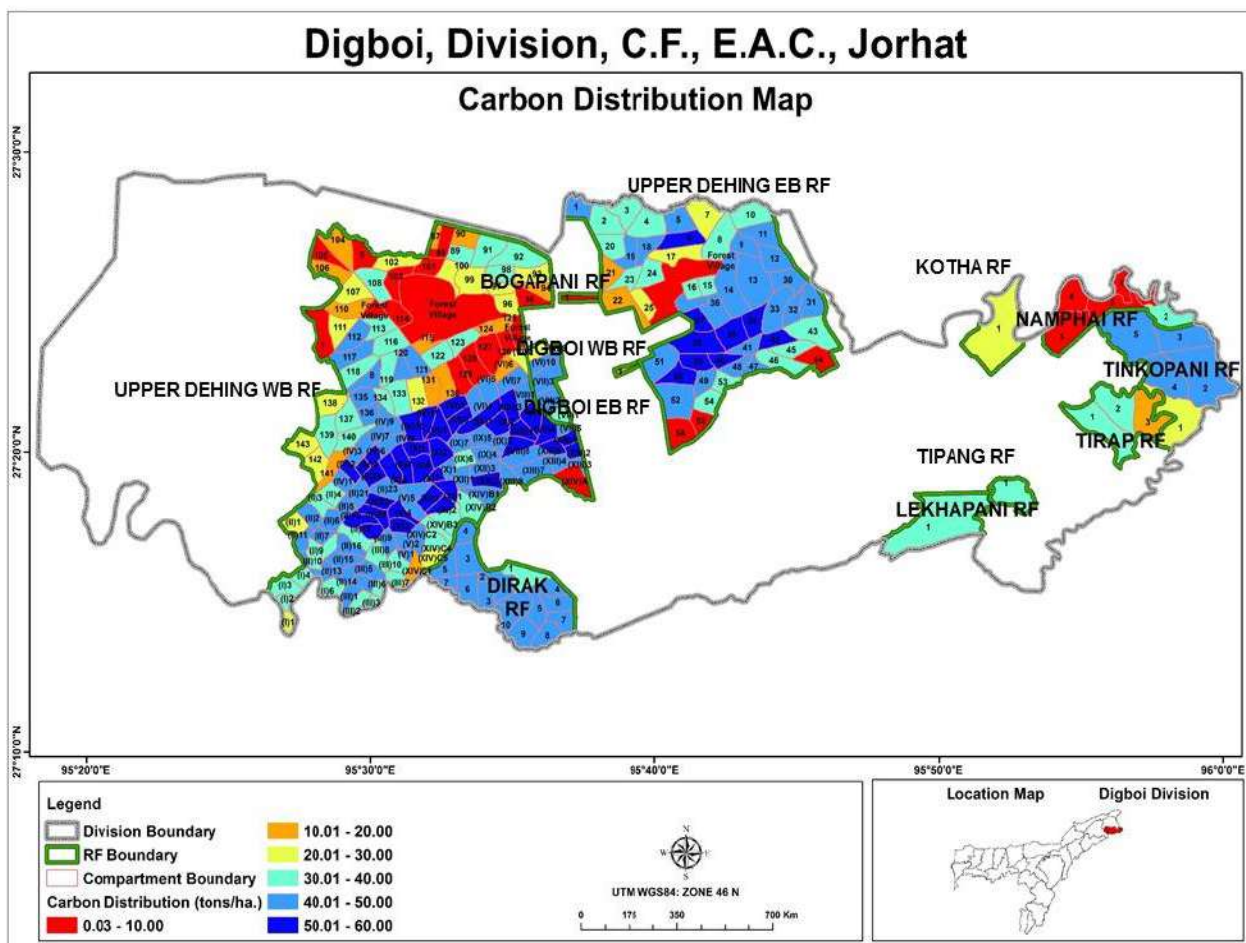


Figure 6.5b: Forest carbon distribution (tons/ha) as per the recasted compartments.

6.6 Carbon sequestration and mitigation

Carbon sequestration is the process of capture and long-term storage of atmospheric carbon dioxide to mitigate global warming and to avoid dangerous impacts of climate change. In other words, it also refers to the process of removing carbon from the atmosphere and depositing it in a reservoir. This carbon storages or reservoirs are also known as carbon pools. Carbon pool refers to a system or mechanism which has the capacity to accumulate or release. It can be natural or human induced. Examples are forest biomass, wood products, soils, and water. Carbon pools in a forest are a complex mix of live and dead organic matter and minerals. Human induced carbon pools are geological storages of carbon dioxide. The quantity of carbon in a pool is known as carbon stock and any change may be expressed as 'stock change'.

Trees use the energy from sunlight to convert CO₂ in the atmosphere to sugars through the process of photosynthesis. Melvin Calvin was awarded the Nobel Prize in 1961 in Chemistry for his research on the process of carbon dioxide assimilation in plants using carbon isotopes, which proved that the carbon assimilated in trees, are absorbed from atmospheric CO₂. This way trees and forests act as a major sink

of carbon in the natural carbon cycle. Destruction of forests leads to release of CO₂ into atmosphere, which has been calculated to be more than the global vehicular emissions. Harvested wood traps and stores the carbon within it over a long period of time. So promoting carbon sequestration in trees is a practical and cost effective way to capture carbon from atmosphere and store away for a long period of time. Hence the emission reductions are real and long term. Trees are natural sequesters of carbon, they take carbon from atmosphere; utilize it in the process of photosynthesis as well as they store it in the form of biomass or wood. For this process of carbon sequestration to be success it is essential that carbon must not return to the atmosphere from burning. Carbon Sequestration can assist significantly in maintaining the natural carbon cycle. Therefore, requirement is that we need to implement this practice properly. There is a need to go for natural sequestration first, thus conservation of existing forests and more and more reforestation is required. Only then we will be able to reduce carbon emission and corresponding harmful impacts

Greenhouse Gases (GHG) have the capability to reflect back shorter wavelength infrared (IR) radiation. GHGs allow the longer wavelength IR radiation from sun to reach earth through the atmosphere. Earth absorbs the IR radiation, and radiates shorter wavelength IR radiation back into the atmosphere, which is reflected back into earth by the GHGs. So, the GHGs (such as water vapor, CO₂, CH₄, SF₆, HFCs, PFCs and O₃ (in troposphere)) form a blanket around earth resulting less variation in night and day temperatures, which is critical for life to flourish. This phenomenon is called the greenhouse effect. Moreover, due to the increase in consumption of fossil fuels after the industrial revolution and other sustained life style patterns of humans, the concentration of GHGs in the atmosphere increased, leading to an increase in the average temperatures on land as well as oceans. This increase in temperature caused the air and ocean circulation systems to behave differently, and change course patterns in certain cases, resulting in a change in climatic patterns on the earth. Further, life on earth will have to adapt to this increase in temperatures in a very short period. This phenomenon, which threatens the very existence of life on earth, is termed as Global Climate Change or GCC. Since these changes have been brought about due to human action, these are also called anthropogenic climate change. Mitigation strategies include reduction in emissions of GHGs from sources as well as capture and storage of GHGs over a long period of time (sequestration).

6.6.3 Enhanced carbon sequestration through recognised and innovative silvicultural practices, eco-restoration of degraded/mined out forest land:

Forestry has been recognized as a means to reduce CO₂ emissions as well as enhancing carbon sinks. Forests are a large sink of carbon and their role in carbon cycles is well recognized. Forestry provides a unique opportunity to combine the twin objectives of climate change adaptation and mitigation. It has the ability to enhance the resilience of the system for coping with the adverse impacts of climate change. Forestry systems offer important opportunities for creating synergies between both adaptation and mitigation actions. Forestry practices in climate change mitigation in India can be realized to its full potential by overcoming various technical, financial and institutional barriers.

The carbon storage capacity in plants varies across species and geography. Further, the amount of carbon in any forestry system depends on the structure and function of different components within the systems put into practice. The fact that forestry systems can function as both source and sink of carbon has been presented in literature. There is also clear evidence to suggest that forestry system greatly influences the source or sink of carbon. For example, agri-silvicultural systems where trees and crops are grown together are net sinks while agro silvipastoral systems are possibly sources of GHGs. Practices like tillage, controlled burning, manuring, application of chemical fertilizers and frequent soil disturbance can lead to significant emissions of GHGs. The carbon in the aboveground and belowground biomass in an forestry system is generally much higher than the equivalent land use without trees (i.e. crop land without any trees). India has a long tradition of agroforestry practices. The agroforestry systems in India include trees on farms, community forestry and a variety of local forest management and ethno forestry practices. In India, the practice of growing scattered trees on farmlands is quite old and has not changed much over centuries; these trees are multipurpose, used for shade, fodder, fuel wood, fruit, vegetables and medicinal uses.

There is a growing interest in the role of different types of land use systems in stabilizing the atmospheric CO₂ concentration and reducing the CO₂ emissions or on increasing the carbon sink of forestry systems. Forestry has been recognized as a means to reduce CO₂ emissions as well as enhancing carbon sinks. The role of forests (or trees) in carbon cycles is well recognized and forests are a large sink of carbon. There is considerable interest to increase the carbon storage capacity of terrestrial vegetation through land-use practices such as afforestation, reforestation, and natural regeneration of forests, silvicultural systems and agroforestry. Agroforestry systems are very important given the area currently under agriculture, the number of people who depend on land for their livelihoods, and the need for integrating food production with environmental services.

Globally, climate negotiations have highlighted the importance of land use sectors in mitigating the climate change. Agriculture alone accounts for 10-12% of the total global anthropogenic emissions of GHGs with an estimated non-CO₂ GHG emission of 5120-6116 MtCO₂ eq/yr in 2005. Since agricultural lands are often intensively managed, they offer many opportunities to improve agronomic practices, nutrient and water management, land use practices to fit the objectives of carbon sequestration. The emphasis of land use systems that have higher carbon content than existing plant community can help achieve net gains in carbon, specifically and significant increases in carbon storage can be achieved by moving from lower biomass land uses (e.g. grasslands, crop fallows, etc) to tree based systems such as forests, plantation forests and agroforestry.

Enhancements in biomass productivity, etc. result in improvement of forest health and vitality. Forest soil must be kept as healthy and fertile as possible and the forest crops must be kept as vigorous as possible to produce as rapidly as they can, till the biomass production attains its most desirable level. The growing stock of trees must be so constituted that it provides regularly the greatest possible quantity of the desired products, including intangible benefits. It is therefore essential that the specific composition and the

structure or form of the forest must harmonise with the environment or factors of the locality, and the species grown and the methods of silviculture adopted must be suitable to the site to ensure full growth. Data is not yet available for carbon sequestration and mitigation.

As per the analysis, scrub comprises of 13.2 % and 30.4 % of the forest area in Digboi forest division is scrub (<10% canopy cover) and open forest (10% - 20% canopy cover), respectively. Medium dense forest (40% to 70% cover) comprises 20.7% while only 14.7% of forest area is under dense forest (>70% canopy cover). It is suggestive of enhancing the forest area under dense forest canopy cover.

Considering the observations, in Digboi division, during the tenure of this working plan innovative and suitable practices of silvicultural, eco-restoration of degraded/ mined out forestlands, improved biomass productivity, etc. which will result in improving forest health and vitality and enhanced carbon sequestration will be undertaken. Forest conservation and enhancement activities such as Afforestation, Assisted Natural Regeneration, Restoration and Rehabilitation of mining areas, agroforestry, etc. will be carried out. Forest soil must be kept as healthy and fertile as possible and the forest crops must be kept as vigorous as possible to produce as rapidly as they can be till the biomass production attains its most desirable level. The growing stock of trees must be so constituted that it provides regularly the greatest possible quantity of the desired products including intangible benefits. These activities will not only help in carbon sequestration and storage but also other co-benefits in terms of community and biodiversity.

6.6.4 Forest Carbon Finance: Carbon financing for forestry is a mechanism to incentivize carbon sequestration and long-time storage in forest lands. This can take different forms such as carbon credit based which includes Clean Development Mechanism (CDM) based Afforestation/Reforestation (AR) project activities and voluntary markets such as Agriculture, Forest and Other Land Uses (AFOLU) projects under Verified Carbon Standard (VCS), Plan Vivo and Gold Standard or program based where carbon forestry is made a part of a state's Nationally Approved Mitigation Activities (NAMAs) or a specific program aimed at improving tools and techniques and the Monitoring, Reporting and Verification (MRV) systems associated with carbon forestry. It is understood that the financing options could be domestic, bilateral or multilateral; in-line with the Government's decisions.

REDD+ is a mechanism being negotiated through the United Nations Framework Convention on Climate Change (UNFCCC) to mitigate climate change by compensating developing countries for demonstrated reduced emissions from deforestation and forest degradation. Since REDD was introduced on to the UNFCCC agenda in 2006 its scope has been expanded through successive negotiations to include not only forest conservation activities, but also forest enhancement and sustainable management of forests. With growing momentum to develop REDD+ systems, there has been increasing focus on the appropriate institutional arrangements for implementing REDD+ at the international, national and project levels. Currently the Assam Forest Department has considered potential revenues from carbon that may arise from the REDD+ carbon projects, and had piloted a jurisdictional REDD+ project design in Nagaon division (Lowering Emissions, Enhancing Forests (LEEF) in Nagaon). This REDD+ design detailed the

prescriptions for various elements and extent of conservation, regeneration and afforestation activities, which can be included in the working plans to account Carbon sequestration by this forest division also. This can eventually help in state-wide reporting of contribution to national NDC goals.

The use of forest is also a financially viable technique to reduce emission from atmosphere. It could also bring significant benefits to the local communities involved and consequently helps in reducing poverty at the same time. Forestry projects can bring social, economic, and local environmental benefits to millions of people.



CHAPTER 7

OPTIMIZATION OF FOREST RESOURCES UTILIZATION

7.1 Recorded removal of Timber

There was no harvesting of timber during last Working Plan period. But illegal felling of trees took place during past years. Some portion of these illegally felled trees could be seized and recovered. The following table (Table 7.1) shows the record of timber removed from forest.

Table: 7.1. Recorded removal of timber (2009-10 to 2017-18)

Reporting year	Wood		Total extraction (c. ft) from un-authorized means (if any)
	Type / quality	Extraction (m ³)	
2009-2010	Non-Sal	262.169	(Already recovered and disposed)
	Fire wood		
2010-2011	Non-Sal	420.632	(Already recovered and disposed)
	Fire wood		
2011-2012	Non-Sal	61.66	(Already recovered and disposed)
	Fire wood		
2012-2013	Non-Sal	432.096	(Already recovered and disposed)
	Fire wood		
2013-2014	Non-Sal	433.428	(Already recovered and disposed)
	Fire wood		
2014-2015	Non-Sal	41.231	(Already recovered and disposed)
	Fire wood		
2015-2016	Non-Sal	2.267	(Already recovered and disposed)
	Fire wood		
2016-2017	Non-Sal	26.849	(Already recovered and disposed)
	Fire wood		
2017-2018	Non-Sal	393.75	(Already recovered and disposed)
	Fire wood		
2018-2019	Non-Sal	33.361	(Already recovered and disposed)
	Fire wood		
2019-2020	Non-Sal	77.395	(Already recovered and disposed)
	Fire wood		

7.2 Recorded removal of Fuelwood:

Fuelwood removal is banned from the forest Division. However, there are many villages situated adjacent to the RFs. The people of these villages used to collect fuelwoods from the forest area for many years. It is estimated that approximately 1200 tons of fuelwood are extracted every year from the RFs of Digboi division which is about 35% of the total requirement of the fuelwood for all the villages. The average annual consumption of fuelwood per family is 2 tons. With this extent of extraction of fuel wood from the forest area and continues increased demand for the same, reserve forests could not maintain its sustainability. Therefore, it is apparent that fuelwood collection is one of the main cause of forest destruction in Digboi division.

7.3 Recorded removal of Bamboo/Rattan:

Statement of recorded removal of bamboo/rattan in Digboi division is shown in the table 7.3.

Table 7.3: Statement showing recorded removal of bamboo in Digboi division, Assam

Species	Range	Compartment	Current growing stock (tons)
<i>Bambusa tulda</i>	Upper Dehing East Block	2	1821.223
		3	970.434
		4	1830.696
		5	606.758
		7	7903.017
		8	1134.226
		10	3862.887
		19	195.621
<i>Dendrocalamus hamiltonii</i>		20	4.547

7.4 Recorded removal of locally important NTFPs including MAPs

There is no record of removal of NTFPs in the Division. However, the villager's usually collect medicinal herbs and wild vegetables, leaves of plants such as bon ada, tokou, kauptat, etc. for their own uses from the forest area. Sometimes the local villagers also collect bamboo, canes for their house maintenance, which are infact not significant.

7.5 Demand and supply of timber and important non-timber forest produce: The demand of timber in the Division is very high, but due to poor stock in forests, supply from the region is not possible. Further, there is a ban imposed on tree felling in the Division.

7.5.1 Markets: With the increase of population and development of small townships in several places of the district and also development of plywood industries, there is an increased demand of plywood timbers, mainly Hollong and Mekai. In fact, the timber extracted from the forests is largely utilized by the plywood industries only for preparation of vaneers for tea chests as well as commercial plywood. There are 8 nos. of wood based Industries, the annual requirement of which would be about 2.5 lakhs cu.m. of logs. The demand will have to be met by the timbers extacted not only from Digboi division but also from the neighbouring Divisions, such as Dibrugarh, Doomdooma and Sibsagar Division and also timbers flowing from the neihbouring State of Nagaland and Arunachal Pradesh.

In view of scarcity of raw materials it is being considered to reduce the number of these wood based Industries. List of wood based Industries get clearance from the High Power Committee is in table 7.5.1.

Table: 7.5.1 Detail of Wood based Industries under Digboi Division

Sl. No.	Name of Saw Mill	Name Proprietor	GPS Co-ordinate	Name of Range
1	National Plywood Industry Limited	Mr. Tush Periwal	N-27°18'28.0", E-095°39'28.1"	Margherita East
2	Natural Panel Industry Pvt. Ltd.	Mr. Sanjay Kumar Subey	N-27°18'19.8", E-095°39'30.1"	Margherita East
3	National Wood	Mr. Ramgupal Marda	N-27°17'44.3", E-	Margherita East

	Product (Saw Mill)		095°39'31.8"	
4	Paioneer Timber Seasoners (Ply) Makum	Mr. Prashanna Kumar Keshan	N-27°28'52.7", E-095°26'44.3"	Lakhipathar
5	M/S- Sriram Boards and Panels Pvt. Ltd. (Ply), Makum	Mr. Rajesh Goel.	N-27°28'34.2", E-095°28'08.0"	Lakhipathar
6	M/S- Shree Timber Product Pvt. Ltd. (Ply), Makum	Mr. Amarjeet Singh Hundal	N-27°28'29.5", E-095°27'57.1"	Lakhipathar
7	M/S- Deepak Saw & Veneer Mill, (Saw Mil), Digboi	Mr. Awdhesh Sahi	N-27°24'10.8", E-095°37'11.7"	Digboi
8	M/S- Shrikrshna Timber & Plywood Products, (Saw Mill)	Mr. Kameshwar Sing	N-27°24'23.2", E-095°37'04.8"	Digboi

The main minor forest produce include cane, bamboo, patidoi, thatch grass and reeds, Nahor seeds and other minor forest produce.

i) Cane: Jatibet is found in some of the RFs in limited quantities, which is mainly consumed by the tea industry for making baskets for collecting tea leaves and also by the local people for meeting their day to day needs. Raidang bet is used for maling furnitures like chair and tables. The species has decreased considerably.

ii) Bamboo: Amongst bamboos, Kako and Bajal are found most. Kako bamboos are mostly used by the army for constructing their camp huts. Otherwise, they are not used by local people for any purpose. Bajal bamboos are used by the local people for making fencing around the house compound and also by the railways for roofing, wall, etc of the temporary huts. Daloo bamboo is also used for house construction.

iii) Patidoi, thatch grass, and Reeds: Patidoi and reeds are not abundant in the Division, Wherever these are available, patidoi is used for preparing Mat. Thatch is used for roof and reeds for construction of walls.

iv) Nahor seed: Though Nahor seed contains a good quantity of oil and is inflamabale, yet Nahor seed is not collected from the forests as it is not found to be economically profitable because of is scattered availability.

v) Other minor forest produce: Dhekial lata and bark of Odal is collected for making ropes. Koupat is used for wrapping and binding of laterials and also as dishes. Dhuna is collected from Hollong, mekai and Dhuna trees. Jengpat, Kaupat, and Takaupat are used for making Japi and house roofing. Phuljharu is also collected wherever availavble for making brooms. Sand and gravels are also collected from different mahals for meeting the local demand.

7.5.2 Minor minerals: There is heavy demand of minor minerals. The status of minor minerals from the division is shown in table 7.5.2.a

Table 7.5.2.a: Table showing status of minor minreals in Digboi Division

Sl. No.	Name of MCA	Name of Minor Minerals & Area In Hacts	GPS Co-ordinate	Name of Range
1	DIG/1	Stone Gravel , Area= 7.29	N-27°27'57.04", E- 095°57'32.74"	Jagun
2	DIG/2	Stone Gravel , Area= 6.53	N-27°21'55.44", E- 095°56'17.67"	Jagun
3	DIG/3	Stone Gravel , Area= 16.00	N-27°22'06.65", E- 095°55'20.22" N-27°21'51.94", E- 095°54'05.17"	Jagun
4	DIG/4	Stone Gravel , Area= 5.75	N-27°21'56.00", E- 095°53'51.70" N-27°22'00.89", E- 095°53'23.20"	Jagun
5	DIG/5	Stone & Sand Gravel, Area=11.25	N-27°24'03.23", E- 095°53'36.74" N-27°24'02.66", E- 095°52'35.71"	Jagun
6	DIG/7	Sand & Silt, Area= 17.50	N-27°18'26.23", E- 095°42'21.57" N-27°18'03.08", E- 095°41'30.71"	Lekhapani
7	DIG/8 (A)	Stone Gravel, Area= 5.10	N-27°19'53.37", E- 095°51'04.60" N-27°20'28.62", E- 095°51'40.54"	Lekhapani
8	DIG/9(A)	Sand, Area= 6.30	N-27°18'00.55", E- 095°40'54.59" N-27°17'31.78", E- 095°40'21.09"	Lekhapani
9	DIG/10	Sand, Area = 8.63	N-27°17'29.51", E- 095°40'04.27" N-27°17'52.45", E- 095°40'37.44"	Margherita East (EZ)
10	DIG/11	Sand, Area = 12.38	N-27°17'07.64", E- 095°39'35.35" N-27°17'36.78", E- 095°38'47.03"	Margherita West (EZ)
11	DIG/12	Sand, Area = 24.00	N-27°28'20.44", E- 095°38'22.86" N-27°28'29.05", E- 095°37'16.93"	Digboi
12	DIG/13	Sand & Silt, Area = 15.50	N-27°17'41.95", E- 095°22'47.60" N-27°16'59.20", E- 095°23'23.62"	Saraipung (EZ)
13	DIG/14	Sand & Silt, Area= 15.00	N-27°18'05.01", E- 095°20'50.08" N-27°17'25.27", E- 095°21'22.24"	Soraipung, (EZ)
14	DIG/15(A)	Sand & Silt, Area= 4.07	N-27°19'34.80", E- 095°19'20.24" N-27°19'37.16", E- 095°19'06.38"	Soraipung
15	DIG/15-(B)	Sand & Silt, Area = 4.00	N-27°19'33.64", E- 095°19'24.24" N-27°19'29.79", E- 095°19'23.03"	Soraipung
16	DIG/15-(C)	Sand & Silt, Area = 4.80	N-27°19'26.36", E- 095°19'39.65" N-27°19'22.97", E-095°19'36.79"	Soraipung
17	DIG/16	Silt, Area = 4.44	N-27°28'02.03", E- 095°26'10.96" N-27°27'55.80", E- 095°24'31.19"	Lakhipathar
18	DIG/17	Silt, Area = 4.75	N-27°27'44.30", E- 095°23'55.46" N-27°27'44.60", E-095°23'55.45"	Lakhipathar
19	DIG/18	Sand & Silt, Area= 3.60	N-27°18'00.50", E- 095°41'41.01" N-27°17'57.02", E- 095°41'53.05"	Margherita East
20	DIG/19	Sand & Silt, Area = 3.70	N-27°19'53.99", E- 095°42'43.97" N-27°20'00.67", E- 095°42'49.21"	Margherita East
21	DIG/21	Sand & Silt, Area = 2.60	N-27°22'34.52", E- 095°46'57.66" N-27°22'43.84", E- 095°46'57.78"	Lekhapani
22	DIG/22	Sand & Silt, Area = 3.90	N-27°20'03.83", E- 095°42'54.38" N-27°20'03.82", E- 095°42'51.45"	Lekhapani

7.6 Import and Export of Wood & Non Wood Products

Statement showing import and export of wood and wood products timber in Digboi Division is shown in the table 7.6 below.

7.8 Removal of fodder: No recorded removal of fodder in the Division. However, the forest villagers and nearby villagers collect fodders from the RFs.

Table 7.6: Statement showing import and export of wood and non-wood products in Digboi division, Assam

Sl. No.	Name of Industries	Import (From 2011-12 to 2015-16)					Total (Import)	Export (From 2011-12 to 2015-16)					Total (Export)
		2011-12	2012-13	2013-14	2014-15	2015-16		2011-12	2012-13	2013-14	2014-15	2015-16	
1	Sri Krishna Timber, under Digboi Range	226.67	266.4	453.59	413.17	141.44	1501.29		150.31	358.96	869.27	333.33	1711.88
2	National Wood Products, under Margherita East Range	99.16	90.03	59.50	48.75	84.16	381.62						
3	National Plywood, under Margherita East Range	4353.03	6063.99	6406.83	4043.31	5669.33	26536.49	4353.03	5934.55	6823.17	4657.60	6629.89	28398.24
4	Natural Products, under Margherita East Range	6299.85	5612.84	7686.04	9192.68	9540.71	38332.12	4381.71	5016.07	6174.79	7065.5	7532.3	30170.37
5	Deepak Saw & Veneer, under Digboi Range	283.08	220.38	114.07	355.53	81.62	1054.70		177.48	14.16	419.47	62.09	673.22
6	Tirupati Plywood, under Lakhpathar Range	5014.13	4502.77	5324.41	6294.22	7413.14	28548.69	3862.44	3733.55	4493.58	5494.37	6306.05	23890.02
7	Pioneer Timber Seasoners, under Margherita East Range	1549.14	1731.61	1870.26	1641.89	1055.78	7848.70	1885.72	1646.46	2501.50	2234.12	4331.14	12598.96
Total		17825.08	18488.04	21914.72	21989.57	23986.20	104203.63	14482.90	16658.43	20366.18	20740.35	25194.82	97442.70

7.9 Valuation of the products

Past and current prices of products in Digboi in shown in table 7.9

Table 7.9: Past and current prices (Rs.) of products in Digboi division, Assam.

Items	Quantity (t)	Current prices (₹)	
		Below girth	Above girth
A - I	per m ³	6,006.00	9828.00
A - II	per m ³	4,604.00	6396.00
A - III	per m ³	3,549.00	5675.00
B - I	per m ³	2,403.00	3998.00
B - II	per m ³	1,346.00	2018.00
C	per m ³	843.00	1202.00
D	per m ³	410.00	492.00
E	per m ³	273.00	410.00
Fire Wood			
a)For removal by head load	head load	5.00/head load	
b)For removal by Buffalo		50.00/cart load	
c)For removal by Bullock or Pony		100.00/cart load	
d)For removal otherwise per stack m ³		100.00 stack m ³	
e)For Industrial Wood (Raw materials fire wood specification utilized by various Industries) stack m ³		300.00 stack m ³	

CHAPTER 8

MAINTANENCE OF SOCIAL, ECONOMIC, CULTURAL AND SPRITIUAL BENEFITS

Joint Forest Management is a concept, which is based on the principle of rights of local communities in forests, a mechanism to manage the forest that is owned by the State but appropriated by local communities, also an approach involving the evolution of a very complex property rights regime to generate a sustainable interface between the Forest Department (FD) and the local community and it is a possible way through which the interests of people and of long term sustainability are harmonized in a mutually supporting manner.

Prior to 1988, the forest management objectives were commercial forestry & revenue generation. But the 1988 Forest Policy envisaged for conservation of soil and environment, subsistence requirements of the local people etc. Thereafter, the Government of India issued guidelines on 1st June, 1990 and adopted Joint Forest Management under the National Afforestation Programme for conservation of forests with clearly identified duties and functions for ensuring protection of forests. The policy was motivated by a desire to both reduce environmental degradation and also reduce rural poverty.

Government of Assam promulgated the 'Assam Joint (people's participation) Forestry Management Rules, 1998 and adopted the 'Assam Forest Policy, 2004' which emphasizes JFM to graduate to Community Forest Management aiming at sustainable forest management. Objective of JFM to support The Livelihoods of the Forest fringe communities through improved Natural Resource Management with Community Participation.

8.1 Number of JFM Committees and Area Protected by them:

Number of JFM committees and area (s) protected by them and their status is shown in the table below.

Details of JFMCs under the Digboi Forest Division:

Sl. No.	Name of Range	Name of JFMC	Year of Formation	Name of Schemes	G.P.S. Co-ordinates	
					Latitude	Longitude
1	Digboi Range	Balijan JFMC	2003-2004	NAP Scheme	N-27°23'44.71"	E- 095°36'55.20"
2		Borjan	-Do-	-Do-	N-27°20'12.00"	E- 095°29'23.00"
3		Kherjan	-Do-	-Do-	N-27°25'29.40"	E- 095°40'42.90"
4		Dhekiajan	-Do-	-Do-	N-27°26'14.00"	E- 095°40'55.00"
5		Panbari	-Do-	-Do-	N-27°25'23.00"	E- 095°38'44.00"
6		Bogapani JFMC	2005-2006	-Do-	N-27°24'14.40"	E- 095°38'02.40"
7		Baraphutia JFMC	2009-2010	NaRMIL Project	N-27°23'48.18"	E- 095°36'58.62"
8		Najirating	-Do-	-Do-	N-27°28'00.20"	E- 095°36'47.30"
9		Balijan Milijuli JFMC	2015-2016	APFBC Scheme	N-27°13'57.36"	E- 095°21'11.16"

10		Baliojan Sanmilita	-Do-	-Do-	N-27°23'24.00"	E- 095°35'06.00"
11		Maidhya Balijan Patkai	-Do-	-Do-	N-27°13'23.52"	E- 095°20'27.78"
12		Panbari Bapapung	-Do-	-Do-	N-27°24'14.40"	E- 095°39'25.20"
13		Dhekiajan Rojaali	-Do-	-Do-	N-27°15'39.96"	E- 095°24'41.54"
14	Lakhipathar Range	Lakhipathar	2003-2004	NAP Scheme	N-27°24'56.80"	E- 095°30'47.90"
15		Chiring Mamoroni	-Do-	-Do-	N-27°26'18.20"	E- 095°29'28.00"
16		Tingrai	2005-2006	-Do-	N-27°27'22.80"	E- 095°33'56.00"
17		Dhuliajan	-Do-	-Do-	N-27°25'35.90"	E- 095°28'34.90"
18		Lungkashi Purbanchal	2015-2016	APFBC Scheme	N-27°24'23.40"	E- 095°33'31.20"
19		Lakhipathar Purbanchal	-Do-	-Do-	N-27°24'21.20"	E- 095°28'32.30"
20		Ramnagar Borbuil	-Do-	-Do-	N-27°24'56.40"	E- 095°35'56.90"
21		Borbil No.3	2009-2010	NaRMIL	N-27°24'35.20"	E- 095°35'28.70"
22	Margherita West Range	Makumkilla	20003-2004	NAP scheme	N-27°19'10.10"	E- 095°36'36.80"
23		Janglu Kuruka	-Do-	-Do-	N-27°24'14.40"	E- 095°39'25.20"
24		Bor Kuruka	-Do-	-Do-	N-27°18'09.30"	E- 095°34'51.30"
25		Bhitor Pawoi	2009-2010	NaRMIL Project	N-27°18'29.20"	E- 095°35'06.40"
26		Agbondha	2015-2016	APFBC Scheme	N-27°19'35.50"	E- 095°37'36.10"
27	Soraipung Range	Soraipung	2003-2004	NAP Scheme	N-27°18'43.70"	E- 095°28'08.20"
28		Kathalguri	2005-2006	-Do-	N-27°19'58.30"	E- 095°27'03.00"
29	Marggherita East Range	Pawoi	2003-2004	NAP Scheme	N-27°19'55.90"	E- 095°40'05.91"
30		Bapupathar	-Do-	-Do-	N-27°20'36.40"	E- 095°42'31.50"
31		Khamonpathar	-Do-	-Do-	N-27°22'56.30"	E- 095°43'48.50"
32		Ulup	-Do-	-Do-	N-27°22'28.80"	E- 095°45'33.90"
33	Lekhapani Range	Balijan (Sema)	2003-2004	NAP Scheme	N-27°19'52.10"	E- 095°53'44.80"
34		Lalpahar	-Do-	-Do-	N-27°18'23.70"	E- 095°52'13.30"
35		Funning/faneng	-Do-	-Do-	N-27°21'35.10"	E- 095°55'20.10"
36	Jagun Range	Jagori FV	2003-2004	NAP Scheme	N-27°23'33.70"	E- 095°55'43.80"
37		Namphai FV	-Do-	-Do-	N-27°24'43.90"	E- 095°55'57.30"
38		Lakla	-Do-	-Do-	N-27°23'36.60"	E- 095°54'55.20"
39		Tinku pathar FV	2005-2006	-Do-	N-27°23'03.60"	E- 095°55'52.70"

Details of EDC under the Digboi Forest Division:

Sl. No.	Name of Range	Name of EDC	Year of Formation	G.P.S. Co-ordinates	
				Latitude	Longitude
1	Soraipung Range	Gelipung	2015-2016	N-27°18'14.50"	E- 095°27'27.50"
2		Thong thong	2015-2016	N-27°16'19.70"	E- 095°27'53.10"
3		Fakelajan	2015-2016	N-27°18'05.90"	E- 095°27'12.70"
4	Margherita West	Khagori pathar	2015-2016	N-27°16'43.49"	E- 095°35'20.56"
5		1No. Dirok Gaon	2015-2016	N-27°17'02.10"	E- 095°38'50.08"
6		Mirika majuli	2015-2016	N-27°16'56.70"	E- 095°34'21.90"
7	Digboi Range	No.2 Bapapung	2015-2016	N-27°24'14.40"	E- 095°39'25.20"
8		Muluk Gaon	2015-2016	N-27°26'16.00"	E- 095°42'05.00"

Name of BMC Under Digboi Division :

Sl. No.	Name of Range	Name of BMC
1	Lakhipathar	Itakhuli
2	Soraipung	Tengkhat

Plantation activities carried out by different JFMC's and their status is given below in the table 8.2.

Table 8.2: Statement showing JFMC protection activities for Digboi division

Sl. No.	Range	Name of JFMC	Sites	Type of plantation	Year of Creation	Area Sanctioned (In Ha)	Spacing (mtr.)	Species planted	G.P.S. Locations	Remarks
1	Margherita West	Agbandha	Upper Dehing RF (West Bock)	Firewood	2015-16	30	2 x 2	Ghora Neem, Mojh, Siris, Bhelkar, Rain Tree etc.	27°19'01.3" N 95°37'27.2" E 27°19'03.9" N 95°37'38.0" E 27°19'24.2" N 95°37'03.5" E 27°19'28.4" N 95°37'13.8" E	Fund was received late (In June 2015 and was released to JFMC in July-2015). Hence the creation could not been done by the JFMCs due to non-availability of seedlings. Site nursery has been raised. Created 27 hact Firewood Plantation. Progress =90%
2	Digboi	Panbari-Bogapani	Upper Dehing RF (East Bock)	Firewood	2015-16	30	2 x 2		27°25'35.0" N 95°38'03.7" E 27°25'37.3" N 95°38'25.5" E 27°25'51.7" N 95°38'22.5" E 27°25'51.1" N 95°38'04.2" E	-do- Created 9 hact. Progress = 30%
3	Digboi	Balijan Sanmilata	Upper Dehing RF (West Bock)	Firewood	2015-16	20	2 x 2		27°23'05.5" N 95°35'13.4" E 27°23'21.6" N 95°35'45.0" E 27°23'15.6" N 95°35'49.1" E 27°22'59.8" N 95°35'17.4" E	-do- Created 6 hact. Progress = 30%
4	Digboi	Balijan Milijuli	Upper Dehing RF (West Bock)	Firewood	2015-16	20	2 x 2		27°22'30.5" N 95°34'16.8" E 27°22'57.7" N 95°35'02.6" E 27°22'47.8" N 95°35'09.4" E 27°22'22.8" N 95°34'23.5" E	-do- Created 6 hact. Progress = 30%
5	Digboi	Madhya Balijan Patkai	Upper Dehing RF (West Bock)	Firewood	2015-16	20	2 x 2		27°22'30.3" N 95°34'10.8" E 27°22'27.6" N 95°33'55.8" E 27°22'09.3" N 95°33'58.9" E 27°22'23.1" N 95°34'18.6" E	-do- Created 6 hact. Progress = 30%

Working Plan of Digboi Division

Sl. No.	Range	Name of JFMC	Sites	Type of plantation	Year of Creation	Area Sanctioned (In Ha)	Spacing (mtr.)	Species planted	G.P.S. Locations	Remarks
6	Digboi	Dhekiajan Rajaali	Upper Dehing RF (East Bock)	Firewood	2015-16	50	2 x 2		27°26'40.1" N 95°42'02.2" E 27°27'11.2" N 95°41'55.7" E 27°27'03.5" N 95°42'16.0" E 27°26'34.0" N 95°42'22.1" E	-do- Created 15 hact. Progress = 30%
7	Lakhipather	Lakhipather Purbanchal	Upper Dehing RF (West Bock)	Firewood	2015-16	50	2 x 2		27°25'17.6" N 95°33'58.2" E 27°25'17.3" N 95°33'39.7" E 27°25'49.7" N 95°33'41.4" E 27°25'49.7" N 95°33'59.7" E	-do- Created 15 hact. Progress = 30%
8	Lakhipather	Lankachi Purbanchal	Upper Dehing RF (West Bock)	Firewood	2015-16	50	2 x 2		27°26'25.1" N 95°27'53.1" E 27°25'52.1" N 95°28'04.4" E 27°25'58.4" N 95°28'21.1" E 27°26'29.5" N 95°28'10.0" E	-do- Created 15 hact. Progress = 30%
9	Lakhipather	Ramnagar Borbil	Upper Dehing RF (West Bock)	Firewood	2015-16	30	2 x 2		27°25'22.9" N 95°36'33.2" E 27°25'04.3" N 95°36'35.3" E 27°24'59.0" N 95°36'03.3" E 27°25'18.3" N 95°36'03.7" E	-do- Created 9 hact. Progress = 30%

8.2 Status of empowerment of JFMC'S

JFMCs have conducted microplanning exercises and are able to work out the legalities as provided in the JFMC act, 1998. The JFMCs are constituted under the Digboi Forest Development Agency (FDA) which is already registered under the Societies Act. The JFMCs are on the other hand, are registered with the Conservator of Forests, Eastern Assam Circle, Jorhat who is the Chairman of the Digboi FDA. The Divisional Forest Officer (DFO) of the Digboi Division is the Chief Executive Officer (CEO) of the FDA. The flow of fund is designed in a purely “Decentralized Module” and the JFMCs have been empowered to draw the sanctioned fund and execute the works after taking resolution in the Gram Sabha. The President, who is a villager, heads the JFMC with other Executive Members who are also from the same village. The Range Officer is the Member Secretary of the respective Range JFMC. The Committee comprises of 9 or 11 Members out of which 33% are ladies. The Committee must have at least a Member of the Panchayat. The Range Officer cum Member Secretary maintains the “Joint Account” in the Bank with the President of the JFMC and can draw fund jointly as per sanctioned work and after due resolution in Gram Sabha. The villagers of a particular village(s) are the ‘General Members’ of the JFMC. As per the members decision The Executive Committee can be changed periodically. All other activities are performed as per SocietiesRegistration Act.

8.2.1 Flow of Fund

The sanctioned fund under a Scheme/Programme is directly deposited to the Account of Digboi FDA through Core Banking System. The CEO, then immediately transfers the fund to the Account of concerned JFMC after deducting the “Overhead or Office expense”. The CEO is no way entitled to draw and spend the fund allotted to the JFMC but he can monitor progress of the works. If any irregularity is noticed, he may hold back release/drawl of the fund by writing to the concerned Bank. The CEO further offers suggestions for better management of the JFMC activities and guides technically to achieve the targets.

8.2.2 Distribution of the ‘Usufructs’

Usufruct Sharing Arrangement are: (1) Full share in NTFP collection, (2) Full share in the harvest of timber in plantations raised by JFMC, (3) Share in proportion to period of management in high forests managed by JFMC and (4) 50% of net revenue to be reinvested in forestry works - a step towards sustainability of JFMC.

8.3 Labour Welfare Measures

Minimum wage provided to labor employed by forest department is shown in the table 8.3.

Table 8.3 Labor welfare measures in Digboi Division

Reporting year	Welfare measures					Payment of minimum wage	Number of cases registered	Budget allocated
	Drinking water and shade in the work place	Provision of specific equipment and handling	Child care at work place	First aid facility at work place	Accidental insurance			
2015-16	Nil	Nil	Nil	Nil	Nil	240/-	Nil

8.4 Use of indigenous knowledge

Use of indigenous knowledge is integrated into the plan through involvement of local communities while making decisions in plantation and regeneration activities. The local people possess knowledge of using medicinal plants available locally. Apart from this local people have some knowledge of regenerating some NTFP. These knowledges underlying with local people shall be explored and be utilized. As per the guidelines of Assam State Biodiversity Board, Biodiversity Management Committees are constituted by the local bodies to promote biodiversity conservation through preservation of indigenous knowledge and sustainable use of natural resources for development of sustainable livelihoods.

8.5 Extent of cultural sacred groves:

There is no sacred grove in the Division.

8.6 Ecotourism areas and activities:

Eco-tourism to Dehing Patkai Wild Life Sanctuary which is under Digboi Forest Division shall be a responsible travel to its fragile, Pristine and protected areas that strive to have low impact on its eco-system. Its purpose will be to educate the traveler; provide funds for ecological conservation; directly benefitting the economic development and political empowerment of local communities; and foster respect for different cultures and for human rights. Eco-tourism is a purposeful travel that creates on the standing of cultural and natural history, safeguarding the integrity of the ecosystem with economic benefits that encourage conservation wilderness, recreation & has an important role in support of wildlife management. The tourism zone has been identified in the PA which is a small portion of the core zone.

8.6.1 Objectives:

The main objective of Eco-tourism is to promote tourism to Dehing-Patkai Wild Life Sanctuary. Eco-tourism to Dehing Patkai Wild Life Sanctuary shall involve travel to destinations where flora, fauna and cultural heritage are of primary attractions with the goal to offer tourists an idea of insight into the impact of human beings on the environment, and to foster a greater appreciation of our natural habitats.

Eco-tourism to Dehing Patkai Wild Life Sanctuary shall include programs that minimize the negative aspects of conventional tourism on the environment and enhance the cultural integrity of local people. Eco-tourism to Dehing Patkai Wild Life Sanctuary shall involve visiting the natural areas in the remote wilderness. This will help to promote sustainable use of biodiversity, by providing jobs to locals, sharing of socio-economic benefits with local communities and indigenous peoples by having their informed consent and participation in the management of eco-tourism enterprises.

8.6.2 Identification of the tourism zone

Digboi forest Division is one of the most biodiversity rich division in Assam with more than 50% area under forest cover. Also, Dehing Patkai National park known as Amazon of the East is located contiguous to the division making the area one of the most preferred tourist destination in Assam. Further, Digboi Forest

Division has more than 1000 forest villagers located in various places in the division and who are primarily dependant on forest resources.

Present Status: Ecotourism in Digboi Forest Division is in nascent stage with tourists mainly visiting Dihing Patkai National Park area and Digboi area. The tourists mainly visit for birds, orchids and lush evergreen forests. The division is one of the main habitats in Assam for White Winged Wood Duck, the state bird of Assam and Hollong Tree, the state tree of Assam.

Tourism facilities are minimal under the division with one interpretation centre located in Soraipung range. Accommodation in nearby area is also a challenge as the infrastructure available is inadequate. Further the tourism locations also lack basic amenities, trained guides and information centres.

Potential Areas: The ecotourism potential areas under these division has been grouped into 4 locations namely

1. Digboi Tourism Zone
2. Tinkopani Tourism Zone
3. Lekhapani Margherita Tourism Zone
4. Soraipung Tourism Zone

Digboi Tourism Zone: Digboi Town has a population of around 20,000 persons and hosts the old refinery in Asia. Most of remaining area is under forest and forest villages. A forest interpretation centre and museum along with guest house is under construction in Digboi. This centre could act as the nodal point of all tourist information under the division. An arboretum and a biodiversity park with orchid centre is also present nearby. Also, OIL Museum and World War Cemetery are located close to this forest interpretation centre. An integrated tourist route involving other attractions could be a game changer for Digboi forest villagers.

Digboi has evergreen forests which hosts numerous fauna and flora including mammals like Tigers, Leopards, Hoolock Gibbons etc. The area also is a rich habitat of endangered White Winged Wood Duck, the state bird of Assam. Also, various species of hornbills are found here along with numerous orchid varieties.

Forest villages like Kheirjan, Dhekiajan, Panbari etc located close to these locations. The villagers can be trained as local guides for the tourists. Further homestays can be planned for the tourists in the forest village itself. This will engage the forest villagers in alternate employment opportunities leading to reduced pressure on the forests. This will also improve the community participation in the forest management.

Tinkopani Tourism Zone: Tinkopani Reserved Forest is located in the south eastern part of Digboi Division along Arunachal border. The reserved forest is one of the most biodiversity rich area in Assam with thick forests where even sunlight cannot penetrate. The area also has rich cane brakes. One side of the RF is bounded by fast flowing Namchek river. Also, the area is part of an old Tribal block with various tribes with diverse cultures residing here.

The area can be developed as an ecotourism zone with activities like jungle trails, trekking, river rafting, bird watching etc along with culture tourism in the form of diverse food and traditions. This will not only reduce the dependency on forests, but also increase the protection of forests by ensuring frequent movement of tourists and guides in selected areas.

Lekhapani Margherita Tourism Zone: Lekhapani area is famous for its hilly terrain with waterfalls and thick forests. The area has can be developed as a medium level trekking route to increase protection and to develop the communities living along the forests. Margherita Range also has parts of Dihing Patkai National Park and Dehing River parts through the range. This range is one of the best habitats of orchids. Also, the area is highly vulnerable to illegal felling and ecotourism is to be promoted to reduce this pressure over forests.

Coal Museum is also located in Margherita along with old coal mines including underground mines of North Eastern Coal fields. An integrated tourist circuit involving local community and other establishments can be planned in this zone. Also, adventure activities like rappelling, rafting etc can be incorporated into the plan.

Soraipung Tourist Zone: Soraipung Tourist zone is currently the most active Tourist Zone of the division with current revenue of about Rs 1 lakh/year. The zone also has Dihing Patkai National park and Upper Dihing Reserved Forest in it. Some of the forest villagers have already been trained as guides in various activities like bird watching, identification of plants, orchids etc. Forest villages like Soraipung FV can also have homestays to accommodate the tourists and to share the culture. The forest road passing through the protected area from Soraipung to Bet camp, Bet camp to Premier point, Betcamp to Naralata, Naralata to Thongthong via Maikighat and Naralata to Maikighat shall constitute the tourism zone. Boating can be done over river Buridihing from Thongthong to both upstream (upto the interstate border of Assam & Arunachal Pradesh) & downstream up to Naharkatia, which is also included in the tourism zone. Boating is feasible in the river during May to September. Hoolock Gibbon, Asian elephants, green pigeon, jungle fowl, Malayan giant squirrel and other endangered animal and avi- fauna can be sighted during day time..

Proposed Model: The tourism in Digboi can centre around the forest villages and can operate through Joint Forest Management Committees and Ecodevelopment Committees. The forest villagers can be trained in various fields like hospitality , cooking , languages etc along with training on environment , local ecosystem , flora and fauna and their identification . Further homestays can be developed in forest villages so that facilities for tourists are created along with additional income for the villagers.

An integrated model involving other important tourist locations like OIL museum, Coal Museum etc along with cultural centres can boost the tourism potential of the area. This will not only boost the local economy but also reduce the dependency on forest resources like fuelwood , timber etc and keep the local populace engaged .

8.7 Social customs:

Very few prevalent social customs related to forests are recorded in this Division. Worshipping hollong tree (*Dipterocarpus*) is not a custom of the Morans-an ethnic community, yet the Moran Students are devoting themselves to protect the trees which are very laudable efforts.

8.8 Status of Compliance of Forest Rights Act:

Table 8.8 Status of Implementation of Forest Right Act, 2006 Under Digboi Forest Division

Claim Received						Claim accepted						Claim rejected					
Claim received by Gram Sabha			Area (Ha) involved			Claim accepted			Area (Ha) involved			Claim rejected			Area (Ha) involved		
Individual	Community	Total	Individual	Community	Total	Individual	Community	Total	Individual	Community	Total	Individual	Community	Total	Individual	Community	Total
1996	0	1996	2129	0	2129	207	0	207	231	0	231	1789	0	1789	1898	0	1898

8.9 Other Rights and Concession:

As per the present practices the rights and concession provided to the recognized forest villages, JFMC members are shown in table 8.9.

Table 8.9: Statement of other rights and concession

Sl. No	Nature & Extent of Rights	Rights and concession holder	Remarks
1	Right to entry in the R.F. area	JFMC beneficiaries and forest villagers along with FRA Rights holders.	Being they are living in the forest area
2.	Cattle grazing	-do-	-do-
3.	Fuel and fodder collection	-do-	-do-
4.	NTFP for domestic uses	-do-	-do- and along with the fringe villages
5.	Domestic and small wood collection	-do-	-do-

8.10 Dependency of local people on NTFPS

During the constitution of the RFs, certain rights and concessions were allocated to the people living in and around the RFs. Forest villagers, JFMC beneficiaries are dependent on NTFPs produced in the forest. They are legally empowered for collecting NTFPs for their domestic need. The people from forest villages and from forest fringe villages are accustomed to collect firewood and other Non Timber Forest Produce

(NTFP) from R.F. areas. The items generally collected are vegetables mainly- Outenga, Tikoni Baruah, Bamboo Shoot, Cane shoot, Fern, etc. Medicinal plants like Nephaphu, Jamlakhuti, Bon haladhi, Boga bahek, Bhatghila, Bor thekera, Salmugra, Titaphul, etc. to get relief and healing from common flue, stomach problems, body pain, muscle pain as a traditional practice. Besides these other forest products like Patidoi, Tokowpat, Cane, Bamboo, etc. are collected for domestic purposes. Though the Assam Forest Regulation (Amendment) Act 1995 and other regulations/Rules/Act prohibit collection beyond domestic need and selling of forest grown products, yet it can not be enforced in consideration of the fact that the these fringe villagers otherwise plays an important role in forest protection. The Forest department and JFMCs shall evolve a mechanism for assessing the quantity for domestic need and also assess the quantity extracted for marketing in the local market; and thereby find a way for revenue generation from NTFPs. Revenue generated from NTFPs shall go to JFMC.

8.11 Other aspects: Other aspects are not yet listed. A brief account of other rights and concessions, their extent, nature, etc. which are to be regulated or met under working plan prescriptions will be provided during tenure of this Working Plan. All vacant Govt. land should be covered by forest with the help of Social Forestry Division and other local bodies to lessen the dependency of local people on RFs.

CHAPTER 9

ADEQUACY OF POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

9.1 Existing policy and legal framework and their compliance

The management of Forests in the Division is done in accordance with the existing Assam Forest Policy 2004. The Reserve Forests had been declared as per the provisions made in Assam Forest Regulation 1891 and in managing Forests, provisions made in the said Regulation and Assam Forest Regulation (Amendment) Act 1995 are strictly followed. The Wildlife (Protection) Act 1972 as amended till date and The Wildlife Protection Rule 1995 are other Acts and Rules in force for dealing with the matter related to Wildlife matter in the Division. Other Acts and Rules which are held by the Division for discharging its functions for management of Forests are:

- a) Assam Forest Regulation 1891 (Amended Act 1995).
- b) Wild Life (Protection) Act 1972.
- c) The Assam Wildlife Protection Rule 1997.
- d) Indian Forest Act 1927.
- e) Forest Conservation Act 1980.
- f) The Biological Diversity Act-2002.
- g) Assam Bio-diversity Rule-2010.
- h) The Wood base Industries (Establishment and Regulation) Rules 2000.
- i) The Cattle trespass Act 1871.
- j) The Assam Forest (Removal and storage of produce) Regulation Act-2000.
- k) The Assam (Control of Felling and Removal of trees from Non-forest Land) Rules 2002.
- l) The Schedule tribe and other traditional Forest Dwellers (Recognition of Forest Rights) Acts 2006
- m) The schedule tribes and other traditional Forest Dwellers (Recognition of Forest Rights) Rules 2007.
- n) The Assam Joint (Peoples Participation) Forestry management Rule-1998.
- o) The Assam Minor Mineral Concession Rules-2013.
- p) Assam Sale of Forest Produce Coupe and Mohal (Amendment) Rules, 2000'

Besides the above Acts, Rules and Regulation, Indian Penal Code and Criminal Procedure Code are also applicable to support the above Acts/Rules depending applicability and jurisdiction. Compliance of all the above Acts, Rules, Regulations are satisfactory in as much as the provisions of such Acts/ Rules are being applied/ enforced towards sustainable management of forest. But enforcing of Assam Forest Regulation 1891 (Amended Act 1995) and Wild Life (Protection) Act 1972 for punishment of offenders require much meticulous efforts. Capacity development and training of staffs and officers are becoming an urgent to deal with the legal issues which can, of course, give an positive impact in forest conservation.

The Policy, Rules and Acts are in place in the Division to ensure Conservation, Protection and Sustainable use of forest produce in scientific manner.

9.2 Status of approved Working Plans and their Compliance

After expiry of A.C. Das's Working Plan (1974-75 to 1985-86) no Plan was approved by the MoEF. Though M.C. Malakar's Working Plan (2000-2001 to 2009-2010) was provisionally approved, for failure to submit the field verification report about enumeration data by statistical sampling by a special team as constituted by the C.C.F. Working Plan, Govt. of Assam within a stipulated period, the approval deemed withdrawn.

9.3 Number of Forest Offence

There are number of forest offences ongoing and pending under court jurisdiction. The following table shows the list of forest offences sent to court in Digboi division from 2009-10 to 2019-20.

Table 9.3. Status and number of forest offence in the division since 2009-10 to 2019-20

Assessment year	Types of offence	Number	Cases taken to the court of law	Types of loss to forest and revenue
2009-10	Illegal removal of Sand	8	Nil	Nil
	Stone	15	Nil	Nil
	Earth	7	Nil	Nil
	Timber	47	Nil	Nil
	Sand gravel	4	Nil	Nil
2010-11	Illegal removal of Sand	7	Nil	Nil
	Stone	12	Nil	Nil
	Earth	1	Nil	Nil
	Timber	12	Nil	Nil
	Sand gravel	4	Nil	Nil
2011-12	Illegal removal of Sand	15	Nil	Nil
	Stone	41	Nil	Nil
	Earth	11	Nil	Nil
	Timber	8	Nil	Nil
	River Silt	8	Nil	Nil
	Stone	6	Nil	Nil
	Earth	4	Nil	Nil
	Timber	6	Nil	Nil
	River Silt	1	Nil	Nil
2013-14	Illegal removal of Sand	2	Nil	Nil
	Stone	5	Nil	Nil
	Earth	3	Nil	Nil
	Timber	5	Nil	Nil
	River Silt	3	Nil	Nil
2014-15	Illegal removal of Sand	11	Nil	Nil
	Stone	17	Nil	Nil
	Timber	3	Nil	Nil
	River Silt	4	Nil	Nil
	Sand gravel	16	Nil	Nil
	Single	7	Nil	Nil
2015-16	Illegal removal of Sand	5	Nil	Nil
	Stone	14	Nil	Nil
	Earth	63	Nil	Nil
	Timber	6	Nil	Nil

	River Silt	6	Nil	Nil
	Sand gravel	2	Nil	Nil
	Single	3	Nil	Nil
2016-17	Illegal removal of Sand	47	Nil	Nil
	Stone	66	Nil	Nil
	Earth	26	Nil	Nil
	Timber	5	Nil	Nil
	River Silt	7	Nil	Nil
	Sand gravel	24	Nil	Nil
	Single	6	Nil	Nil
2017-2018	Illegal removal of Sand	29	Nil	Nil
	Stone	35	Nil	Nil
	Earth	5	Nil	Nil
	River Silt	20	Nil	Nil
	Sand gravel	21	Nil	Nil
	Single	9	Nil	Nil
2018-2019	Illegal removal of Sand	27	Nil	Nil
	Stone	53	Nil	Nil
	Earth	07	Nil	Nil
	Sand gravel	14	Nil	Nil
2019-2020	Illegal removal of Sand/Stone Dust	26+03=29	Nil	Nil
	Stone	56	Nil	Nil
	Earth	06	Nil	Nil
	Timber	02	Nil	Nil
	River Silt	04	Nil	Nil
	Sand gravel	12	Nil	Nil

9.4 Status of Research and Development

1. Preservation plot was laid out in as one of the important means for conserving and protecting the existing biodiversity of important floral species as well as for assessing ecological changes occurring in such areas over a period of time.

Narlota at Upper Dihing Reserve Forest–Digboi division

Area 20.5 ha,

Forest type : Assam Valley Tropical wet Evergreen (Dipterocarpus)

Type: 1B/C1

Date of formation -1980

The dominant species are Dipterocarpus macrocarpus (Hollong), Shorea assamica (Mekai), Canarium resiniferum(Dhuna), Ailanthus integrifolia (Barpat).

2. An ex-situ conservation area was created during 2013-14 at Eastern Assam Genetic Range, Lakhpathar for conservation of various species found in Assam, which include *Calamus erectus* (Jori bet), *Calamus tenuis* (Jati bet), *Calamus rotang* (Raidang bet), *Calamus flagellum* (Chulibet), *Calamus floribundus* (Lejai bet) etc. Efforts are underway for planting remaining 9 indigenous species of Assam (Altogether 14 species of cane are available in Assam) and subsequent establishment of propagation protocols with a view to conserve as well as identifying source of additional income for the JFMC members from commercially viable species.

3. An arboretum for growing of all the plant species available in Assam was set up at the north of Upper Dehing (West Block) Reserve Forest near Bogapani in the vicinity of Digboi within Lakhpathar Forest Range under Digboi Forest Division. 50 hectares under the project was covered. The whole area is divided into small segments of 400 m² and each segment has one particular species of plant. This is going to be India's second of its kind, next to the oldest one in the National Forest Institute in Dehradun established during the British Rule.

9.5 Human Resources, Capacity Building Efforts

The ongoing developments in the forestry sector at policy, administrative and implementation level together with paradigm shift towards sustainable forest management, participatory forestry, biodiversity conservation, forests for climate change mitigation and adaptation through the mechanism of REDD +(Reducing Emissions through Deforestation and Forest Degradation) , focus on forest based livelihoods and forests for water and increasing role of technology and social media in forestry and sustainable development etc. have necessitated fundamental re-orientation and attitudinal changes of forestry personnel. These challenges coupled with conflict resolution issues faced in protection, management and conservation of the forest resources require appropriate capacity building of frontline forestry personnel by providing them the state of art information, knowledge and skills. Staffs and officers of the division were deputed to various forestry training Institutes including SFTIs of the State for imparting training.

The capacity building of the existing staff is carried out through a number of trainings, field visits and workshops. The foresters and Forest Guards are imparted training in Assam Forest School, Jalukbari and Assam Forest Guards School, Makum. The effectiveness of the training programmes was also assessed. The capacity building programmes helps to build active taskforce.

9.6 Forest Resource Accounting

Tangible benefit from forests are timber, NTFPs, fuelwood, fodder, livelihood, ecotourism, biodiversity, etc. The non-tangible benefits of forest are carbon sequestration, soil erosion control, water recycling, oxygen production, control of air pollution, animal habitat, etc. Prior to hon'ble Supreme Court imposed ban on tree felling in 1995, there were as many as 26 Plywood factories in Tinsukia. Majority portion of raw materials for all these plywood factories were supplied from Digboi Division. Suitable species for plywood, Hoolong and Mekai were abundant in Digboi forest. After 1996 wood number of based Industries reduced to 8 (eight). The present operative wood based Industries are given in following table (Table 9.6.a).

Table: 9.6.a: Detail of Wood based Industries under Digboi Division

Sl. No.	Name of Saw Mill	GPS Co-ordinate	Name of Range
1	National Plywood Industry Limited	N-27°18'28.0", E- 095°39'28.1"	Margherita East
2	Natural Panel Industry Pvt. Ltd.	N-27°18'19.8", E- 095°39'30.1"	Margherita East
3	National Wood Product (Saw Mill)	N-27°17'44.3", E- 095°39'31.8"	Margherita East
4	Paioneer Timber Seasoners	N-27°28'52.7", E- 095°26'44.3"	Lakhpathar

	(Ply) Makum		
5	M/S- Sriram Boards and Panels Pvt. Ltd. (Ply), Makum	N-27°28'34.2", E- 095°28'08.0"	Lakhipathar
6	M/S- Shree Timber Product Pvt. Ltd. (Ply), Makum	N-27°28'29.5", E- 095°27'57.1"	Lakhipathar
7	M/S- Deepak Saw & Veneer Mill, (Saw Mil), Digboi	N-27°24'10.8", E- 095°37'11.7"	Digboi
8	M/S- Shrikrshna Timber & Plywood Products, (Saw Mill)	N-27°24'23.2", E- 095°37'04.8"	Digboi

Minor Minerals is a forest resource having tangible benefits. The Forest Division earns a sizeable revenue from these Minor Minerals. Details of Mahals are given in table 9.6.b

Table 9.6.b Details of Mahal under Digboi Division

Sl. No.	Name of MCA	Name of Minor Minerals & Area In Hacts	GPS Co-ordinate	Name of Range
1	DIG/1	Stone Gravel , Area= 7.29	N-27°27'57.04", E- 095°57'32.74"	Jagun
2	DIG/2	Stone Gravel , Area= 6.53	N-27°21'55.44", E- 095°56'17.67"	Jagun
3	DIG/3	Stone Gravel , Area= 16.00	N-27°22'06.65", E- 095°55'20.22" N-27°21'51.94", E- 095°54'05.17"	Jagun
4	DIG/4	Stone Gravel , Area= 5.75	N-27°21'56.00", E- 095°53'51.70" N-27°22'00.89", E- 095°53'23.20"	Jagun
5	DIG/5	Stone & Sand Gravel, Area=11.25	N-27°24'03.23", E- 095°53'36.74" N-27°24'02.66", E- 095°52'35.71"	Jagun
6	DIG/7	Sand & Silt, Area= 17.50	N-27°18'26.23", E- 095°42'21.57" N-27°18'03.08", E- 095°41'30.71"	Lekhapani
7	DIG/8 (A)	Stone Gravel, Area= 5.10	N-27°19'53.37", E- 095°51'04.60" N-27°20'28.62", E- 095°51'40.54"	Lekhapani
8	DIG/9(A)	Sand, Area= 6.30	N-27°18'00.55", E- 095°40'54.59" N-27°17'31.78", E- 095°40'21.09"	Lekhapani
9	DIG/10	Sand, Area = 8.63	N-27°17'29.51", E- 095°40'04.27" N-27°17'52.45", E- 095°40'37.44"	Margherita East (EZ)
10	DIG/11	Sand, Area = 12.38	N-27°17'07.64", E- 095°39'35.35" N-27°17'36.78", E- 095°38'47.03"	Margherita West (EZ)
11	DIG/12	Sand, Area = 24.00	N-27°28'20.44", E- 095°38'22.86" N-27°28'29.05", E- 095°37'16.93"	Digboi
12	DIG/13	Sand & Silt, Area = 15.50	N-27°17'41.95", E- 095°22'47.60" N-27°16'59.20", E- 095°23'23.62"	Saraipung (EZ)
13	DIG/14	Sand & Silt, Area= 15.00	N-27°18'05.01", E- 095°20'50.08" N-27°17'25.27", E- 095°21'22.24"	Soraipung, (EZ)
14	DIG/15(A)	Sand & Silt, Area= 4.07	N-27°19'34.80", E- 095°19'20.24" N-27°19'37.16", E- 095°19'06.38"	Soraipung
15	DIG/15-(B)	Sand & Silt, Area = 4.00	N-27°19'33.64", E- 095°19'24.24" N-27°19'29.79", E- 095°19'23.03"	Soraipung
16	DIG/15-(C)	Sand & Silt, Area = 4.80	N-27°19'26.36", E- 095°19'39.65" N-27°19'22.97", E-095°19'36.79"	Soraipung
17	DIG/16	Silt, Area = 4.44	N-27°28'02.03", E- 095°26'10.96" N-27°27'55.80", E- 095°24'31.19"	Lakhipathar
18	DIG/17	Silt, Area = 4.75	N-27°27'44.30", E- 095°23'55.46" N-27°27'44.60", E-095°23'55.45"	Lakhipathar
19	DIG/18	Sand & Silt, Area= 3.60	N-27°18'00.50", E- 095°41'41.01" N-27°17'57.02", E- 095°41'53.05"	Margherita East
20	DIG/19	Sand & Silt, Area =	N-27°19'53.99", E- 095°42'43.97"	Margherita East

		3.70	N-27°20'00.67", E- 095°42'49.21"	
21	DIG/21	Sand & Silt, Area = 2.60	N-27°22'34.52", E- 095°46'57.66" N-27°22'43.84", E- 095°46'57.78"	Lekhapani
22	DIG/22	Sand & Silt, Area = 3.90	N-27°20'03.83", E- 095°42'54.38" N-27°20'03.82", E- 095°42'51.45"	Lekhapani

9.7 Budgetary Allocation to the Forestry Sector

Budget provision of the last plan period is provided in table 9.7. There should be more budget for executing the planned works. Sufficient budget should be provided to undertake the works prescribed in this Working Plan.

Table 9.7: Allocated budget in Digboi division, Assam

Year	Allocated budget provisions	
	Plan scheme (Rs.)	Non-plan scheme (Rs.)
2005 - 2006	39,15,840.00	11,80,000.00
2006 - 2007	43,13,100.00	19,71,281.00
2007 - 2008	38,38,000.00	18,48,684.00
2008 - 2009	1,05,07,764.00	38,03,600.00
2009 - 2010	96,89,845.00	30,54,000.00
2010 - 2011	58,89,845.00	30,09,906.00
2011 - 2012	60,18,192.00	23,46,000.00
2012 - 2013	77,35,740.00	28,04,000.00
2013 - 2014	1,57,36,882.00	38,25,400.00
2014 - 2015	48,06,441.00	24,79,500.00
2015 - 2016	50,000.00	17,77,000.00
Sub Total	7,25,01,649.00	2,80,99,371.00

9.8 Existence of Monitoring, Assessment and Reporting Mechanism

Both physical and financial monitoring are being done from time to time by C.C.F., C.F, D.F.O, and other external agencies. Control forms attached. Execution of the work takes place through the Range officer of the respective Ranges by the Divisional Forest Officer. Monitoring, assessment of the executed work is done by the Divisional Forest Officer himself or through the Assistant Conservator of Forests and reported to the Circle Conservator. In their fortnight diaries the Assistant Conservator of Forests and Divisional Forest Officer record their findings of monitoring and assessment and submit to the Circle Conservator of Forests. The Circle Conservator also monitors and assesses the work and reports to the Addl Principal Chief Conservator of Forests who subsequently reports to the Principal Chief Conservator of Forests and finally it reaches to the Government accordingly. The Addl Principal Chief Conservator of Forests of Upper Assam Zone also time to time monitors and assesses the work and reports to the Principal Chief Conservator of Forests.

9.9 Public Awareness and Education

Environmental awareness programmes, training on micro plans, awareness on need to conserve signature species, plantation drives are being carried out in the Division from time to time. On the

occasion of various forestry related festivals like World Environment day, Vana Mahotsava, Wildlife Week, World Earth day etc. various awareness programmes are organized. Results of these awareness programmes were also significant. During the tenure of this Working Plan the efforts shall be made to increase public awareness. Forestry/environmental education programmes should be conducted at the school level targeting the students who can contribute much in forest conservation and environmental issues.

9.10 Adequate Man Power in Forest Division

The details of sanctioned, permanent, temporary, and seasonal posts are given in the table 9.10.

Table 9.10: Status of manpower in Digboi Division, Assam as on 31/03/2021

Sl. No.	Name of Post	Sanction strength	Man in position	Vacant	Excess
1	D.F.O.	1	1	0	0
2	A.C.F.	3	2	1	0
3	ForestRanger	9	7	2	0
4	Dy.Ranger	5	5	0	0
5	Forester - I	46	31	15	0
6	Forester - II	9	9	0	0
7	ForestGuard	77	37	40	0
8	Mali	1	0	1	0
9	Chainman	4	3	1	0
10	Mahut	4	2	2	0
11	GrassCutter	4	2	2	0
12	HeadAssistant	1	1	0	0
13	Accountant	3	2	1	0
14	Sr.Assistant	6	1	5	0
15	Jr.Assistant	9	7	2	0
16	Draftsman	1	0	1	0
17	F.V.SchoolTeacher	2	1	1	0
18	ForestSurveyor	4	1	3	0
19	Driver	4	1	3	0
20	Handyman	1	1	0	0
21	OfficePeon	6	4	2	0
22	D/Runner	1	0	1	0
23	Chowkider	10	6	4	0
24	Sweeper	1	0	1	0
25	Game Watcher	0	1	0	1
	Total	214	134	81	1

A good number of posts of frontline staffs are lying vacant in the Division because of which the works are adversely affected.

CHAPTER 10

FIVE YEARS PLANS

10.1 Details of five years plans

The First Five Year Plan (1951-56) laid significant importance on the development of forests. The Plan aimed for the improvement as well as expansion of the areas under forests to cater the increased demand for timber and forest produce in sustainable manner. The enunciation of the New National Forest Policy of India, 1952 was a major step in this direction to revise and align with the trends of economy. The policy emphasized the protective as well as productive roles of forests and envisaged that one third of the land area (around 33%) should be under forests including 60% of the land 86 in hilly regions and 20% in the plains. An overall provision of `7.64 crores was made in the plan (in both Centre and State budgets) for forestry and wildlife conservation programmes. The First Five Year Plan also laid importance to the role of forests in soil conservation.

The Second Five Year Plan (1956-61) aimed mainly at adopting measures for afforestation and improvement of poorer areas in the forests and extension forestry, formation of plantations of species of commercial and industrial value, promotion of methods for increased production and availability of timber and other forest produce for the future, conservation of wildlife, amelioration of the conditions of staff and labor in the forests, increased volume of forest research, increased provision of technical personnel and central coordination and guidance in the implementation of forest development schemes all over the country. A sum of `21.21 crores was provided in the plan (in both Centre and State 88 budgets) for the development of forestry and wildlife. Funds were also allocated for soil conservation.

The Third Plan (1961-1966) laid special emphasis on adopting measures which ensured more economic and efficient utilization of the available forest products including inferior timber and wood residues. Major forest development programmes included in the plan were economic plantations for industrial and commercial purpose, plantations of quick growing species, village and extension forestry. The plan included programmes for the development and establishment of five zoological parks, five national parks and ten wildlife sanctuaries. The plan provided an outlay of `45.85 crores for various programmes of forest development in States and Union Territories including a sum of `6.7 crores for Centre and centrally sponsored schemes. The plan also initiated various programmes related to soil conservation and an outlay of about `72 crores have been provided for their execution (The Third Five Year Plan, 1961-1966).

The Fourth Five Year Plan (1969-1974) laid emphasis on three main objectives in the area of forestry, namely, to increase the productivity of forests, to link up forest development with various forest based industries and to develop forests as a support to rural economy. Important objective was to achieve self-sufficiency in forest products especially for major forest based industries. The plan also recommended special training in ecology and conservation. Two centrally-sponsored schemes- Project Tiger and Development of National Parks and Sanctuaries also came into existence in 1973. The total outlay for

forestry programmes 90 (including wildlife) in the Fourth Plan was `89.42 crores in the Centre, States and Union Territories.

The major programmes of forest development included in the Fifth Five Year Plan were large scale commercial plantations, plantations of quick growing species, social forestry, forest consolidation, surveys and statistics, communications and logging. A sum of `208.84 crores were tentatively allocated in the Centre and State budgets for forestry and wildlife conservation programmes for the Fifth Five Year Plan, 1974- 1979. Mass afforestation and social forestry programme programmes were emphasised during the Sixth Five Year Plan (1980-1985). The Forest (Conservation) Act was enacted in 1980 with the main objective of checking the diversion of forest land for non- forestry purposes. Forest Survey of India (FSI) was established in June 1981 (on the recommendations of the National Commission on Agriculture) for carrying out regular surveys of forest resources of the country. A sum of `692.49 crores was provided for forestry and wildlife conservation programmes.

During Seventh Five Year Plan (1985-1990) emphasis was laid on the role and importance of forestry sector for economic development of the country in terms of protection of the ecosystems and supply of various forest products. The policy encouraged people's participation in the protection and management of forests and a decentralized system of forest management was started during the Seventh Plan with the introduction of JFM programme in 1990. A sum of `1859.1 crores were provided in the Plan in the Centre, States and Union Territories for forestry and wildlife conservation programmes. Despite various efforts undertaken to enhance and promote the area under, the forests faced massive destruction due to anthropogenic pressure which ultimately resulted in the degradation of forests.

The Eighth Plan (1992-1997) also initiated various programmes and schemes regarding the protection and conservation of forests. A number of afforestation schemes like Integrated Afforestation and Eco-Development Project Scheme, Fuel wood and Fodder Project Scheme, Non-Timber Forest Produce Scheme, etc. were initiated under NAEB for reclaiming degraded forest areas. An overall provision of Rs 4910 crores was made in the plan for forestry and wildlife conservation programmes in Centre and State budgets.

The Ninth Five Year Plan (1997-2002) stressed on massive afforestation programmes, control over hacking and grazing and provision of cheap fuel through alternative technologies. A National Forestry Action Plan was also launched during the plan in 1999 to address major issues in forestry sector. The plan also laid emphasis on the conservation of biodiversity in the country. A provision of Rs 8189.09 crores was made in the Plan in Centre and State budgets for the execution of various programmes under forestry and wildlife.

The Tenth Five Year Plan (2002-2007) further emphasized on the important role of forests in achieving environmental and economic sustainability as well as in maintaining life support systems on earth. The target of Tenth Five Year Plan had stipulated the need to bring 25% of area under forest and tree cover by 2007 and 33% by 2012. It was also proposed to merge all afforestation programmes of National Afforestation and Eco-development Board (NAEB) into a single scheme called National Afforestation

Program (NAP). This 100% Centrally Sponsored Scheme (CSS) was started in 2002-03 for regeneration and eco-development of degraded forests and adjoining areas on watershed protection and conservation of natural resources through active involvement of people and checking land degradation, deforestation and loss of biodiversity (The Tenth Five Year Plan, 2002-2007). A sum of Rs 14344 crores were provided in the Plan for the execution of various programmes under forestry and wildlife sectors in the Centre, States and Union Territories. The strategy of the Eleventh Plan for forestry sector development was to create an environment for achieving sustainable forestry and wildlife management with specific focus on the socio-economic targets. Accordingly, the plan initiated various programmes for developing forestry and improving the status of green cover. A sum of Rs 15583.02 crores was tentatively 97 envisaged in the Plan (in Centre and State budgets) for forestry and wildlife conservation programmes.

CHAPTER 11

PAST SYSTEMS AND MANAGEMENT

11.1 General history of the forest

The first scientific management plan for the forests under this Division was compiled by C.G.M. Mackarness for 10 years from 1931-32 covering the U.D.R.F, Digboi, Dirak and Jaipur (presently in Dibrugarh Division) Reserves.

Prior to the introduction of the Mackarness plan, no systematic work was done in any of the Reserve of the Division and the various operations that were carried out at that time were as follows:

From 1912-1994, an area of about 2 sq. Miles bounded by the Jaipur-Borajan Tramline in the south west corner of the Upper Dehing Reserve (West Block) was leased out to a saw mill known as Naharkatiya Ltd. The complete details of this operation are not traceable, but marking figures show that 2828 trees were marked for felling, out of which 2009 were Nahor, 443 Hollong and 376 were of mixed species. The felling girth limit for trees other than unsound and silviculturally non-available ones were fixed at 6'0" for Nahor and 7'6" for all other species. The Company did not survive long and went into voluntary liquidation and was wound up in 1914-15.

In the year 1921, the Assam Railways and Trading Company Ltd. got a thirty years lease in the Upper Dehing Reserve (West Block) in an area near the Tingrai Railway Station. This agreement permitted an apparently unrestricted exploitation of trees without pre-marking and under a girth limit of 4'6" for Nahor and 6'0" for other species. It appeared to indicate a condition of lumbering to a girth limit without any consideration for Silvicultural requirements. About 4,00,000 cft of timber was removed from a small area in three - years' time. As regards communication, a cart road through the reserve was completed west to east from Jaipur to Digboi, which was originally started in 1908-09. A tramline (narrow gauge) was subsequently laid over this road by the Assam Oil Company. A second road was made from Makum Junction in a southern direction to Borjan.

In 1917, the Assam Oil Company was granted a mining lease over an area of 160 acres of Upper Dehing Reserve (East Block) near Hansapung, just south of the Pengari road and bounded by the Reserve western boundary between boundary pillars 36 and 33. Practically all timbers have since been removed in this area after paying royalty.

During 1926-27, 1063 trees were marked under selection system combined with improvement fellings in an area of 243.6 acres.

The "Pengeri Ali" was a good fair-weather road running from Digboi west to east through the Reserve and separating the plains from the hilly area. In 1927, a trade permit for 500 trees was issued in an undemarcated and apparently well-stocked area of approximately 63 acres just south of "Pengeri Ali" near Kherjan steam.

In case of Digboi Reserve, Assam Railways and Trading Company Ltd worked over some parts on a very small scale. Prior to its reservation in March'1926. An area of 401 acres was reserved for exploitation from August'1924 and June'1925 under an arrangement with the Assam Oil Company for the purpose of Malaria Research. In 1926-28 departmental sleeper operation were carried out on a small scale.

11.2 Past system of management

11.2.1 Mackarness Plan

The first plan for most of the forest areas of this Division was prepared by C.G.M. Mackarness for the period from 1931-32 to 1940-41. The plan was prepared for eleven Reserves of the then Lakhimpur and Sibsagar Divisions, out of which the following four Reserves of the present Digboi Division were included:

Reserves	Area in Acres	Area in Sq Miles	Area in Hectares	Area in Sq Km
1.Upper Dehing (East)	32275.00	50.40	13061.24	130.6124
2. Upper Dehing (West)	66371.00	103.70	26859.42	268.5942
3. Digboi	2797.00	4.40	1131.91	11.3191
4. Dirok	7543.00	11.80	3052.55	30.5255

All these Reserves under this plan were constituted into one Working Circle were divided into four felling series, out of these, the first felling series covered the area leased to the Assam Railway and Trading Company Ltd. The treatment proposed by the plan was provisional felling of the selection type accompanied by:

- a) Artificial regeneration in poorly stocked areas with little regeneration, tending operations in moderately stocked areas where a certain amount of natural regeneration was present on the ground.

The plan fixed the girth limits of 7'6" for Hollong, Hollock, Mekai and Sam, 5' 6" for Nahor and 6'0" for other species a rotation of 150 years and felling cycle at 30 years was fixed. Further volume yield with an area check and a sequence of areas to be carried out in the prescription of the Plan.

With girth limits fixed and selection felling prescribed, the plan permitted removal of only two-thirds of the available stems over the girth limits in the first felling cycle. There was a definite ban on marking in open areas with a few standards. Such areas were suggested to be left for regeneration work by cutting out bamboos and inferior scrubs and planted up as funds permitted. The plan also stressed on the retention of species like Amari, Gonsoroi, Poma, Sam and Sopas with a view to maintain the mixture and encouraging the supply of these species. The yield was calculated first in terms of the number of terms over the girth limits of the different species and the volume was then arrived at by multiplying with volume factor without taking in to consideration of the increment factor to provide a margin of safety. About one-third of the productive areas of these Reserves were allocated as working area for the period of the plan.

As regards regeneration work, the plan prescribed that after exploitation, the area was to be inspected by the Divisional Forest Officer and the Silviculturist, if necessary and one of the following courses of treatment is to be followed as per suitability of the nature of the crop:

- a) Poorly stocked areas indicating condition unsuitable for trees growth to be excluded from working and allocated for cultivation or grazing.
- b) Poorly stocked areas with little regeneration and shortage of seed bearers to be artificially regenerated.
- c) Moderately or well stocked areas with some regeneration present on the ground to be weeded and cleaned to favour the advance growth and encourage regeneration and supplemented by artificial regeneration where necessary. For the general improvement of the crop the plan also prescribed climber cutting on a 15 - year's cycle.

Soon after the inception of the plan, general depression set in and as a result of the lack of demand for timber, most of the prescriptions of the plan remained heavily in arrears, a certain amount of fellings was carried out in Makum Block of the Upper Dehing Reserve in the initial years of the plan. The Powai Block was operated from 1937 onwards by the Assam Railways and Trading Co. Ltd. This state of affairs continued till the beginning of World War-II. During the later part of the war years, the accessible portions of the Reserves were affected due to very heavy felling near a mile on either side of the roads, in the Powai Block, the area under the Kherjan Mining Lease of the Assam Oil Co Ltd., Digboi was worked for timber under what has been aptly termed as destructive felling, whilst an area to the south of this, called the Concessional area", was heavily exploited by the Assam Railways and Trading Co. Ltd. In the initial years, the marking followed the rules as prescribed in the plan, but during those years, the marking was anything but Silvicultural and this was necessitated by the urgency of the situation.

11.2.2 Purkayastha's Plan (1933-34 to 1943-44)

C. Purkayastha prepared the working plan for the 13 plain Reserves on the south bank of the Brahmaputra River in Lakhimpur Division, which came in to force in the year 1933-34 and was for a period of ten years. Out of these 13 Reserves, Borjan RF was the only reserve forest of the present Digboi Division. Purkayastha's plan prescribed four working circles and the Borjan RF was included in the Shelter Wood Working Circle under which it was proposed to regenerate the areas under the "Shelter wood Method of Regeneration with modification to suit the local condition." This Reserve Forest was included in the Tinsukia Felling Series in which the conversion period was fixed at 120 years with regeneration period of 20 years and rotation of 180 years. The yield was prescribed by base area with a stipulation that the annual yield calculated adopting Von Mantel's formula could be removed only if the regeneration kept pace with the felling. The annual yield was apportioned between valuable and less valuable species as a safeguard against the removal of only valuable species up to the limit of the annual yield.

Artificial regeneration by sawing and planting of local species like Khorikasopa. Kathalsopa, Phulsopa, Sum, Amari, Poma, Gonsoroi, Pansopa, Ajhar, etc. were prescribed for the areas when natural regeneration was found poor. The yield from areas outside the P.B.I. areas was also fixed by basal area and was arrived at by calculating the yield for the felling series by Van Mantel's formula and deducting there from the yield from P.B.I. as already calculated.

The inception of Purkayastha's plan coincided with the depression years and there was hardly any demand for any timber those days, this plan also suffered from the same fate that of Makarness. But during the war years, particularly from 1943 onwards, all the accessible areas were heavily exploited bereft of silvicultural considerations to meet the urgency of the situation.

11.2.3 Srinivasan's Plan (1949-59)

Then came the plan of Mr. M.M. Srinivasan for the then Lakhimpur Division for the period from 1 October'1949 to 30th September'1959. Due to the World War II, the revision of the earlier two plans could not take place in time. This plan dealt with 25 reserves out of which 10 Reserves, viz upper Dehing (East), Upper Dehing (West), Digboi east, Digboi West, Bogapani, Tipong, Tirap, Namp hai, Dirok and Borajan were from the present Digboi division.

Four working circle were constituted for the management of the forests under this plan. These are (i) Veneer wood WC, (ii) Hollong Local Trade WC, (iii) Miscellaneous WC, and (iv) Clear felling WC. The Reserves of the present Digboi Division were included in the Veneer Wood WC and Hollong Local Trade WC.

(i) Veneer wood working circle: Block I to XIV of the Upper Dehing Reserve (West) Digboi, West Reserve. Powai block of Upper Dehing Reserve (East), Digboi East Reserve and Dirok Reserved Forests were included in this Working Circle Later on Tirap, Tipong and Namp hai Reserved Forests were also included in this Working Circle by Mr. P. Bhattacharjee through an addendum after retention of these three Reserves within the State of Assam by finally fixing the boundaries for the North East Frontier Agency. The object of management was to provide sustained annual yield of Hollong, Hollock and Mekai, the tree principal veneer species for the veneer industry. The silvicultural system prescribed was to compensate the exploitation by regeneration of Hollong, Hollock and Mekai in areas other than those where felling was taking place. Here Hollock was to be regenerated artificially in plantation while Hollong and Mekai were to be regenerated naturally.

On the other hand, the forests were kept under Selection-cum-Improvement markings. The rotation was calculated at 180 years to produce trees of 7'6" in girth of Hollong and Mekai and for Hollock the rotation was fixed at 75 years to produce the tree of the same girth, but due to preponderance of trees of higher girth classes in the existing growing stock, the girth limit prescribed for felling in the first felling cycle had to be kept higher to remove the over mature trees initially and as such the girth limit of 9'0" was fixed, The felling cycle was taken as 30 years. The yield was prescribed for the three veneer species together by volume on a rather conservative estimate.

Due to variable nature of the crop, the marking rules were not rigid and generally followed Selection-cum-Improvement type. As the plan provided for regeneration in areas other than those where marking was being done, it was not specifically aimed at inducing or establishing the regeneration on the ground but to raise the canopy from below upwards.

The principles followed for marking were as follows.

- a) Trees over the prescribed girth limit will be marked without creating any large gap to avoid invasion of weeds and climbers and also mortally due to exposure. In the top canopy one out of five exploitable trees of the veneer wood species was to be retained evenly spaced.
- b) Trees even below the girth limit were to be thinned in congested patches, if any marked tree was found to benefit at least to other retained trees.
- c) All dead, uprooted, unsound and dying trees were to be marked.
- d) Other things being equal, preference was to be given for retention of the three main veneer species, Viz. Hollong, Hollock and Mekai.

1,400 acres was the minimum area to be regenerated during the period of the plan under this working circle to compensate for removal of the prescribed yield, but the actual area allotted for regeneration work was 4,320 acres in Powai Block and 900 acres in U.D.R (West Block-I). Tending operation were prescribed in these areas according to the necessity and availability of funds. Raising of the canopy was prescribed as regeneration progressed.

Hollock was to be planted up artificially at the rate of 28 acres annually along the bank of the Buri Dehing River, but to start with, the same could be done in the existing centres like Powai, Nahorjan and Delli.

Climber cutting scheme for twenty years to cover the entire area of this working circle was also prescribed in the said plan.

II. Hollong Local Trade Working Circle: The Hollong Local Trade Working Circle comprised the remaining portion of the Hollong bearing areas. The object was to meet the demand of the local people as well as to meet the demand of Railway sleepers. The silvicultural system prescribed was the same as in case of the Veneer Wood Working Circle. The total area to be regenerated under this Working Circle was 2,800 acres as against an area of 5,179 acres allotted as Regeneration Block. Another 550 acres was prescribed for plantation with other species like Ajhar, Sam, Hollock, Sopas, Amari, Bola, Gamari, Gansoroi, etc. Climber cutting was prescribed in this Working Circle with 20 years' cycle.

iii) Miscellaneous Working Circle: The Miscellaneous Working Circle consisted of a major portion of Dibru Reserved Forests, now under the present Dibrugarh Division. The silvicultural system prescribed was selection making with compensatory planting in the accessible areas. The exploitable girth limits were fixed as 9' for Hollock, Ajhar, Sam, and Simul, 7'0" for Amari, Bogipoma and Sopas and for other species. The felling cycle was fixed at 25 - years, the yield was fixed by number of trees above the girth limit. One-acre area against every 20 trees felled was to be planted up annually.

(iv) Clear Felling Working Circle: The Clear Felling Working Circle comprised of the reserved forest areas situated in the plains and having poor stock. The object of constituting the working circle was to meet the demand of the surrounding population for supply of timber and firewood. The silvicultural system for this working circle was clear felling and planting. The yield was prescribed by area subject to the maximum of 400 nos. of trees that could be felled annually and 62 acres' area was to be clear felled and planted annually.

Cane bearing Reserved Forest and un-classed State Forest areas were grouped into 8 mahals with a cutting cycle of three years under the miscellaneous regulations prescribed in the plan.

Marking of trees in the Reserved Forests was done as per the marking prescription of this plan. However, no operation could be carried out in some of the felling series prescribed due to various reasons. No attempt was made to improve the young crops by thinning, etc. as prescribed in the plan. Climber cutting prior to marking of trees was also not done. This resulted into heavy felling damage. Since no subsidiary operation was prescribed in the clear felled areas, the felling gaps remained uncovered and were invaded by the climbers and under growths.

Plan target of natural regeneration could not be achieved due to unsystematic tending and other subsidiary operations.

Plantations were raised in all the centres of the Reserved Forests as per the Plan prescriptions and even excess plantations were raised.

11.2.4 B.N. Das's Plan (1965-66 to 1979-80)

This plan was prepared for the period from 1965-66 to 1979-80 as a revision of Srinivasan's plan.

The Plan constituted four working circles namely.

- 1) Hollong-Mekai Shelter-Wood Working Circle,
- 2) Hollong Mekai Selection Working circle.
- 3) Miscellaneous Working Circle, and
- 4) Clear Felling Working Circle.

Bulk of the Hollong –Mekai forests were brought under Hollong-Mekai Selection Working Circle. Since the crops consisted of trees of various girth classes mixed together, the silvicultural system adopted for this Working Circle was selection system. The rotation for Hollong-Mekai and Nahor was fixed at 140 years. The exploitable girth limit for Hollong and Mekai was fixed at 9'0", for Anchor at 6'0", for Hollock and Sam at 9'0" and for other species at 7'0". The felling cycle was taken as 20 years for Hollong Mekai and Nahor. For Hollock, the felling cycle was fixed at 15 years. Yield was prescribed by volume for Hollong and Mekai only while removal of silviculturally available trees above the exploitable girth limit was suggested in case of other species since their occurrence was sporadic. There were four felling series in this working circle. Selection - cum - Improvement type of marking rules was prescribed with certain specific guidelines. Subsidiary silvicultural operation like removal of all marked trees, damaged trees retention of advance growth, climber cutting, tending etc. were also prescribed.

Heavily exploited forest areas were included into Hollong-Mekai Shelter Wood Working Circle. The main object of this working Circle was to remove matured stock and to open the existing regeneration in order to convert the forest into a more regular crop. Keeping the nature of crop in view, the silvicultural system prescribed for this working circle was irregular shelter wood system with regeneration period of 20 years. Six felling series were prescribed and the rotation period for Hollong, Mekai and Nahor was fixed at 140 years while conversion period was fixed at 120 years. The yield was prescribed by volume. The felling was confined mainly in the well-stocked and medium stocked areas of Hollong and Mekai. In other areas,

the felling of mother trees standing over the patches of established regeneration was allowed. Marking rules were prescribed for each category of areas and the exploitable girth limit was fixed at 9'0" for Sam, Sopas and Hollock and 7'0" for others. Subsidiary silvicultural operations were prescribed in detail for all categories of areas under this working circle.

The miscellaneous working circle was constituted to cater to the needs of local people and consisted of forest areas of mixed species. After detailed survey, stock mapping and analysis of the crop, two felling series were prescribed. Selection felling with girth limit and compensatory regeneration in suitable centres was prescribed. Hollock being the main species in this working circle, a rotation of 100 years at an exploitable girth of 10'0" was fixed. For Hollong, the exploitable girth limit was fixed at 9'0", while for other miscellaneous species, it was fixed at 5'0". The felling cycle was fixed at 25 years in order to ensure that there was no fall in yield. The yield was fixed in terms of number of trees above the exploitable girth limit and the annual coupes were marked as per the marking rules. In order to compensate these felling, annually 29 acres of plantation were raised with Hollock, Sam, Amari and Sopas etc. In the poorly stocked miscellaneous forests.

The clear felling working circle consisted of a large portion of swampy areas and forest village areas where the crop was very poor. These areas were inundated during high floods every year. Four felling series were constituted for this working circle. The Silvicultural system prescribed was clear felling and planting. Rotation for Simul was fixed at 30 years. In order to convert the poorly stocked forests under this working circles into a better stocked one, the conversion period was fixed at 90 years corresponding to the rotation of Ajhar and 3 rotations of Simul. The yield was determined by area and the annual area to be clear –felled was specified. Annual plantation target was fixed and subsidiary Silvicultural operations like weeding, climber cutting, cleaning and thinning were also prescribed.

In the miscellaneous regulation, cane, thatch, fishery and some other mahals were also allowed to be operated on lease basis. Matters relating to other development activities, like roads, building, reserved forest boundary maintenance, survey, statistics, research and experiments were also allowed.

11.2.5 A.C. Das's Plan (1974-75 to 1985-86)

The working plan written by Sri B. N. Das, for the period from 1965-66 to 1979-80 had to be revised during 1974-75 at its pre matured stage in order to accommodate the following three objectives:

- 1) Regeneration of Hollong Mekai forests,
- 2) Raising of plywood plantation at a large scale, and
- 3) Augmentation of the annual yield from the forests by reducing rotation and exploitable girth prescribed in the previous plan.

In the revised Working Plan for Digboi Division written by Shri A.C.das, the following two Working Circles were constituted.

(i) Hollong Plantation Working Circle: No fresh stock-mapping and enumeration figures of Shri B.N.Das's plan were taken as the basis of calculation of the growing stock, annual yield, etc.

The areas allotted to the Hollong Plantation Working Circle were mainly productive blanks, poor Hollong-Mekai forests and miscellaneous forests bearing a few utilizable species but fit for raising Hollong plantation. The main objective of constituting this working circle was to convert the poor Hollong-Mekai forests, miscellaneous forests and productive blank in to Hollong-Mekai forests by raising plantations in a rotation of 45 years.

Ten felling series, namely, (1) Kheto Felling Series, (2) Tingrai Felling Series, (3) Borjan Felling Series, (4) Agbandha Felling Series, (5) Dirok Felling series, (6) Namchik Felling Series, (7) Jagun Felling Series were formed for operation of forests under this working circle. The silvicultural system adopted was conversion to uniform by artificial regeneration complemented by the existing natural regeneration.

After the detailed analysis of the crop, the areas allotted to these working circles were classified into two types, namely, (a) High forest areas bearing woody erect shrubs, undergrowth and middle storey, etc. (b) Open degraded areas resulting from encroachment, past cultivation and heavy grazing. Separate plantation techniques were prescribed for these two types of plantation areas.

Operation of clear felling coupes was permitted till the months of February. Keeping the seeding time of Hollong and its storage difficulties in view, it was prescribed that the plantation should be taken up in the month of March only in the areas where the coupe operation was completed in January. In case of delayed coupe operation, it was suggested that such areas be taken up for plantation during the next season starting from October.

During the first year of the plantation, three weeding was prescribed and during the second and third years, only two weeding were prescribed. In the subsequent years, one climber cutting up to 9th year was prescribed. Vacancy filling by atleast a year-oldsaplings of Mekai, Sopa and Borpat was prescribed.

When the seedlings attain a height of 3 mt. only, selected healthy seedling were supposed to be retained bearing 400 plants per ha at a spacing of 5m x 5m.

First and second thinning were prescribed at the age of 15 and 35 years. During the first thinning at the age of 15 years, the only work envisaged was to reduce the number of Hollong seedlings per thali to one and to free the seedlings from suppression. At the age of 35 years, the number of Hollong, Mekai seedlings were to be reduced to 300 per Ha. No further thinning was prescribed.

A shorter rotation of 45 years was fixed aiming to produce maximum yield per unit area to make proper scientific and economic use of the land. The financial rotation was also considered while fixing the rotation period at 45 years. While calculating financial rotation, the intangible benefits were not taken in to consideration, e.g., depletion of gene pool, erosion of environment status of such a delicate forest type, etc.

Thus, the value of those intangible benefits having been thrown to oblivion, mathematical justifications were only given while bringing down the rotation drastically. This has ultimately resulted in overexploitation and also rendering large chunks of forest floor waterlogged inhabiting regeneration of the main species. Since no fresh enumeration and stock mapping was carried out, the volume of the growing stock was

determined by projecting the figures of Shri B.N. Das's plan adding 16% increment in three different felling cycle.

Following areas were prescribed for clear felling coupes and selection marking annually:

Felling Series (FS)	Annual clear felling Coupe area (Ha)	Annual selection Marking area (Ha)
1. Kheto FS	40	88
2. Tingrai FS	35	75
3. Borjan FS	30	64
4. Agbandha FS	50	110
5. Dirok FS	30	75
6. Namchik FS	30	70
7. Jagun FS	25	60
8. Tirap FS	40	95
9. Raja Ali FS	100	230
10. Khathalguri FS	20	52
Total	400	919

Marking rules were prescribed for selection marking in the un-allotted blocks. Dead, dying and wind fallen trees were to be marked and removed first. Volume of such trees was to be adjusted against the final yield. Following exploitation girth limits were prescribed:

Species	Exploitable girth (m) limit during		
	1st Felling Cycle	2nd Felling Cycle	3rd Felling Cycle
1. Hollong	3.0	2.4	1.8
2. Sam, Hollock	2.7	2.1	1.5
3. Sopa	2.7	2.1	1.8
4. Amari, Gansoroi, Bogipama	2.1	1.8	1.5
5. Nahor	1.5	1.2	1.2
6. Others	1.8	1.5	1.5

Marking was to be done in such a way that no permanent gap was created. Advance growth of Hollong and Mekai was to be retained in any case. In the poorly stocked areas, 8 trees of Hollong/Mekai of even 3m and above in girth per ha were to be retained as seed bearers.

The yield was regulated by area with a volume check for two main species, i.e. Hollong and Mekai. The other species were not converted against the prescribed yield. The annual yield prescribed for each felling series is shown in table.

Felling Series	Final annual yield (in Cu. M.)
1. Kheto Felling Series	500
2. Tingria Felling Series	800
3. Borjan Felling Series	600
4. Agbandha Felling Series	1300
5. Dirok Felling Series	550
6. Namchik Felling Series	250

7. Jagun Felling Series	600
8. Tirap Felling Series	1100
9. Raja Ali Felling Series	650
10. Khathalguri Felling Series	550
Total	6900

This yield was prescribed to be removed both from the clear felling as well as the selection marking areas. After determining the yield available from the clear felling coupes, the selection marking in the Un-allotted Block was prescribed to meet the balance yield. But in the poorly stocked areas in Un-allotted Block, about 8 no. of Hollong/Mekai trees of 3mt. and above in girth per ha. Were to be retained as seed bearers to obtain natural regeneration of these species to supplement the artificial regeneration. In the clear felling coupes, the marking was to be carried out as per the plantation techniques prescribed.

(ii) Hollong-Mekai Regeneration Working Circle: The areas allotted under the Hollong-Mekai Regeneration Working Circle were mainly the miscellaneous poor forests, Hollong-Mekai forests, Hollong-Nahor forests, productive blanks, swamps and forest village areas. The main aim of constitution this working circle was to remove the mature trees so as to free the existing regeneration and to augment the fresh regeneration of Hollong and Mekai and to convert the present irregular forests into a more regular forests. Six Felling Series, namely, (1) Digboi F.S., (2) Makum F.S., (3) Margherita F.S., (4) Lekhapani F.S., (5) Powai F.S. and (6) Lakhimijan F.S. were formed for operation of the forests under this working circle.

The silvicultural system adopted for this working circle was "The Irregular Shelter-wood System". The rotation for Hollong and Mekai was fixed at 84 years and the conversion period was also fixed at 84 years accordingly, 7 felling cycles, each of 12 years were made.

The areas having advance growth of various sizes up to 1.5m. in girth with matured and over-matured stocks of Hollong and Mekai and the areas the areas already operated under irregular shelter-wood system during B.N. Das's plan but having less regeneration were allotted to the regeneration block and other areas allotted to this working circle were kept outside the regeneration block.

The yield was prescribed to be regulated by volume for two main species, i.e., Hollong and Mekai and was calculated by using Von Mantel's formula with Simon's modification. Other species were not covered against the yield. Such calculation of yield was cross-checked by separately calculating the yield from the Regeneration Block and outside areas. In Regeneration Block, the yield was regulated by the area of annual coupes while in case of areas outside the Regeneration V Block, the selection marking was prescribed. The yield calculated by these two methods almost tallied with each other. Following annual yield was finally prescribed for this

Felling Series	Final Annual Yield (in Cu. M.)
1. Digboi Felling Series	18400
2. Makum Felling Series	5500
3. Margherita Felling Series	4500

4. Lekhapani Felling Series	5100
5. Powai Felling Series	8400
6. Lakhimijan Felling Series	4500
Total	46400

Working Circles: It was specifically mentioned that it is the total yield which was prescribed and there was no compulsion to regulate yield from the Regeneration Block and the areas outside the Regeneration Block separately.

Following areas were allocated for annual coupes under the Regeneration Block and areas for selection marking outside the Regeneration Block:

Felling Series	Area for annual Coupe (Ha)	Area for annual selection Marking (Ha)
1. Digboi	140	750
2. Makum	45	400
3. Margherita	25	120
4. Lekhapani	60	300
5. Powai	30	250
6. Lakhimijan	40	300

Annual sequence of marking in annual coupes as well as selection areas was also specified. In the regeneration Block, all the Hollong- Mekai trees above 1.5 m in girth were to be removed from the annual coupes areas to establish the young regeneration of Hollong and Mekai in these areas within the regeneration period of 12 years. 8 nos of seed bearers were supposed to be retained in the poor stocked coupes areas. While removing the middle canopy trees, it was suggested not to create any permanent gap. But when the regeneration attains considerable height, the under-wood and middle canopy could be removed heavily to free the regeneration. Mixture of all the associated species was to be retained to maintain the existing general composition.

The exploitation girth limit for species other than the Hollong-Mekai was fixed as: -

- i) Nahor – 90 cm. g.b.h.
- ii) Others - 150 cm. g.b.h.

But all the dead dying damaged and wind fallen trees were to be removed in any case, of which the Hollong and Mekai will count against the final yield.

Following exploitable girth limit were fixed for marking of trees outside the Regeneration Block as selection marking:

- | | |
|--|-------|
| 1. Hollong - Mekai | 3.0 m |
| 2. Hollock, Sam, Sopa, Barpat, Bhelu | 2.7 m |
| 3. Bansum, Amari, Gansoroi, Simul, Dhuna, etc. | 2.4 m |
| 4. Gamari, Khakan, Bola, koroi, Hilika etc. | 2.4 m |
| 5. Nahor and Ajhar | 1.8 m |
| 6. Others | 1.8 m |

Subsidiary silvicultural operations like removal of tops and branches of felled trees, coppicing of the damaged saplings of Hollong and Mekai, tending by way of light weeding and shrub cutting around the seedling and saplings of Hollong and Mekai, annual climber cutting up to fifth year and then one in every two years till the regeneration is established were prescribed for the generation Block. Thinning in the congested patches was also prescribed to reduce root competition.

Similar precautions and tending operations were prescribed for the areas outside the Regeneration Block also.

Under the miscellaneous regulations, the formation and operation of Bamboo, Sand, Stone, Cane, Fishery and Patidoi Mahal were prescribed. Maintenance of the reserved Forest blocks, compartments and coupe boundaries were also prescribed. It was suggested that at least one experimental silvicultural plot should be established in Digboi Division to evolve the best technique for Hollong – Mekai plantation. *Michaniaspp.* eradication, etc. Laying out of sample and preservation plots was also prescribed. Thinning in the old plantations, problems of grazing, maintenance and construction of forest roads paths, buildings, etc also discussed and suggestions were in this regard in this plan.

The main objective of A.C. Das's plan was to accommodate the two plantation schemes for regeneration of Hollong – Mekai and raising of plantations of plywood species so that the sustained supply of raw materials to a large number of plywood mills was ensured. That is why the rotation for Hollong was reduced from 140 years as fixed in B.N. Das's plan to 45 years. The growth statistics of Jokai plantation centre shows that a Hollong tree attains an average girth of 1.2 m at the age of 45 years. Such a low exploitable girth limit could have been quite harmful from the environment and protection point of view.

In A.C. Das's plan, the model presented and used for calculation of yield in the first felling cycle and projecting the growing stock in the subsequent felling cycles was a uniform volume increment of 16% added to each girth class below the selection marking limit and 8% for the girth classes above the selection limit. This involves an assumption that in a period of 15 years all the trees in each girth class pass over to the next higher girth class. The available growth data for Hollong does not support this hypothesis. The number of years required by a tree to pass over to the next higher girth class is different for each girth class. It is mentioned in the plan that the volume increment percent is 16% for each girth class. But actually, it is different for each girth class as can be seen from the simple calculation made A.C. Das's plan. Because of these factors, the assessment of growing stock and yield calculation in A.C. Das's plan were not realistic and reflected on a very high estimation of yield.

As no control forms were regularly maintained in the Division during the plan period of A.C. Das's plan, a definite conclusion regarding the management of forests as per the Working Plan prescriptions cannot be drawn.

The felling was not carried out as per the felling sequence prescribed in the plan. Also adjustment of excess and illegal felling was not done against the final yield.

11.2.6 M.C. Malakar's Working Plan (2000-2001 to 2009-2010)

This is a revised plan of Digboi Division revising the last plan of the Division prepared by Sri A.C. Das, I.F.S. which covered the period from 01-10-74 to 30-09-86. From 30-09-86 to 01-10-2000 there was no approved working plan of Digboi Division.

The first preliminary working plan in respect for this plan was prepared by Sri Abdul H.Choudhury, I.F.S. Dy Conservator of Forests. Accordingly, the enumerated works were taken up from 1980 to 1986. Initially 100% enumerations were carried out for most of the areas. Later on, it was brought down to 20% for some of the compartments and finally to 10% for the remaining compartments.

This working plan was approved by the C.C.F. (Central), Shillong subject to field verification of the enumeration data by statistical sampling by a special team (to be constituted by the C.C.F. Working Plan, Govt. of Assam) within a period of one year. In the event of failure to submit the verification report to the C.C.F (Central) by the constituted team before 30-09-2001, the approval of the same was automatically withdrawn.

The working plan officer, Upper Assam has already been stated the enumeration work in Digboi Division. However, the data are not updated in this plan till to date and therefore the M.C.Malaker's Plan is still un-operative.

This plan is written elaborately and included all the aspects of Digboi Division such as recreational forestry and eco-friendly tourism, background of compartment numbering, thinning, J.F.M. etc. In this plan four working circles have been prescribed according to Forest type and nature and these are:

- i. Hollong plantation working circle.
- ii. Hollong Mekai Regeneration working circle.
- iii. Miscellaneous plantation working circle.
- iv. Participatory firewood plantation working circle.

(i) Hollong plantation working circle: Hollong is the most sought after plywood species in the region which unlike Mekai, does not seem to deteriorate even after maturity. So the areas poor in Hollong stocking sought to be enriched even by artificial plantations of Hollong polypot seedlings. The main object of Management of this working circle is to enrich the existing poorly stocked areas of Hollong by means of its regular plantation, as the species is economically the most important and valuable one in this tract of forests. A considerable portion of this working circle is covered by poorly stocked Hollong, Nahor forests, known as Upper Assam *Dipterocarpus*, *Mesua* formation. But the major areas are occupied by miscellaneous forests, which are also evergreen in nature and capable of growing Hollong, but having very small proportion of these two main species of Hollong and Mekai. A small negligible portion of blank areas and planted up areas are also included in this working circle.

For facilitating the execution of prescription this working circle have been divided into seven felling series analogous to the seven Ranges. The seven felling series are:

Felling series	Area (Ha)
1. Digboi Felling Series	6869.53
2. Lakhpathar Felling Series	3866.80
3. Soraipung Felling Series	1780.91
4. Margherita (East) Felling Series	2354.86
5. Margherita (West) Felling Series	4230.16
6. Lekhapani Felling Series	423.00
7. Jagun Felling Series	1594.60

The rotation of Hollong Mekai trees were fixed at 70 years corresponding to 180 cm.g.b.h. The conversion period is also fixed at 70 years. The total yield will be 11,734 cu.m per year. The marking rules for artificial regeneration block are as follows:

1. All dead dying diseased, wind fallen, top broken etc are to be first marked.
2. All Hollong Mekai 120 cm in g.b.h. and other from 90 cm in g.b.h. to be marked.

In un-allotted block only hygienic felling is necessary by removing dead and wind fallen tree only.

(ii) Hollong Mekai regeneration working circle: The areas formed to be well stocked with Hollong Mekai are considered to be capable of replenishing itself with natural regeneration of the said two species with slight assistance through canopy manipulation. The main object of management is to increase the growing stock of Hollong and Mekai in the areas other than the regeneration blocks. In this working circle areas are occupied by medium and well stocked Hollong-Nahor and Hollong-Mekai forests having sufficient natural regeneration. There are six felling series formed for each Range except Margherita East Range. These are:

Felling series	Area (Ha)
1. Digboi Felling Series	4591.84
2. Lakhpathar Felling Series	2156.30
3. Soraipung Felling Series	3369.60
4. Margherita (West) Felling Series	3206.76
5. Lekhapani Felling Series	1198.30
6. Jagun Felling Series	2829.30

The rotation is forced at seventy (70) year's corresponding to exploitable girth of 180 cm at g.b.h. as done in Hollong plantation working circle. The conversion is fixed at 70 years. The silvicultural system is the irregular shelter-wood system retaining advance girth of 1.5 mt. in g.b.h. The annual yield of this working circle will be 20813 cu. m.

The marking rules for regeneration block are as follows:

- a) Removal of Hollong Mekai above 1.5m girth in well and medium stocked area. In poor stocked area 8 nos of seed bearer per ha to be retained as mother tree.
- b) Other species like Nahor above 90 cm and all other species above 1.5 mt to be marked and removed.

(iii) Miscellaneous Plantation working circle: The areas where Hollong plantation is not suitable such as seasonal swampy area and riverine area, the miscellaneous species can be tried in those areas to produce at least some quantity of timber or other forest produce instead of keeping the areas blank.

The main object of management is to enrich the poorly stocked forests by raising plantation of economically valuable species and maintaining the composition for the crop as near to the original formation as possible. Moreover, to meet the local demand of fire wood, timber etc. partially from the thinning outturn.

The silvicultural system adopted for this working circle is partial felling of species present up to 60 cm g.b.h. retaining advance growth of economically valuable species and creation of plantation of Miscellaneous species.

The rotation for this working circle is fixed at 60 years corresponding to exploitable girth of 180 cm g.b.h. in case of Kadam, Borpat and Simul. The conversion period is fixed at 60 years, corresponding to the rotation period. This working circle have been divided into three felling series:

Felling series	Area (Ha)
1. Margherita (West) Felling Series	1154.28
2. Lakhpathar Felling Series	835.30
3. Lekhapani Felling Series	1015.80

The annual yield will be 777 cu.m.

The marking rules in regeneration blocks are as follows:

- 1) Hollong and Mekai above 150 cm g.b.h. are to be marked. In case of other species 60 cm. g.b.h. are to be marked.
- 2) All dead, dying diseased and top broken trees will be marked.

In UN - allotted block any trees suppressing seedling of valuable species including Hollong, Mekai should be marked.

In subsidiary silvicultural operation in Regeneration block the tops and branches of the harvested trees should either be extracted departmentally for disposal as firewood or be offered to the local villagers for using in their homes. In un-allotted block Hollong or Mekai seedling damaged during felling should be coppiced.

(iv) Participatory firewood plantation working cycle: To meet up growing demand of firewood raising some specific plantation of fast growing species in the fringes of RF area with people participation under J.F.M. scheme.

The areas allotted under this working circle are mainly encroached areas, productive blanks, degraded open area subjected to heavy grazing and biotic interference from adjacent villagers.

The main object of management of this working circle is to clear the areas from encroachment and raising two tier plantations, Upper tier with Miscellaneous plywood species and lower tier with firewood species, to meet local demand. To involve local people in protection, maintenance and creation of plantation by forming Forest Protection and Regeneration Committees of willing villagers of adjoining villages.

The five felling series have been formed and these are:

Felling series	Area (Ha)
1. Digboi Felling Series	530.70
2. Lakhipather Felling Series	348.80
3. Margherita East Felling Series	275.40
4. Lekhapani Felling Series	220.20
5. Jagun Felling Series	506.20

The rotation for firewood species is 10 years where as rotation for Miscellaneous plywood species is 60 years. The conversion period is also 60 years.

In this working circle the D.F.O. will constitute Forest Protection and regeneration Committee within the framework of Assam Joint (people's participation) Forestry management Rule 1998 from amongst the willing villagers of the adjacent villages.

Survey and demarcation of annual areas for plantation for each plantation centre under each felling series will be carried out and map of each plot will be prepared. Where the plantation areas are large more than one plantation may be opened in such felling series. The species for miscellaneous plywood plantation will be Kadam, Borpat, Simul, Bon-am, Bhelu, etc and for firewood will be Maj, Koroi, Acacia, Ajhar, Nuni, Ghoraneem, Bohera and any other available species. In subsidiary silvicultural operation in Regeneration block protection measure of new plantation from grazing and other biotic interference to be taken with the help of the beneficiaries.

11.2.7 A.C Sarmas's Working Plan 2005-2006 to 2014-2015

This was the most elaborate working plan as on date written on the basis of national forest policy and Govt. of India's guidelines for writing working plans with the following objectives:

- To conserve the existing forests by suitable utilization, restoration and enhancement of natural environment,
- To improve the growing stock by adopting suitable method of working plan for regeneration and plantation,
- To protect the already over exploited and rehabilitate the degraded forests,
- To encourage people's participation for rehabilitation of degraded forests through regeneration and protection,
- To recover the encroached lands systematically and plant up the same. To evolve and effective methodology to prevent fresh encroachments,

- f) Consistent with above to conserve soil, water, trees and wildlife to maintain ecological balance,
- g) To provide sustained yield of timbers to meet the existing and future demands i.e. ply wood for ply wood industries and other timbers for socioeconomic needs of the locality and also state in general.

In this plan the following methods of treatments were suggested:

- 1) In areas where Hollong-Mekai is poorly stocked, felling of all the bigger size trees retaining Hollong and Mekai up to 120 cm girth at breast height and in case of other species up to 90 cm girth at breast height, as advance growth and then planting the areas with Hollong poly potted seedlings,
- 2) Concentrated operations in the specifically earmarked regeneration blocks of the well-stocked Hollong-Mekai areas for assisted natural regeneration by canopy manipulation,
- 3) Selection marking for hygienic felling in areas outside regeneration blocks,
- 4) Plantation of suitable species in the marshy and productive blanks and
- 5) Raising of suitable firewood species in the areas near human habitations.

A.C. Sarma suggested the following working circles to meet the outlined objectives above:

- 1) Hollong plantation working circle,
- 2) Hollong-Mekai regeneration working circle,
- 3) Misc. Plantation working circle,
- 4) Joint Forest Management working circle,
- 5) NTFP overlapping working circle,
- 6) Protection overlapping working circle,
- 7) Wild Life and Bio-diversity conservation working circle.

(The Working Plan was not approved. Since 1987, there is no operative working plan for Digboi Forest Division).

11.3 Special works of improvement undertaken

Various schemes has been implemented in the division under various projects like Fodder Plantation Scheme under Project Elephant Scheme, Revolving Fund Scheme and Compensatory Plantation Scheme,

11.4 Past yield, Revenue and Expenditure

Since 1996, felling of trees is banned in the Division. The following tables show the past yield, revenue and expenditure in the Digboi division.

Table 11.4.1: Statement showing Revenue and Expenditure of previous Plan and Non Plan Budget

Financial year	Revenue	General Budget (Rs.)			Development Budget (Rs.)			Total of General & Development Budget
		Conservation of works	Establishment	Total	Conservation of works	Establishment	Total	
1989-1990	3727198.96	3052342.66	4122360.56	71774703.22	2459834.31	146618.20	2606452.51	9781155.73
1990-1991	2073552.83	5065492.85	4427641.05	99493133.90	2932201.79	189753.73	3121955.52	12615089.73

1991-1992	40480666.15	5834405.07	5596851.57	11431256.40	3732087.23	211243.97	2943331.20	15374587.80
1992-1993	9207525.83	6529969.86	5684348.80	12214318.66	3216328.33	142667.00	3358995.33	15573313.99
1993-1994	15138701.87	4963044.46	5969612.25	10932657.71	2495976.28	121541.00	2617517.28	13550174.99
1994-1995	4314811.72	9995161.21	7150675.72	9145836.93	1599701.00	285498.00	1885199.00	11031035.93
1995-1996	15295277.15	3534296.66	8220721.00	11755017.66	1406133.00	277224.00	1683357.00	13438374.66
1996-1997	18924899.10	4445791.61	8884011.10	13329802.71	1052045.82	376808.00	1428853.28	14758655.99
1997-1998	2309070.00	2574659.41	8165320.00	10739979.41	778955.00	409542.00	1182497.00	12922496.41
1998-1999	1163548.00	3918888.23	13098651.00	17017539.23	1222700.00	895943.00	2118643.00	19136182.23

Table 11.4.2. Expenditure statement of Plan and Non-Plan w.e.f. 1995-96 to 2004-05 of Digboi Division

Year	Non – Plan (Rs.)	Plan (Rs.)
1999-2000	21812024.00	1500265.00
2000-2001	16770038.00	2020822.00
2001-2002	19642463.00	1446329.00
2002-2003	17384318.00	3472944.00
2003-2004	20907727.00	1053419.00
2004-2005	19184373.00	903000.00

CHAPTER 12

STATISTICS OF GROWTH AND YIELD

Hollong is the most important and valuable species in this tract of forest of this Division. The other main associates having economic and industrial importance are Mekai, Nahor, Sam and Champ. Data recorded by the silvicultural Division from the sample plots and linear increments plots scattered in Digboi division were collected to prepare the growth curves of Hollong, Mekai, Nahor and Champa. The diameter obtained against ages of the different species as read from the curves is given in table 12.

Table 12: Table with diameter at breast height (dbh) in cm under different ages of trees in Digboi division.

Age (years)	Hollong dbh (cm)	Mekai dbh (cm)	Nahor dbh (cm)
10	11.0	10.90	13.70
20	17.50	17.30	17.50
30	24.50	24.30	21.60
40	32.50	32.00	26.00
50	43.00	40.80	30.60
60	55.50	50.00	35.60
70	108.50	59.00	40.20
80	125.2	67.20	45.20
90	143.8	74.50	50.20
100	166.2	81.30	58.4
110	174.6	88.00	62.3

However, due to the changes in the forest conditions, anthropogenic pressure and effect of climatic variability perhaps there has been changes in the growth characteristics of the tree species. Therefore, during the tenure of the current working plan period periodic data would should be recorded and realistic volume table for the important timber species should be developed.

12.1 Statistics of Yield

In this Working Plan no felling prescription is given. However, the average volume of trees at different diameter classes as calculated from the existing data is shown in table 12.1.

Table 12.1. Volume table (cu.m) of signatory species under different dia classes (cm) in Digboi division.

Dia class	Hollong	Mekai	Nahor	Sam	Sopa
10-20	0.12	0.11	0.04	0.04	0.05
20-30	0.15	0.13	0.07	0.06	0.08
30-40	0.29	0.41	0.26	0.36	0.29
40-50	0.82	0.89	0.88	0.81	0.57
50-60	1.61	1.64	1.62	1.35	1.33
60-70	2.72	2.61	2.39	2.04	2.26
70-80	4.23	3.72	3.14	2.83	3.27
80-90	6.58	5.19	4.19	4.26	4.74
90-100	9.68	6.75	4.23	5.96	6.26

12.2 Statistics of Forest Carbon Stock

The average forest carbon (tons) stock under different diameter class (cm) for Digboi forest division is shown in Table 12.2.

Table 12.2. Forest carbon stock under different diameter class in Digboi division.

Diameter class (cm)	Number of trees	Average of Carbon Content (tons)
10 – 20	173829	0.12
20 – 30	93471	0.43
30 – 40	134781	0.99
40 – 50	82471	1.95
50 – 60	60250	3.28
>60	125003	9.19

PART II



FUTURE MANAGEMENT

CHAPTER 1

BASIS OF PROPOSAL

The working plan of Digboi Division is a technical document prepared to manage the forest under Digboi Division on sustainable basis. The overall objectives of the working plan are to restock the forest with its original multy layered floral composition, enhance biodiversity, improve growing stocks and maintain the environmental stability in the areas under the Division.

1.1 Objectives of Management: To contribute achieving the National goal to have a minimum one-third of total geographical area of the country under tree cover. Effort should focus for consolidation and preservation of the existing forest cover and increase their productivity. The objectives of this forest management plan is organised around the following major elements for sustainable management.

1.1(1) Dynamics of Forests and Stands: Forest is a dynamic system. It is disturbed, destroyed and again regains its status through a dynamic process. Forest disturbances are events that cause change in the structure and composition of a forest ecosystem, beyond the growth and death of individual organisms. Disturbances can vary in frequency and intensity, and include natural disasters such as fire, landslides, wind, outbreaks of insects, fungi, and other pathogens, animal-caused effects such as grazing and trampling, and anthropogenic disturbances such as warfare, logging, pollution, the clearing of land for urbanization or agriculture, and the introduction of invasive species. Not all disturbances are destructive or negative to the overall forest ecosystem. Many natural disturbances allow for renewal and growth and often release necessary nutrients.

Small-scale disturbances are the key to creating and maintaining diversity and heterogeneity within a forest. Small-scale disturbances are events such as single-tree blowdowns, which create gaps that let light through the canopy to the understory and forest floor. This available light allows early-successional shade-intolerant species to colonize and maintain a population within the dominant forest, leading to the complex spatial mosaic forest structure recognized as old-growth. This process is referred to as patch dynamics or gap dynamics and has been described across many types of forests, including tropical, temperate, and boreal.

The sets and patterns of natural disturbances that characterize a particular area or ecosystem are referred to as the ecosystem's disturbance regime. A natural community is closely linked with its natural disturbance regime. For example, temperate and boreal rainforests typically have a disturbance regime consisting of high-frequency but small-scale events, resulting in a highly complex forest dominated by very old trees. In contrast, forests that have a disturbance regime consisting of high-severity stand-replacing events, such as frequent fires, tend to be more uniform in structure and have relatively young tree stands.

Forest succession is the process by which species recover and regenerate after a disturbance. The type of disturbance, the climate and weather conditions, the presence of colonizing species, and the interactions among species all influence the path that succession will take. Species diversity and composition fluctuate throughout succession. The classic model of succession is known as *relay floristics* and refers to a relay of dominant species. After a stand-replacing disturbance, shade-intolerant species colonize and grow into a dominant canopy, but due to their shade-intolerance they are unable to regenerate under their own canopy; the understory (composed of shade-tolerant species) gradually replaces the canopy, and due to its shade-tolerance it can regenerate under its own canopy and therefore becomes the dominant species. Often succession is not so complete or directed as the relay floristics model describes. Species can be mid-tolerant of shade and survive by taking advantage of small amounts of light coming through the canopy, and further disturbances can create small gaps. These and other factors can lead to a mixture of dominant species and a not so obvious “end” to succession (climax community).

Many successional trajectories follow a basic four-stage development pattern. The first of these stages, *stand initiation*, occurs after a major disturbance and involves many species arriving in the area of abundant light and nutrients. The second stage, *stem exclusion*, describes the growth and competition of these species as resources become less available; likely one or a few species outcompetes and becomes stand-dominating. The third stage, *understory reinitiation*, involves further disturbance and the creation of gaps; at this point stratification develops, with layers of canopy, midstory, and understory appearing. The final stage, known as *old-growth*, is the extension and completion of the understory reinitiation; a complex multi-aged and multi-layered forest has developed.

The forests of Digboi Division already attained the fourth stage of successional trajectory, but the disturbances including over exploitation had pushed it steps back which need to be addressed by assisting with appropriate silvicultural treatment.

1.1(II) Forests and Soil: Forests and forest soils play a broad, complex and interactive role within the environment. Soils have provided the foundation for trees and entire forests over millions of years. Soil is an important component of forest and woodland ecosystems as it helps regulate important ecosystem processes, such as nutrient uptake, decomposition, and water availability. Soils provide trees with anchorage, water and nutrients. In turn, trees as well as other plants and vegetation, are an important factor in the creation of new soil as leaves and other vegetation rot and decompose.

1.1(III) Forests and Water: Water is the most vital element of all natural resources and is essential to life. Forests and woodlands have a close relationship with our water resources, and forest management and water quality are closely linked. It is widely recognised that sustainably managed forests play an important role in maintaining water quality. Through stabilisation of soil, forests minimise erosion and hence reduce the impairment of water quality due to sedimentation. Woodlands protect water bodies and

water courses by trapping sediments and pollutants from other up-slope land use and activities. Forests also play a role in water availability. They influence the amount of available water by intercepting precipitation, evaporating moisture from vegetative surfaces, transpiring soil moisture, capturing fog water and maintaining soil infiltration. At the same time, forests may influence the timing of water delivery by maintaining and improving soil infiltration and the soil's water-storage capacity.

1.1(IV) Forest Biodiversity: Forest biological diversity is a broad term that refers to all life forms found within forested areas and the ecological roles they perform. As such, forest biological diversity encompasses not just trees, but the multitude of plants, animals and micro-organisms that inhabit forest areas and their associated genetic diversity. Forest biological diversity can be considered at different levels, including the ecosystem, landscapes, species, populations and genetics. Complex interactions can occur within and amongst these levels. In biologically diverse forests, this complexity allows organisms to adapt to continually changing environmental conditions and to maintain ecosystem functions. Forest biological diversity results from evolutionary processes over thousands and even millions of years which, in themselves, are driven by ecological forces such as climate, fire, competition and disturbance. Furthermore, the diversity of forest ecosystems (in both physical and biological features) results in high levels of adaptation, a feature of forest ecosystems which is an integral component of their biological diversity. Within specific forest ecosystems, the maintenance of ecological processes is dependent upon the maintenance of their biological diversity.

1.1(V) Climate and Forests: Forests' role in climate change is two-fold. They act as both a cause and a solution for greenhouse gas emissions. Around 25% of global emissions come from the land sector, the second largest source of greenhouse gas emissions after the energy sector. About half of these (5-10 GtCO₂e annually) comes from deforestation and forest degradation. Forests are also one of the most important solutions to addressing the effects of climate change. Approximately 2.6 billion tonnes of carbon dioxide, one-third of the CO₂ released from burning fossil fuels, is absorbed by forests every year. Estimates show that nearly two billion hectares of degraded land across the world – an area the size of South America – offer opportunities for restoration. Increasing and maintaining forests is therefore an essential solution to climate change.

IUCN's forest work tackles the role of trees and forests in building resilience to climate change in several ways:

- **Combatting deforestation and forest degradation** in areas of high biodiversity and cultural significance, such as primary forests and World Heritage sites. This helps conserve the benefits that people and societies get from forests, including forest carbon stocks and livelihoods.
- **Restoring forest landscapes** helps enhance climate change mitigation and adaptation. As the co-founder and Secretariat of the Bonn Challenge – a global effort to bring 150 million hectares of deforested and degraded land under restoration by 2020 and 350 million hectares by 2030 – IUCN supports national and sub-national decision makers in reaching this important goal.

Reaching the 350 million hectare target could sequester up to 1.7 gigatonnes of carbon dioxide equivalent annually.

- **Enabling rights-based land use** ensures community involvement in land-use outcomes. IUCN produces results on the ground through partners and projects worldwide to help strengthen community control over forests, alleviate poverty, empower women and men, enhance biodiversity, and sustainably manage forests.
- **Unlocking forest benefits** is critical to a sustainable and equitable supply of forest goods and services. IUCN builds capacity for implementing restoration, engaging the private sector and striving to make sure benefits – such as those from Reducing Emissions from Deforestation and Forest Degradation (REDD+) – are equitably shared with local landowners and forest communities.

1.1(VI) Socioeconomic considerations and generation of forest based employment opportunities and livelihood options:

India is a developing nation. The majority of its population resides in rural areas. Forests are important renewable natural resources generating livelihood requirements for more than 25% of the world's population. Forests play an important role in the rural economy. In many areas, forests and trees are among the few resources that are available to rurals. They provide different kinds of benefits: employment and incomes often needed to supplement inadequate returns from agriculture; produce such as fuelwood, food, fodder and poles for the home; and -a range of environmental benefits, without which other activity, such as agriculture might be impossible. Forest sector is the second largest land use after agriculture. Statistics reveals, in remote forest villages about 300 million tribal and other local people depend on forest for their subsistence and livelihood and about 70% of India's rural population depends on fuelwood to meet its domestic energy needs. For about 100 million of them, forests are main source for livelihood and cash income from fuelwood, non-timber forest products or construction materials. The application of local skills and village-level technology in wood-based and small-scale forest based enterprises provide secondary employment and livelihood opportunities for rural people, Forest development integrated with agricultural and industrial progress has great potential to enhance livelihood security, poverty reduction and food security for vulnerable section of society including illiterate, unskilled, resource-poor, jobless, landless and labourers people in rural India.

1.1(VII) Tool for integrated development: Integrated development means the integration of development schemes. This Working Plan may be a tool for integrated development. The main objective of integrated development is to provide employment opportunities to the poor as well as to provide opportunities to develop their skill sets so as to improve their living conditions. This Working Plan emphasizes in upliftment of socio-economic condition the village community. There are numbers of rural development schemes of the Government. Maximum of those schemes do not percolate to the village communities particularly to the fringe forest areas. Forest department can create a liaison with the departments with a view to take these communities accessed to the development schemes. Working in convergence with other line

departments for upliftment of socio economic condition of rural people shall be emphasized during the tenure of this Working Plan. Details are mentioned in para 8.20, chapter-8 of Part- II.

Considering the above major elements and with a view for sustainable management, the following objectives are set for this forest management plan.

- i) Main objective of the Working Plan is to increase productivity of the forest ecosystem and maintain the vitality. To restock the degraded forest with its original multi-layered indigenous floristic composition of Hollong, Mekai, Nahor under intensive system of management with the aim of attainment of normal forest in due course.
- ii) To protect the forest from various forest depletion drivers e.g., illegal felling, encroachments and other anthropogenic factors.
- iii) To retain and enrich all the moist deciduous forests of comparatively poor value by raising plantations of more valuable indigenous species.
- iv) To protect the crests, ridges and steep slopes as well as the forest soil from erosion adopting various biological and engineering interventions.
- v) To protect water bodies by increasing woodlands and to augment hydrological regime of both surface water and ground water.
- vi) To protect and conserve the rich biodiversity of the forest which include multitude of plants, animals and micro-organisms that inhabit forest areas and their associated genetic diversity.
- vii) To create a substitute habitat for wildlife in the reserve forests so that wild animals can enjoy a broader habitat besides the Protected Areas (PA).
- viii) To improve of degraded habitat of wildlife ensuring availability of basic habitat formation criteria e.g, food, water and shelter. Biodiversity conservation shall be one of the prime agendas.
- ix) To enhance the Carbon pool growing more and more trees enabling increased carbon sequestration and decreased green house gas emission.
- x) To uplift socio-economic condition of rural communities living in and around the forests and fringe forest areas.
- xi) To evolve means for generation of forest based employment opportunities and livelihood options besides catering their need for firewood, timber, NTFP etc. sharing forest management practices and empowering village community.
- xii) To improve the living conditions of tribals and forest dependent communities through sustainable harvest of non timber forest products.
- xiii) To take communities accessed to various Government development schemes. Apart from development schemes of the forest department, other departments' schemes are also will be brought for their socio-economic development.

1.2 Methods of treatment to be adopted

Method of treatment depends upon the ecological and silvicultural requirements for sustainable management of different identified forests. Different method of treatment for different Working Circle keeping in view the stakeholder's requirements, aspects of biotic factors, legal status of forests, drivers of unsustainability, etc. shall be prescribed.

1.2.1 Treatments prescribed

- i) Existing forests will be protected from all sorts of forest degradation factors. All efforts shall be given to restock the forest as it was a couple of decades ago.
- ii) Soil and moisture conservation efforts shall be boosted to prevent soil erosion and siltation of the water bodies.
- iii) Suitable tending and soil working operations will be carried out to stimulate the growth of the naturally regenerated seedlings and rootstock.
- iv) Timber, if silviculturally available, will be extracted from the dense tree forests capable of producing medium to large-sized timber and poles on sustained basis.
- v) Open forest areas and traditional pastures will be managed with active participation of tribal and village communities for improving the productivity of the land to meet the local domestic needs of fodder and fire wood.
- vi) Uncontrolled grazing, fire, poaching, illicit cutting and uncontrolled encroachment, the major threats for sustainable growth for forest, shall be curbed.

1.2.2 The General Approach of the Treatments

- i) The entire forests will be protected from harvesting. 20 meters wide strips on both sides of streams, watercourses and 40 meters from the river will be protected, no harvesting in these strip areas.
- ii) Special habitat management for wildlife conservation will receive high priority. Digboi being frequented with riparian zones and mesic sites these needs to be protected with extra care. Adequate buffer will be provided to any such important sites in the Division for preparing treatment maps including any harvestings. Dead, dying, decay snag, den trees and down logs will be protected to cater the habitat requirement of birds and small animals, they prefer to build their nests in such build formations. Wildlife requirements shall be the most important consideration for water body management in forest areas.
- iii) Preference will be accorded to natural regeneration and rootstock management. Natural regeneration and promising coppice growth will receive suitable tending and soil working to stimulate growth and development. Areas having good natural regeneration of valuable species shall be protected from fire and grazing. Artificial regeneration will be used as supplementary activity, at places, where natural regeneration is inadequate or is not likely to succeed.

- iv) Management of forests close to villages will be given priority for meeting demands of local people for small timber, poles, firewood, fodder, non-wood forest produce, etc. Local people will be actively involved in forest management, forest protection, plantations and development of natural resources in the village. Management of forests close to villages shall primarily be done through JFM committees.
- v) Non-Timber Forest Produce (NTFP) has great potential for sustainable economic development of local communities with conservation of forest resources. Sustainable NTFP production will be given high priority in the forest management.
- vi) Sustainable use of forest resources will remain the guiding principle for managing the demands of forest produce and services. Various government and non-government agencies will be engaged in identification and promotion of ecologically sound and economically feasible alternatives like wood saving technology, stall-feeding, population control of cattle and livestock improvement.
- vii) Involving local people in managing forests and generating awareness in rural and tribal areas is considered indispensable for the forest conservation.
- viii) Reducing biotic pressure on forests, particularly, illicit felling, unsustainable grazing, fire and encroachment near villages will be considered on priority basis.
- ix) Forests capable of producing medium to large sized timber will be harvested under the Selection-Cum-Improvement management system.
- x) Boundary demarcation will be carried out in time-bound manner for ensuring territorial integrity of forests.
- xi) Action will be taken to convert all the miscellaneous forests adjoining the Reserved Forests and large patches, away from villages into Reserved Forests.

1.3 Constitution of Working Circles

The Working Circles proposed and approved in PWPR for Digboi Forest Division are listed below.

- 1) Joint Forest Management Working Circle
- 2) Plantation and Regeneration Working Circle
- 3) Forest Protection Working Circle
- 4) NTFP and Bamboo (overlapping) Working Circle
- 5) Soil and Water Conservation (overlapping) Working Circle
- 6) Wildlife Management and Biodiversity conservation (overlapping) Working Circle

1.3.1 Justification for constitution of the Working Circles

Joint Forest Management Working Circle: This working circle has been constituted keeping in view the present requirement of the local people for planning and implementation of the various forestry activities. There has been a paradigm shift in the concept of forest management. Involvement of rural communities must be ensured in forest protection instead of policing with a little manpower. The past experience has

taught a lesson that unless and until the rural communities are taken into confidence and their regular requirements, are not met meticulously, possibility of achieving the desired results of bringing the forest cover as envisaged in the 1988 forest policy are very little. Joint Forest Management is sharing of responsibilities, authority and usufructs between the village community or the forest user group and the forest department on the basis of a memorandum of understanding (MoU) between the two.

2) Plantation and Regeneration Working Circle: Forests of this Division have been degraded to a large extent. Encroachment and illegal felling alongwith other anthropogenic interferences resulted depletion of forest cover including timber stock. Coal mining has already destroyed huge rain forest patches. There is an urgent need to restock the forest and it is proposed to undertake massive plantation activities in the Division. Forest Areas with canopy density of less than 10 percent and suitable for raising plantation but does not fall in Wildlife and Bio-diversity, JFM Working Circle or NTFP Working Circle or areas having matured plantations, irrespective of canopy density, without any naturally regenerated forest crops as under canopy are allotted to this Working Circle. Management intervention such as artificial regeneration, felling of the matured crop including dead, dying, diseased, wind fallen, top and mid broken trees and artificial regeneration of commercial long rotation high value species, short rotation high yielding species, fuel wood species, soil moisture conservation works are taken up in this working circle.

3) Forest Protection Working Circle: Forests of Digboi Division are under tremendous pressure from encroachment, illicit felling, grazing besides other anthropogenic activities like Coal mining etc. As per Land use change analysis, significant forest area has been lost during last couple of decades. It is need of hour to protect the last vestiges of the biodiversity hotspot checking further shrinkage. From the view point of forest protection, this working circle shall include entire forest area of the Division. Such areas shall not be worked for timber or other NTFPs but shall be preserved by providing highest degree of protection. These areas should be seen as the ones which sustain the flow of ecosystem services to the fringe forest areas/JFMC areas as well as to the non-forest areas. Hence, it becomes absolutely essential to keep the core of the forest areas/ representative ecosystems intact and free from human disturbances. After many years in future, when the ecosystem starts functioning again at its peak productivity, sustainable extraction from these forests may be allowed. Till that time, these forests shall function as nature's laboratories, which will keep on imparting insights about the functioning of the nature, to a keen observer.

The objective of the Working circle is not only to protect the existing forests but also to clear the encroached areas for restoration of the forests as per the rules and regulations in vogue. Ejection of encroachers is no doubt an uphill task for the present-day administrators simply because of the whooping extent and magnitude of the problem. It requires an all-out effort from all government departments such as Revenue, Police, Forest, Paramilitary, Judiciary etc. There is every need to revise certain policies to begin thinking in the direction of rehabilitation of such a huge number of encroachers to suitable places with attractive compensation package.

4) NTFP and Bamboo (overlapping) Working Circle: The NTFP working circle shall comprise largely of fringe forest areas or such other areas, which are fit for extraction of a particular NTFP at a rate, that does

not lead to the long term decline of the biological diversity so as to maintain its potential to meet the needs and aspirations of present and future generations. All Compartments with canopy density less than 0.2 or some of the Compartments or areas having diversity of non-timber products such as Cane, bamboo, jengu leaves, caupats, patidoi, seeds and flowers of different trees, barks, roots, tubers, leaves etc. which have commercial value are to be allotted to NTFP overlapping working circle. Management interventions like erection of water harvesting structures along the streams, measures for soil and moisture conservation are to be taken up in such area.

Another aim of this working circle is at the production and harvesting of high quality bamboo on a sustainable basis. All the poorly stocked bamboo bearing areas, particularly in the fringe areas, shall be restocked with indigenous and commercially harvestable species. Efforts shall be made to extract bamboo from the difficult to work areas included as parts of prescribed felling series. The working circle should not only meet the demands of Paper Mill, Households, Crafts and Cottage Industries but also provide proper facilities for processing, storing and marketing of the bamboo. It is needless to mention that bamboo can replace timber in most of its uses.

5) Soil and Water Conservation (overlapping) Working Circle: The effective soil conservation measures along with the catchment and watershed management are the pre-conditions for a sustainable forest management. The forests are also sources of water (surface, sub-surface and ground water). Over exploitation of the ground water resources results in a decline in ground water levels; there is an urgent need to augment the ground water resources through suitable management interventions. It is desirable to have forest management practices dovetailed with the principles of watershed based development approach especially in the source areas of water. Such areas should have restrictions on tree felling but there should be operations to improve the water regimes and natural regeneration. Many water streams originate from the R.F.'s of the Division and many streams and rivers originated from other States pass through the R.F.'s of this Division. There are 2 major wetlands, namely, Mota Beel and Bor Beel, and many small water bodies within the reserve forests of the Division. Special provisions shall be made in the working plan to sustain water resources and to address the livelihood issues of the people living in and around the natural inland water sources. Further, areas susceptible to soil erosion such as steep slopes and areas in the vicinity of perennial streams shall be focused for soil and water conservation using mechanical or vegetative control measures.

6) Wild life Management and Biodiversity Conservation (overlapping) Working Circle: Wildlife Management Working Circle will also include Eco-tourism sector as overlapping working circle. All the RFs under this Division are covered by Dibru-Deomali Elephant Reserve. A part of Upper Dehing RF (East block) and Dirok RF has been covered under Dehing Patkai Wildlife Sanctuary. The RFs under this Division is brought under Wildlife management overlapping Working Circle. Under this overlapping working circle activities proposed should be limited to habitat improvement, management for elephants, corridor improvement and protection measures. Special emphasis is given for creation of plantation of fodder species and digging of water holes so that the herds get sufficient food and water within its habitat. Measures should also be suggested for combating man-elephant conflicts.

The RFs under this Division are brought under Wildlife management overlapping Working Circle. Activities proposed are habitat improvement, management for elephant corridor improvement and protection measures and measures to reduce man-animal conflict. Special emphasis is to be given for creation of plantation of fodder species and fruit trees and digging of water holes so that the wild life including the birds gets sufficient food and water within its habitat. Measures should also be suggested for combating man-elephant conflicts. The areas having considerable density of wildlife are brought under eco-tourism circuit in the district. Sufficient measures are to be taken to develop infrastructures for the tourists and other visitors.

Biodiversity represents diversity of life forms. It includes diversity within species, among species of an ecosystem and among ecosystems. The contribution of individual species to the overall diversity within a community or ecosystem varies to a great extent. The coexistence of organisms that differ widely from each other contributes more to overall diversity than the co-existence of very similar species. Functional diversity is considered to be one of the main factors determining the long-term stability of an ecosystem and its ability to recover from major disturbances. Assessment of status of plant and faunal species and their periodic monitoring can be helpful in formulating strategies for conservation, maintenance and enhancement of overall biodiversity through sustainable management and use practices. Assessment of biodiversity especially the lower forms of life (algae, fungi, lichens, epiphytes, parasites, etc.) of a forest division must be made an on-going programme with the support from State Biodiversity Board as it may be difficult for the working plan officer (WPO) to do it within the time allotted for writing the plan.

1.4 Period of working plans and necessary for intermediate revision

The period of Working Plan will be for 10 years i.e. from 2019-20 to 2028-29. A midterm review of the Working Plan should be undertaken for mid-course correction by the consultative committee under the chairmanship of PCCF (HoFF) with representation from RAPCCF (MoEF). Similarly, based on the performance of the WP prescriptions the plan period may be extended up to 5 years beyond the stipulated plan period by designated authority on the recommendations of the standing consultative committee authorized for this purpose.

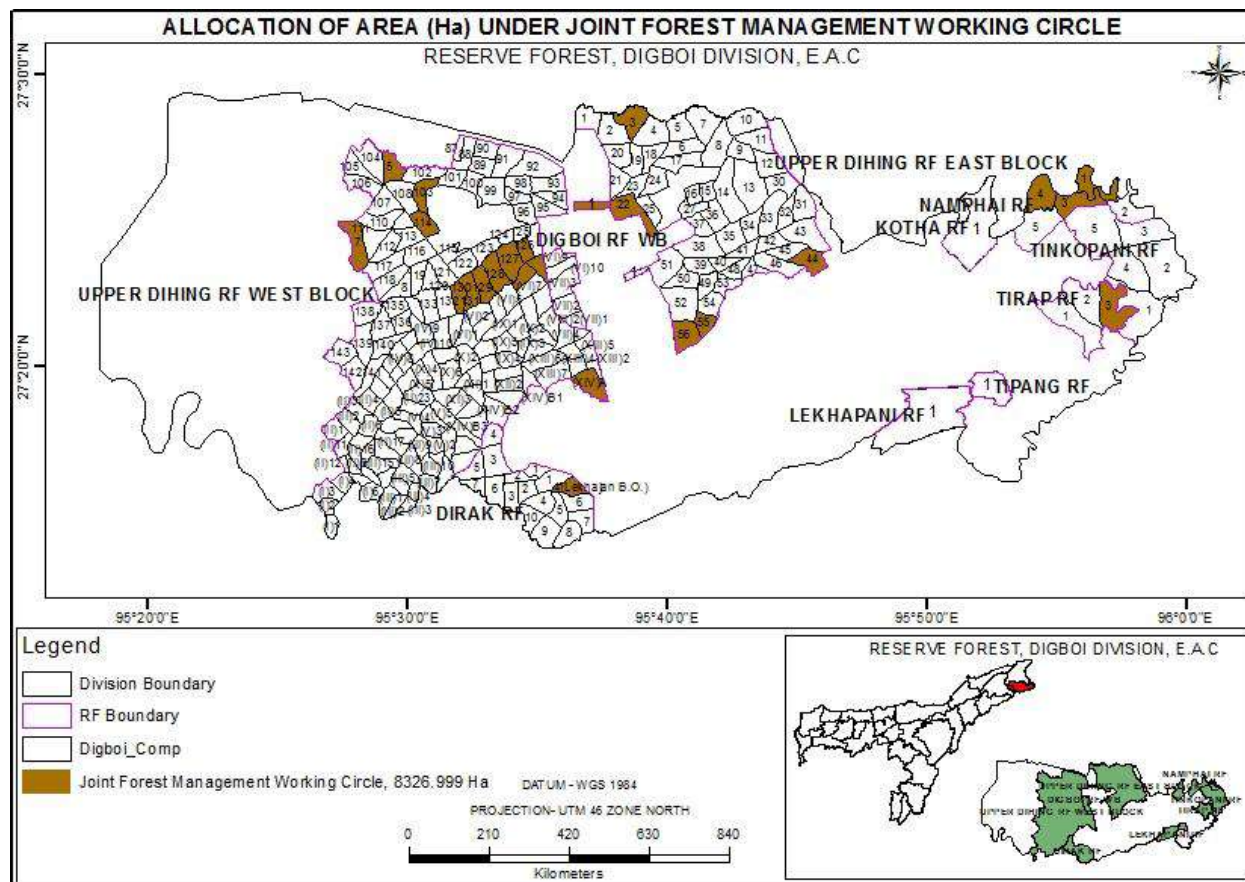
CHAPTER 2

JOINT FOREST MANAGEMENT WORKING CIRCLE

2.1 Name of the working circle:

Name of the Working Circle is “Joint Forest Management Working Circle”. The map of the proposed JFM working circle is shown in Figure 2.1.

Figure 2.1: Map showing proposed JFM working circle in Digboi division.



2.2 General constituents of the Working Circle:

JFM is a concept, which is based on the principle of rights of local communities in forests, a mechanism to manage the forest that is owned by the State but appropriated by local communities, also an approach involving the evolution of a very complex property rights regime to generate a sustainable interface between the Forest Department (FD) and the local community and it is a possible way through which the interests of people and of long term sustainability are harmonized in a mutually supporting manner.

Prior to 1988, the forest management objectives were commercial forestry & revenue generation. But the 1988 Forest Policy envisaged for conservation of soil and environment, subsistence requirements of the local people etc. Thereafter, the Government of India issued guidelines on 1st June, 1990 and adopted Joint Forest Management under the National Afforestation Programme for conservation of forests with

clearly identified duties and functions for ensuring protection of forests. The policy was motivated by a desire to both reduce environmental degradation and also reduce rural poverty.

2.2.1 JFMCs in Digboi Division:

2.2.1.1 Background: The National Forest Policy 1988 envisages massive people's movement for conservation of forest resources. The Govt. of India issued directions to all the State Governments vide letter no. 621/89-PP dated 1st June 1990 regarding framework for creating massive people's movement through involvement of village communities in the protection and management of degraded forest lands. The Ministry of Environment & Forests of Govt. of India issued circular no. 22-8/98-FPD dated February 11, 2000 and no. 22-8/2000-JFM (FPD) dated February 21, 2000 in which detailed guidelines are incorporated for the Joint Forest Management Programme. The Govt. of Assam also issued guidelines to constitute "JFM Committees realising the fact that forest protection can not be achieved without active participation and cooperation of local people. The quality of forests is degraded near human habitations and protection of these areas cannot be achieved unless there is people's participation and cooperation. The villagers with homogenous population and forest areas having sizable population of SC and ST and other economically dependent people shall be given preference to be included in JFM. Details of JFMCs (Name and area projected) are given in table 8.1 in Chapter-8, Details of empowerment of JFMCs are in Table 8.2,

Fringe Villages located within a span of 200m to 500m from degraded, and/or open forests areas are included in the JFMC Working Circle. Selected scrub areas, open forest, moderately dense forest with canopy density less than 10 % and the forest areas which are much susceptible for biotic interference are to be covered in JFMC Working Circle. Existing JFMCs will be boosted.

The micro plans of the JFMCs constituted in Digboi Division include activities such as creation of fuel wood, NTFP, aromatic and medicinal plantations depending upon the need and expectations of the people. Important entry point activities such as construction of community halls, repairing of school buildings, construction of Ring wells & installation of tube wells for drinking water etc. have been taken up. Implementation of several other income generating activities like Bee-keeping, *Agarbatti* stick making, bamboo mat making, weaving etc. have been done through SHGs to demonstrate the seriousness of department to involve people as partners in sustainable management of forests.

2.2.1.2 Need for Implementation of JFM: In consonance with National Forest Policy 1988, special emphasis is given to JFM due to increasing biotic pressure, depletion of soil due to soil erosion and degradation of forests. Demand is increasing for timber and fuel wood. Heavy grazing pressure, diversion of forest land for agriculture, industries, housing and irrigation projects etc are putting strain on forests. To check further loss of forest cover and forest area and to regenerate the degraded forests, the below mentioned aspects are given thrust while implementing JFM Programme.

- (1) Protection and management of forests by developing a sense of ownership and belongingness of forests among the local people, to regenerate degraded forest areas with the active participation of local people.
- (2) Increasing the vegetation cover and to carry out soil and moisture conservation works with the active co-operation of local people.
- (3) Involving local people in forest protection and to provide tangible and intangible benefits in lieu of their cooperation in forest protection.

2.2.1.3 Socio-economic conditions: The population of the Division primarily depends upon agriculture. Some are in Government job including School Teacher.

2.2.1.4 Status of JFM: In Digboi forest Division the JFM was started in 2003-04. The details of JFM implementation are given in the table 8.1 in chapter 8(part-I)

2.2.1.5 Details of villages under JFM in Digboi Forest Division: Number of JFM committees in Division is 39 and number of EDC is 8. Area allotted for protection Plantation area 8326.999 hectare. The population depends on agriculture and allied activities for the livelihood and most of the SC, ST population are land less and work as agricultural labourers. The population adjoining forests mostly depend upon forests for day to day needs, naturally causing pressure on forests. The cattle population also cause lot of pressure on forests for grazing. The local people hardly utilise this area for stall feeding of their cattle. In some pockets grazing by sheep and goats is noticed and they cause extensive damage to the regeneration. Apart from local cattle, migratory cattle also exert pressure on forests in this Division. The most important factor for the implementation JFM is willingness of the local people to participate in these activities. In this regard the guidelines stipulated in “The Assam Joint (Peoples Participation) Forestry management Rule-1998” shall be followed. At present out of 39 committees constituted in the Division, forest area of 3853 ha allotted for taking up plantations and other activities. Any deviation shall be required sanctioned from the competent authority. The participation of woman in JFM shall be encouraged.

2.2.1.6 Principles and ethics: Certain principles and ethics should be as follows as per guidelines for the implementation of JFM in any village.

- (1) Eco-system conservation and sustainable use of resources is the goal of resource management.
- (2) To enable development of strong institutional system in the long run for JFM implementation it is necessary to have participatory and democratic structure.
- (3) Open communication system and gender equity is of the prime concern.
- (4) Management responsibility and benefit sharing in relation to traditional usage should be ensured.
- (5) The community shall take the responsibility to maintain the system.
- (6) Effective conflict resolution should be ensured.
- (7) Traditional rights and uses shall be respected and rational approach should be adopted in accepting or rejecting same.

- (8) Discrete jurisdiction and proper terms of agreements should be ensured.
- (9) Effective monitoring and appraisal systems should be adopted.

2.3 General Characteristics of Vegetation:

Forests of the Division is a part of global bio-diversity hot spot (Myers, 1988; 1991) and has great biodiversity significance. The region is rich in medicinal plants, tea etc. The high biological diversity found in the district is often related to its forest cover, which is categorized into tropical wet evergreen forests. Some important tree species found in such forests include Hollong (*Dipterocarpus macrocarpus*), Guijan (*D. tubinatus*), Mekai (*Shorea assamica*), Kurta (*Palaquium polyanthum*), Nahor (*Mesua ferrea*) and Sianahor (*Keyea assamica*), Khagori or Khag (*Phragmites karka*), Nal (*Arimdo donax*), Ekra or Ikora (*Erianthus ravannae*), Ulu kher (*Imoperata cylmderica*), Meghela or Bhutang (*Saccharum arundinaccuin*, *S.procerum*), Kohuaor Kash (*S.spontaneum*). Other plant species found in the Division are *agerstroemia speciosa* (Ajhar), *Mansonia dipikae* (Badam), *Morns laevigata* (Bola), *Biscofia rnmnica* (Uriam), *Cordial dichotoma* (Bual), *Bombax ceiba* (Simalu), *Lagerstroemia parviflora* (Sida), *Delonix resia* (Radhasura), *Canarium benealensis* & *C resiniferum* (Dhuna, Dhup), *Ficus hispida* (Dimoru), *Premna bengalensis* (Gohra), *Caeslpima pulcherima* (Krishnasura), *Tetrameles mdiflora* (Bheleu), *Euclyptus sp..* *Artocarpus intern fblia*(Ka\ha\). *Psiditm miowt* (Madhuriam), *Dillenia indiea* (Oulena). *Melia azedarch* (Ghoraneem), *Gravelia robusta* (Silver oak), *Gmelina arborea* (Gomeri), *Adina oligocephala* (Haludsopa), *Terminalia chebula* (Silikha), *Terminalia myricarpa* (Holock), *Anthocephalus mdicus* (Kadam), *Michelia manii* (kathalsopa), *Magnolia baillonii* (Khorika sopa), *Ervthrina stricta* (madar), *Shorea assamica* (mekai), *Mesua ferrea* (Nahor), *Michelia montana* (Pan sopa), *Artocarpus chama* (Sam), *Sepium baccatum* (Seleng), *Saimalia malabarica* (Simul), *Albizia lebbek* (Sirish), *Dalbergia sissoo* (Sissoo), *Michelia doltosopa* (sopa), *Michelia champaca* (titasopa), etc. The shrubs and herbs vegetation includes mainly *Justicin adhatoda* (Bahaka), *Bambusa mastersii* (Betibah), *Cannabis sativa* (Bhang), *Solatium mdicum* (Bhekuri), *Alpinia nigra* (Bogitara), *Pseudostachyum polvmorphine* (bajal bah), *Pyrenaria barringtoniaefoha* (bon-madhuriam), *Sarauia roxburghil* (bon-pasala), *Centella asiatica* (bor manimuni), *Cassia tora* (daridinga, bon-medelua), *Clerodendron infortunatum* (dhoptita), *Litsaea salicifolia* (dighloti) *selerostachm fiisca* (ekra, bata), *ricinus communis* (Eragoch), *Pinanga gracilis* (gereguatamol, ramtamol), *Hvdrocotvle rotundifolia* (haru-manmani), *Zalacca secunda* (haukabab), *Antidesma ehaesembilla* (heloch), *Eupatormm odoratum* (jarmom bon), *Bambusa tulda* (jatibah), *Calamus tennis* (jatibet, rangi bet), *Licuala peltata* (jengu, japipat), *Calamus floribundus* (lejai bet), *Dendrocalamus hamiltomi* (kakobah), *Mvrsine cantellata* (kasodoria, kachidria), *Coffea benmlense* (kathandaphul), *Phrvnium placcenarium* (kawpat), *Saccharum spontaneum* (kusi), *Moghania strobihfera* (makhioti), *Saccharum narenga* (meghela), *Phragmites karka* & *Arudo donax* (nal), *Schumannianthus dichotomus* (patidoi), *Melastoma malabathricum* (phukuta), *Laportea crenulata* (sorat), *Phlogacanthus thvrsiflorius* (titaphul), *Livistonia ienkinsicma* (tokopat), *Bambusa palhdici* (wakthoi, makai bak) etc. along with climbers such as *Thunbersia coccinea* (Chonga lata), *Dalbergia stipulacea* (datbijla, datbijili), *Pegia mtida* (Dhindau - bagori lata), *Entada phaseoloides* (syn-e scandens), (*Ghilla. Barghilla* / Ghila -lewa), *Vitis latifolia* (syn- ampelocissus latifoha), *Thunbergia grandiflora* (kukua loti), *Mikama merantha* fmikana. manikilata), *Bauhinia vahle* (Nak-

lati-lewa) etc. The forest water bodies and their bank acts as a bed for numerous free floating aquatic plants such as *Eichhornia crassipes*, *Azolla pinnate*, *Pistia stratiotes*, *Lemna trisulea*, *Spirodela polkyrrhiza* and submerged plants such as *Halophila ovata*, *Hvdrilla verticillata*, *Potamoetodon crispum*, *Potamoetodon crispum Ruppia maritima* etc. They cover the surface of the water bodies throughout the year with plenteous growth during the summer season.

2.4 Compartments and JFM areas: Compartment allotted for JFMC Working Circle is as per criteria mentioned above. Felling series are not formed. The microplans prepared for the area allotted to a particular village of JFM committee shall be in consonance with the prescriptions given for that area under this working plan. Any deviation from the plan requires permission of the competent authority. A total of 8326.999 hectare area is allocated under this working circle. RF's and compartment and the area to be covered in this working circle is provided in the table 2.4.a

Table 2.4.a Area (ha) details under the JFM working circle of Digboi division, Assam

Sl. No.	Reserve Forests	Total RF area (ha)	Compartment Number	Compartment Area allocation to WC (ha)	Area (ha) allocated to WC
1	Bogapani RF	109.09	1	109.00	109.00
2	Dirak RF	3426.74	1	302.00	302.00
3			4(Lekhajan)	155.72	155.72
4			10	169.00	169.00
5	Namphai RF	1679	1	267.055	267.055
6			3	292.038	292.038
7			4	333.392	333.392
8			5	511.075	511.075
9	Tirap RF	1487.40	3	460.00	460.00
10	Upper Dihing EB RF	11686.54	22	320.091	320.091
11			44	240.972	240.972
12			55	139.09	139.09
13			56	272.013	272.013
14			FV	754.81	754.81
15			2	287.00	287.00
16			21	180.00	180.00
17			25	153.00	153.00
18	Upper Dihing WB RF	23594.74	(II)3	122.00	122.00
19			(II)4	142.00	142.00
20			(II)6	141.00	141.00
21			5	203.912	203.912
22			7	320.748	320.748
23			103	188.675	188.675
24			114	180.212	180.212
25			126	114.214	114.214
26			127	277.349	277.349
27			128	246.847	246.847

28			129	205.888	205.888
29			130	194.111	194.111
30			131	144.873	144.873
31			(VI)6	120.944	120.944
32			(VI)8	113.543	113.543
33			(XIV)A	269.907	269.907
34			Forest Village	1890.16	1890.16
35			(IV)1	107.00	107.00
36			(IV)10	194.00	194.00
37			(IV)11	136.00	136.00
38			(XIV)C3	115.00	115.00
39			(XIV)C4	130.00	130.00
	TOTAL	41970.62	-	10504.64	10504.64

2.5 Special Objective of management:

Economic objective: JFMC is a production farm where cultivation of various forestry crops is practiced. This Working Plan will allow practice of horticulture crop, agro-forestry cash crop, animal husbandry, bee keeping etc. for economic development of rural people. Agarwood (*Aquilaria agallocha*) cultivation which can bring a drastic change of the rural economy is proposed. The land for growing such crops shall be shared by the forest department.

Social objective: Uplifting socio-economic condition of rural people by providing employment and catering their need for firewood, timber, NTFP etc. sharing forest management practices and empowering village community shall be other agenda.

Conservation objective: Ensuring involvement of rural people in JFMC programmes will give a positive impact on forest conservation. The usufruct benefits gained out of farming in forest land is reciprocated by the rural villages in the form of helping hand for forest conservation.

Other objectives of management under this working circle shall be:

- To convince the people living in and around forests and fringe forest areas, that the Forest Department is committed to work for their welfare.
- To carry out detailed socio-economic surveys in every JFMC/fringe village to accurately assess the dependency of people over forests in terms of timber and other NTFP.
- To afforest the degraded areas/ compartments allotted to various JFMCs to scientifically meet the above assessed demand both in short and in long terms.
- To document the indigenous traditional knowledge and incorporate the same in the micro-plans of the JFMCs.
- To assess the possibility of converting these areas into production areas in the long run, as envisaged by the NWPC, 2014.
- To provide income support to JFMCs by helping them in raising intercrops of naturally occurring, marketable varieties of various medicinal and aromatic plants within the allotted JFMC areas.

- To associate the people of JFMCs with identification, documentation and implementation of ecotourism activities.
- To analyse the past working of JFMC and suggest suitable policy modifications required for more effective functioning of JFMCs.
- To win over people so that they become willing partners in protection of forests both within and outside the JFMC areas.
- To involve local people (by introducing JFM principles as outlines by Govt. of Assam vide Notification No. FRW,8/93/75 dated 10th November 1998, (*Annexures*) protection, maintenance and creation of plantations, by forming Forest Protection and Regeneration Committee of the willing villagers of the adjacent villages.
- To develop the degraded forest resources by promoting natural and artificial regeneration (through plantation activity) with active participation of the villagers. It also aims to provide effective protection.
- To empower village communities to play a crucial role in forest resource conservation and enable them to resolve their issues and problems.
- This JFM approach should be widely applied even at places where formal JFM committees have not been constituted.
- JFM should be evolved on the basis of its capacity to generate sustainable employment.

2.6 Treatment prescribed for JFM: In the system of JFM the forest staff must know the principles and approach of JFM. The first and foremost thing is to convince the local people about the importance of forestry and their role in meeting daily needs of them. The villagers who are willing to take part in JFM programme a memorandum of understanding shall be signed. DCF of Digboi Division shall prepare Microplans for the area to be assigned to concerned JFM Committee as provided in the The Assam Joint (Peoples Participation) Forestry management Rule-1998 and guidelines issued by Govt. of India from time to time.

- The microplan prepared for the particular village shall be in consonance with the prescriptions contained in Working Plan, the microplans shall be sanctioned by competent authority.
- The assigning of forest area to JFM committee and execution of works shall be strictly in accordance with the guidelines issued by Government of India as well as Government of Assam.
- MOU shall be signed regarding forest area assigned to JFM Committee and there should not be any ambiguity in terms and conditions.
- The area allotted to JFM committee should be shown on the map and incorporated in the memorandum of understanding.
- The Micro Plan should be prepared with active involvement of members of JFM Committee on scientific lines and the site specific estimates shall be prepared for the works which would be taken up and sanctioned by competent authority before implementation.

2.7 Activities to be taken up: JFM Committees should be involved to take up the under mentioned activities in the area assigned to them.

- (1) Stringent protection of forests allotted to JFM committee.
- (2) Active participation of members of JFM committee in protecting, improving and developing forests.
- (3) Protection of forests from illegal felling, grazing and encroachment, collection of NTFP on scientific lines or non- destructive collection methods.
- (4) Helping forest officials in patrolling and enforcement of law for forest protection. For protection of forests from grazing, integrated efforts should be taken to improve the breed of cattle so that, the income may be increased with less number of cattle. In this regard the Rural Development and other departments should be requested to help the JFM committees. The forest officials will have to play the role of facilitator for implementation of various development works. Necessary legal and moral help should be provided to members of JFM Committee for the protecting forests from illicit felling, encroachment, grazing, fire protection etc.

2.7.1 Active cooperation and participation of people: It is the duty and responsibility of forest officials to create awareness among the members of Forest Protection Committee as well as villagers about the importance of forests, its intangible benefits and protection of the forest from fire, illicit felling, encroachment, grazing, etc. The active participation of local people must be encouraged in management, protection and developmental activities of the forest assigned to them. For achieving effective results in this regard it is required to take up regular efforts like conducting meetings, workshops and exposure visits to successful areas shall be arranged to explain about the protection of forests and achievements in other villages. A comprehensive protection scheme shall be prepared and explained to JFM members for prevention and protection of forest from any destructive factors. The Forest Protection Committee's members shall be made to aware of their duties and responsibilities to have their active participation in the protection and management of the forests. The produce obtained from the assigned areas will play an important role for the improvement of economy of JFM members as well as restoration and improvement of the forest area.

2.7.2 Role of Forest Officials: The role of forest officials in implementing of JFM is as the facilitator as given below.

- (1) Providing technical inputs and support for the activities under JFM and ensure implementation of scientific forest management.
- (2) Creation of awareness amongst the members of JFM Committee about the role and various benefits available.
- (3) The forest officials shall act as facilitators for implementation of various development activities by other departments.
- (4) The responsibility and benefit of local people should be thoroughly briefed by forest officials. JFM requires strong institutional capacity to make collaborative efforts for forest protection and make it successful in getting the economic returns and regeneration of the forests. Therefore the forest officials have to take adequate measures and precautions in formalising participatory management.

2.7.3 Sharing of benefits: Usufruct sharing mechanism under this working circle will include as per

the following govt. rules:

- a) Full share of NTFP collection.
- b) Full share in the harvest of timber in plantation raised by JFMC
- c) Share in proportion to the period of management in high forests managed by JFMC
- d) 50% of net revenues to be reinvested in forestry works - a step towards sustainability of JFMCs.

2.7.4 Proposed activities under JFMC working circle:

1. A very ambitious plan which can bring a drastic change in rural economy is thought of. Cultivation of Agar wood trees (*Aquilaria agallocha*) through JFMCs at strategic areas creating a buffer belt to protect the forest is intended to be materialized. The areas through which men and cattles trespass into the forest and cause damage including illegal felling, lopping, grazing and also encroached shall be taken up for Agar wood cultivation. This will create a barrier around the core forest areas and will protect the forestry species (trees) and forest land from encroachments besides uplifting socio-economic condition of rural community.
2. Raising of grafted fruit plants in forest areas, nearby fringe villages.
3. Raising of fast growing timber yielding species such as Azar, Tita sopa, Kadam, Bandordima, Hatipoliya, etc. endemic to the division.
4. Raising of firewood species - Kadam, Simalu.
5. Development of nurseries for local forest species with technical guidance from the forest department.
6. Training on bamboo and cane based skill development training for providing employment opportunities.
7. Developing participatory catchment area treatment plans in area under Digboi Division along the catchment of River Burhidehing. DFO should conduct field investigations and initiate watershed development projects. Looking at the socio-cultural conditions in that area promotion of fishery, poultry with compulsorily forestry activities in the JFMC villages be initiated under the watershed projects.
8. Developing medicinal plants saplings and its plantation on their homesteads.
9. As entry point activities promotion of improved cooking mechanism - biogas, improved chullas, solar lamps etc.
10. Eco-tourism activities shall be developed in the Eco-tourism spots mentioned in chapter 8, para 8.6 (Part-I)
11. Promotion of raising Trees outside forests.

2.7.5 Additional Prescriptions under JFMC working circle:

- i) Forest department staffs with active participation of JFMC shall conduct PRA exercises and develop microplans for socio-economic upliftment and livelihoods development of the local people. This microplans needs to be submitted to DFO for technical feasibility for final approval of the microplan as per the available government schemes and any other funders norms. Before implementing the project Government orders, any amendments to be strictly followed.

- ii) There should be monthly review meeting of the JFMCs under the Chairmanship of JFMC president. Range Forest Officer should attend meeting at least quarterly.
- iii) NTFPs to be collected and sustainably harvested from forest fringe areas under the JFMC and shall be sold by the concerned JFMC.
- iv) Continuous efforts should be made to create and sustain the JFMC movement by creating required awareness among the people and the staff through training programmes.
- v) Agroforestry plantations should be carried out in the encroached areas through the JFMC. In between tree lines ginger, turmeric and other medicinal herbs should be cultivated.
- vi) JFMC areas to practice minimum tillage, organic formulations.
- vii) As entry point activities, development of roads, community hall, culverts, fibre boat/machine boat as per the technical feasibility, for carriage and transportation, construction of drinking water facilities, if mentioned in the micro plans.
- viii) System of rice intensification ensures higher productivity with optimum utilizing the resources, may be promoted in JFMC cultivated paddy fields to increase productivity.
- ix) Establishment of biogas plant as an entry point activity based on the microplans.
- x) JFMC plantation assistance will be released as per the standard government norms, funder norms based on the survival of the plants.
- xi) The forest areas and plantations under the control of Joint Forest Management Committee (JFMC) should be mapped out clearly and necessary records maintained in the Beat, Range and DFO office. While doing so, the provisions of guidelines and resolutions of Govt. of Assam may be followed strictly.
- xii) It is considered necessary that the requirements of the members of JFMCs relating to fuel wood, fodder, bamboo, thatch and other non-wood Minor Forest Products is to be met from the forests free of cost as per govt. circular.
- xiii) It is felt necessary that a leadership should be developed from amongst the committee members for Joint Forest Management. Assistance from local NGOs (if available) may be obtained. Each JFMC should closely interact with the village Panchayats in the interest of forest protection and for all round development of the land resources.
- xiv) JFMC members may be consulted in choosing the species to be planted, keeping due regard to the biodiversity of the area and silvicultural suitability.
- xv) It is necessary to start a publicity campaign for motivating the people for JFM. It is necessary that in DFO's office a separate section may be opened for monitoring the JFM activities in the Division. For better exchange of ideas between different committees a co- coordinator may be appointed by the DFO from amongst the staff for holding experience sharing meeting. Local NGO's, club may be involved in this process.
- xvi) It is considered necessary that the skills of local committee members are required to be harnessed for different arts and handicrafts techniques. Arrangements for necessary training for the beneficiaries may be undertaken through link up with other departments.
- xvii) Soil and land development works may be undertaken in forest areas. Water harvesting structures

may be constructed for soil and water conservation and fisheries.

- xviii) The committee members should interact frequently with each other in order to share their experience. Team of JFMC of each Division should visit other successful works done in other areas.
- xix) Whereas, demand of planting trees on private land is increasing, the JFMC members may be allowed Social Forestry benefits on their individual land.
- xx) Whereas, the involvement of women in the functioning of those committees is necessary, more & more women should be encouraged to become member of the committees.
- xxi) Whereas, it is felt that the population pressure on forests is increasing and it is desirable that the JFMC members should be mobilized for adopting small family norms. JFMC may be supplied with medicines and other family planning devices.
- xxii) The JFMC members should have a meeting place. A community hall may be constructed for use of the JFMC members.
- xxiii) The Micro Plan is to be prepared for each of the areas covered under JFMC by involving Executive Committee and other members of the JFMC. The Micro Plan' would contain all the prescriptions for management, development of the concerned area including flow of usufruct benefits from NTFPs and short rotation timber species to the beneficiaries. The Micro - Plan should have conformity with National Forest Policy and Forest Conservation Act.
- xxiv) After formulation of the aforesaid Micro-Plan, it is to be approved by concerned JFMC General Body meeting and also by competent authority of the Forest Department. After approval and adoption of concerned Micro Plan, the prescriptions contained in the Micro- Plan would be deemed to have superseded the Working Plan of that area to that extent.
- xxv) A Divisional Level Review Committee (DLRC) may also be constituted with DFO as the Chairman and concerned Forest Range Officers and Beat Officers as members to review the working of different JFMC under their jurisdiction.
- xxvi) No new human settlement in any part of the Reserve Forest should be undertaken, whether under JFM or village grouping or under jhum control scheme or any other scheme except after obtaining clearance under Forest (Conservation) Act 1980.

2.7.6 Targets of achievements:

Targets of achievements are-

1. To establish 5 nos. community forest nurseries having 1,00,000 seedlings each
2. Plantation 10% of total allotted area of **8326.999** = 832.69 (say) 850 hect. hectares as production forest.
3. Maintenance of 2550 hect. of existing Plantation.
4. JFMC training and awareness programmes (*4 programs twice a year for ten years, each programme 30 persons*).

- a) 40 training.
- b) 40 awareness programme.
- c) 2400 beneficiaries target.

5. Ecotourism activities Dehing patkai and Charaipung

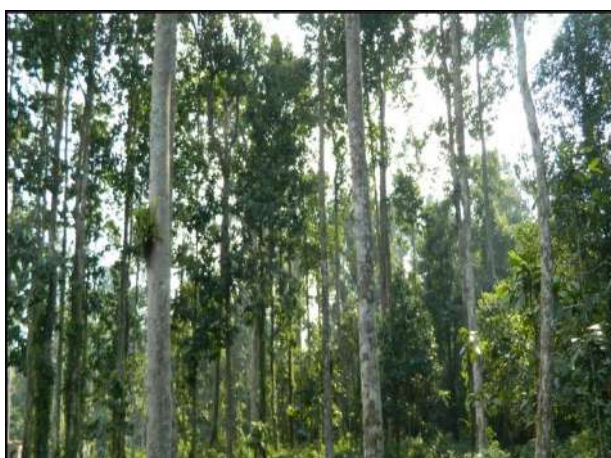
Year-wise physical target of achievement:

Prescribed activity	Physical target over a period of ten years									
	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Estd of 5 nos. community forest nurseries having 1,00,000 seedlings	1	-	1	-	1	-	1	-	1	-
Plantation 850 hectares as production forest.	200	200	150	150	150	-	-	-	-	-
Joint Forest Management Working Circle (Maintenance) 2550 hect.	-	200	400	550	500	450	300	150		
JFMC training and awareness programmes (4 programs twice a year for ten years, each programme 30 persons). a) 40 training. b) 40 awareness programme. c) 2400 beneficiaries target.	8	8	8	8	8	8	8	8	8	8
Ecotourism in Dehing-Patkai	2	2	2	2	2	2	2	2	2	2

2.7.6.b Plantation Models for Fuelwood Plantation and Medicinal Plantations

S.No.	Particulars of works
A	ERECTION OF FENCING
	(a) Erection of full Chain-linked Goat Proof fencing (4' ht. with 10 Gauge, 3" dia link) to be fitted on Pre-cast RCC pillars* at 1.8 mt. apart including transportation of fencing materials to site
B	ADVANCE WORK
	Site selection, surveying, demarcation, jungle cutting, burning etc
	Preparation and acquisition of polypot saplings in the field nursery for planting 1100 Nos. Seedlings/ ha at the rate of spacing 3m X 3m
	Preparation of polypot saplings in the field nursery for vacancy filling while planning for raising nursery the mortality should be accounted.
	a) 25% mortality expected during 1st year (to be planted in the field during the 2nd year) ,i.e., 277 Seedlings/ ha
	b) 20% mortality expected during 2nd year (to be planted in the field during the 3rd year) ,i.e., 222 Seedlings/ ha
	c) 15% mortality expected during 3rd year (to be planted in the field during the 4th year),i.e., 166 Seedlings/ ha
	d) 10% mortality expected during 4th year (to be planted in the field during the 5th year),i.e., 111 Seedlings/ ha
C	Line alignment, carriage of stacking materials and fixing the stacking
	CREATION & 1st YEAR MAINTENANCE
	Soil working, carriage of stumps, polypot seedling and planting at the plantation site including, dibbling of seeds wherever necessary to complete raising of plantation with all necessary operation @ 40 DLS/ ha
	Provision for 5 weedings, mulching and fire protection works
D	Upkeepment of plantation, and making of inspection path, repairing of fence etc. on day to day basis
	2nd YEAR MAINTENANCE

	5 weedings, fire protection works
	25% Vacancy filling by 1 year old seedlings from nursery
	Upkeepment of plantation, and making of inspection path, repairing of fence etc. on day to day basis
	Maintenance and protection of field nursery and watch and ward for the plantation area
E	3rd YEAR MAINTENANCE
	4 weedings, fire protection works
	20% Vacancy filling by 2 year old seedlings from nursery
	Protection work, cattle watching, upkeepment of plantation, and making of inspection path, repairing of fence etc. on day to day basis
	Maintenance and protection of field nursery and watch and ward for the plantation area
F	4th YEAR MAINTENANCE
	4 weedings, fire protection works @15 dls/ha/weeding
	15% Vacancy filling by 2 year old seedlings from nursery
	Upkeepment of plantation, and making of inspection path, repairing of fence etc. on day to day basis
	Maintenance and protection of field nursery and watch and ward for the plantation area
G	5th YEAR MAINTENANCE
	Climber cutting, weeding & other silvicultural works and fire protection works
	10% Vacancy filling by 2 year old seedlings from nursery
	Maintenance & fencing post replacement
	Upkeepment of plantation, and making of inspection path, repairing of fence etc. on day to day basis
	Watch and ward for the plantation area



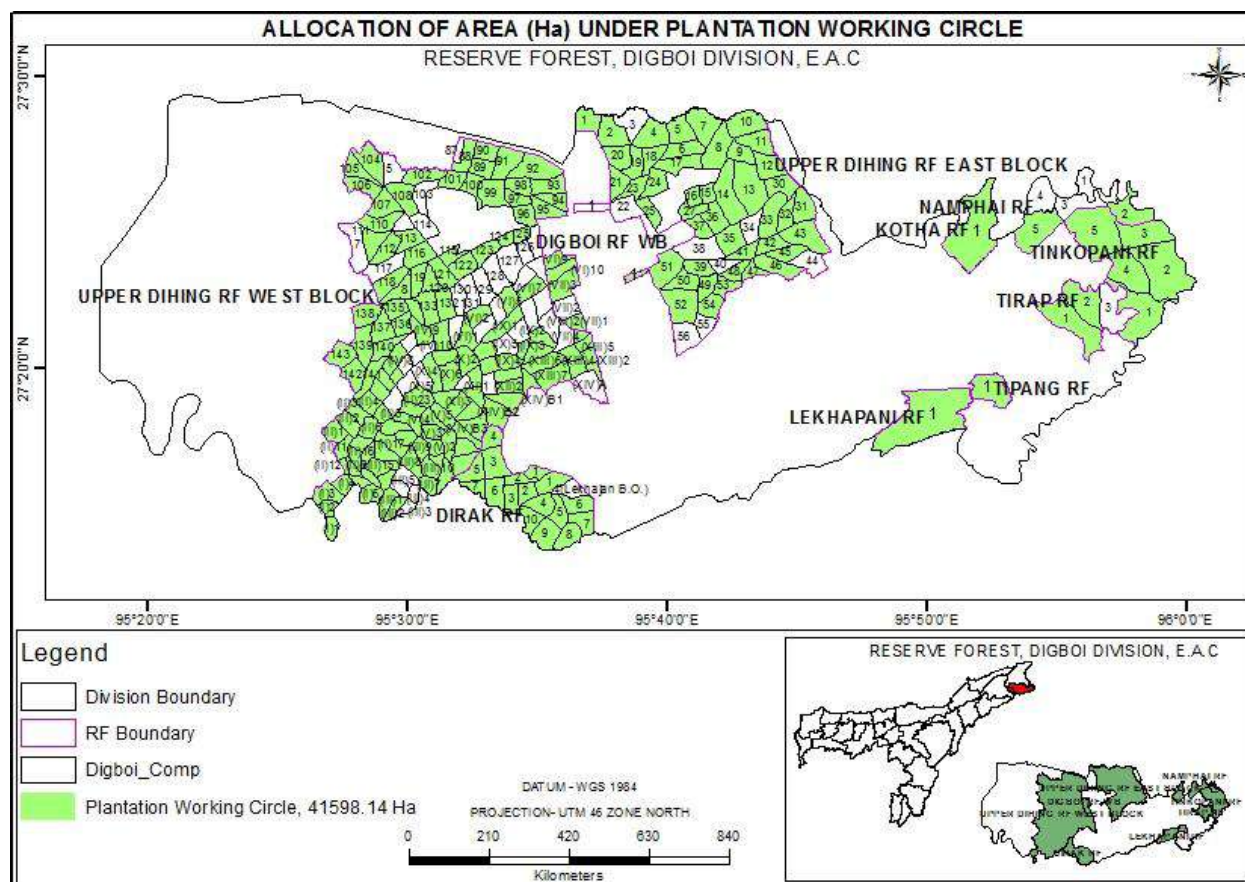
CHAPTER 3

PLANTATION AND REGENERATION WORKING CIRCLE

3.1 Name of the working circle

Name of the Working Circle is "Plantation and Regeneration Working Circle". The detail map of this Working Circle is shown in Figure 3.1.

Figure 3.1: Map showing Plantation & Regeneration working circle in Digboi division.



3.2 General constituents of the working circle

Forest areas with density less than 40% will be covered under this working circle. Catchment and watershed areas, river banks, forest floor and areas susceptible to soil erosion shall be covered in this Working Circle. Existing plantations areas but not been successful, blanks and under stocked areas not suitable for ANR, Road side, Railway side areas and lands under compensatory afforestation etc. which are suitable for plantations will be identified and allocated to different years of plan period. The main objective will be to improve the forest cover with indigeneous tree species. For regeneration special emphasis will be given to improve the status of Hollong, Mekai and Nahor growing areas in the Division.

The plan is focused to enhance the growing stock through this Working Circle with an aim to make a significant carbon pool and improve the flow of ecosystems services and also improve socio-economic conditions of the forest fringe populations. Every effort shall be made to restore the ecology of such areas to their previous status. All the plantation areas shall focus on enhancement of the carbon stocks. Efforts shall be made to register such plantations under REDD+.

3.3 General Characteristics of Vegetation

The forest in this Division is rich in biodiversity. There are few patches wherein the signature species are growing. Endemic species genetic base is shrinking in this Division. The multi-storeyed forests characterised, with dominant species as Hollong reaching a height of 50 metres and girth up to 7 metres, Hollong (*Dipterocarpus retusus*), Mekai (*Shorea assamica*) also occupy the top canopy along with Hollong over limited localities, especially on slightly higher elevations with good drainage and found to occur in patches in Tinkopani, Lekhapani, Tipong and Dirok Reserved Forests and in Blocks II, VII, VIII, IX&X of Upper Dehing RF (West Block). Other Reserved Forests are mainly occupied by Hollong-Nahor formations. Other species which are found to occur in the top canopy sporadically are Sopas, Dhuna, Sam, Jutuli, Amari, Barpat, etc. Hollong prefers well drained soil and its best expressions are found in old alluvium of Dehing River, namely, Tipong RF, UDRF(W.B.) and Dirok RF.

The middle storey is dominated by *Messua ferrea* and *Vatica lanceafolia*. Other species found in this canopy are *Terminalia chebula*, *Syzgium cuminii*, *Sapium baccatum*, *Dysoxylum binectariferum*, *Terminalia belerica*, etc. In some areas, there occurs a third storey occupied by *Dendrocalamus hamiltonii*, *Bamboosa pallida*, *Livingstonia jenkinsonii*, etc.

The undergrowth comprises of woody shrubs like *Myrsine capitellata*, *Osbeckia spp.*, *Laportea crenulata*, Shrubs like *Phrynium placentarim*, *Alpinia allughas* etc. Climbers are numerous and found growing profusely, common among them are *Thumbergia grandiflora*, *Bauhinia vahlii*, etc. wherever there is an opening *Michenia scandens* - an exotic, invades the forests, suppressing all shrubs and advance growths of trees and intercepting free falling seeds from reaching the ground.

The forest water bodies and their bank acts as a bed for numerous free floating aquatic plants such as *Eichhornia crassipes*, *Azolla pinnate*, *Pistia stratiotes*, *Lemna trisulea*, *Spirodela polkyrrhiza* and submerged plants such as *Halophila ovata*, *Hvdrilla verticillata*, *Potamoetodon crispum*, *Potamoetodon crispum*, *Ruppia maritima* etc. They cover the surface of the water bodies throughout the year with plenteous growth during the summer season.

3.4 Plantation Series: As the nomenclature “Plantation and Regeneration Working Circle” indicates that the activity of the Working Circle shall limited on plantation and regeneration, there shall not be any felling series or cutting section; and instead there will be Plantation Series. Table 3.4.a shows the plantation series.

Table 3.4.a Statement showing Plantation Series and blocks and compartments

Plantation Series	R.F.	Block	Comptt.	Area (Ha.)
Digboi Range	Digboi East	Digboi	Whole	56.98
	Digboi West	VI	9 & 10	271.31
		VII	1,2&3	553.85
	Bogapani	Bogapani	Whole	109.09
	UDR (West)	Makum	126 to 137	2233.36
		IV	1 to 11	1208.07
		VI	1 to 8	1128.25
		VII	4 to 5	207.75
		VIII	1 to 5	776.98
		IX	1 to 7	949.03
		X	1 to 7	989.49
	UDR (East)	Bogapani	1 to 25	6305.85
Lakhipathar Range	UDR (West) RF	Makum	5, 7, 8; 87 to 125 & 138	8077.99
Saraipung	UDR (West)	Makum	139 to 143	1052.15
		I	1 to 6	697
		II	1 to 10	1080.13
		III	1 to 10	1098.77
Margherita West Range	UDR (West)	V	1 to 5	512.82
		XI	1 to 4	503.85
		XII	1 to 3	375.09
		XIII	1 to 8	991.13
		XIV (A)	Whole	269.91
		XIV (B)	1 to 3	598.38
		XIV (C)	1 to 5	665.19
	Dirok R.F.	Dehing	1 to 7	2375.90
		Lekhajan	4(Lekhajan)	155.721
	Dirok 1 st addition	1 st addition	8 to 10	620.38
Lekhapani Range	Makumpani	Makumpani	Whole	383.0
	Lekhapani RF	Lekhapani	Whole	1419.72
	Tirap RF	Tirap	1 to 3	1532.97
	Tipong RF	Tipong	Whole	391.18
	Paharpur RF	Paharpur	Whole	66.0
Jagun Range	Tinkopani RF	Tinkopani	1 to 5	3417.43
	Namphai RF	Namphai	1 to 5	1751.25
	Kotha RF	Kotha	Whole	1071.29

3.5 Blocks, compartment:

A total of 41598.14 hectares are allocated under this Working Circle. RFs and compartment and the area under block plantation, gap filling and artificially assisted regeneration to be covered in this working circle is provided in the table 3.6.

Table 3.6: Area details under the working circle of Digboi Division, Assam

Reserve Forest	Total RF area (Ha)	Compartment Number	Area allocation under Plantation & Regeneration WC (Ha)	RF area (Ha) allocated to WC
Digboi EB RF	56.983	1	56.98	56.98
Digboi WB RF	825.158	(VI)10	143.69	637.86
		(VI)9	127.62	
		(VII)1	112.19	

Reserve Forest	Total RF area (Ha)	Compartment Number	Area allocation under Plantation & Regeneration WC (Ha)	RF area (Ha) allocated to WC
		(VII)3	254.36	
Dirak RF	3426.74	1	302.24	2996.28
		2	239.81	
		3	438.30	
		4	346.78	
		5	354.15	
		6	409.70	
		7	284.93	
		8	196.67	
		9	254.73	
		10	168.97	
Kotha RF	1071.29	1	1071.29	1071.29
Lekhapani RF	1419.72	1	1419.72	1419.72
Namphai RF	1751.25	2	347.69	347.69
Tinkopani RF	3417.434	1	692.65	3417.43
		2	930.94	
		3	463.32	
		4	489.17	
		5	841.36	
Tipang RF	391.182	1	391.18	391.18
Tirap RF	1532.968	1	620.54	1072.70
		2	452.16	
Upper Dihing EB RF	11686.54	1	212.81	10692.37
		2	287.29	
		3	266.41	
		4	315.28	
		5	239.86	
		6	221.36	
		7	331.39	
		8	361.34	
		9	180.13	
		10	318.75	
		11	252.15	
		12	250.20	
		13	532.21	
		14	468.48	
		15	108.74	
		16	105.85	
		17	250.41	
		18	170.21	
		19	179.87	
		20	223.61	
		21	179.72	

Reserve Forest	Total RF area (Ha)	Compartment Number	Area allocation under Plantation & Regeneration WC (Ha)	RF area (Ha) allocated to WC
		23	169.55	
		24	206.70	
		25	153.45	
		27	134.80	
		30	231.18	
		31	249.63	
		32	162.29	
		33	312.32	
		35	264.18	
		36	219.54	
		37	153.46	
		39	172.14	
		41	141.33	
		42	165.76	
		43	390.94	
		45	178.37	
		46	256.03	
		47	107.47	
		48	133.33	
		49	152.42	
		50	199.51	
		51	344.81	
		52	413.37	
		53	142.69	
		54	181.05	
	23594.74	8	170.03	19494.65
		88	178.08	
		89	153.93	
		90	157.57	
		91	278.42	
		92	364.14	
		93	216.55	
		94	142.61	
		95	184.93	
		96	129.87	
		97	163.88	
		98	161.56	
		99	275.22	
		100	150.80	
		101	160.26	
		102	1982.82	
		115	104.50	
		116	229.02	

Reserve Forest	Total RF area (Ha)	Compartment Number	Area allocation under Plantation & Regeneration WC (Ha)	RF area (Ha) allocated to WC
		118	233.22	
		119	164.67	
		120	127.24	
		121	194.09	
		122	200.60	
		123	167.53	
		124	71.24	
		125	83.47	
		132	208.92	
		133	228.78	
		134	105.75	
		135	155.13	
		136	136.28	
		137	215.22	
		138	226.25	
		139	256.26	
		140	177.32	
		141	183.39	
		142	211.63	
		143	223.56	
		(I)1	103.00	
		(I)2	88.18	
		(I)3	184.99	
		(I)4	113.85	
		(I)5	63.57	
		(I)6	143.41	
		(II)1	156.47	
		(II)10	63.86	
		(II)11	104.21	
		(II)12	39.28	
		(II)13	76.16	
		(II)14	89.19	
		(II)15	153.73	
		(II)16	142.65	
		(II)17	156.94	
		(II)18	132.59	
		(II)19	106.14	
		(II)2	154.20	
		(II)20	134.07	
		(II)22	111.53	
		(II)23	175.00	
		(II)3	121.67	
		(II)4	142.30	

Reserve Forest	Total RF area (Ha)	Compartment Number	Area allocation under Plantation & Regeneration WC (Ha)	RF area (Ha) allocated to WC
		(II)5	93.69	
		(II)6	140.79	
		(II)7	96.85	
		(II)8	87.85	
		(II)9	86.32	
		(III)1	135.79	
		(III)10	124.46	
		(III)2	105.83	
		(III)7	105.43	
		(III)8	156.47	
		(III)9	114.27	
		(IV)1	107.15	
		(IV)10	194.27	
		(IV)2	90.55	
		(IV)3	66.77	
		(IV)4	56.39	
		(IV)5	97.67	
		(IV)9	158.01	
		(IX)1	216.21	
		(IX)3	70.67	
		(IX)4	132.10	
		(IX)6	109.92	
		(IX)7	126.55	
		(V)1	52.30	
		(V)2	98.75	
		(V)3	115.89	
		(V)4	119.01	
		(V)5	126.87	
		(VI)1	164.89	
		(VI)2	150.54	
		(VI)5	154.74	
		(VI)7	169.85	
		(VII)5	56.76	
		(VIII)4	132.55	
		(VIII)5	146.76	
		(X)1	89.59	
		(X)2	179.82	
		(X)3	133.32	
		(X)4	180.22	
		(X)6	196.21	
		(XI)1	113.58	
		(XI)2	113.24	
		(XI)3	142.35	

Reserve Forest	Total RF area (Ha)	Compartment Number	Area allocation under Plantation & Regeneration WC (Ha)	RF area (Ha) allocated to WC
		(XI)4	134.68	
		(XII)2	136.18	
		(XII)3	126.16	
		(XIII)1	81.53	
		(XIII)2	80.14	
		(XIII)3	55.87	
		(XIII)4	106.37	
		(XIII)5	98.23	
		(XIII)6	199.02	
		(XIII)7	265.23	
		(XIII)8	104.74	
		(XIV)B1	180.35	
		(XIV)B2	226.34	
		(XIV)B3	191.69	
		(XIV)C1	134.69	
		(XIV)C2	133.87	
		(XIV)C3	114.54	
		(XIV)C4	129.88	
		(XIV)C5	152.21	
Grand Total	49174.01		41598.14	41598.14

In the allocated area, scrub (<10% canopy cover) comprises of 5850.69 ha, open forest (10%-40%) 14832.47 ha and moderately dense forest (40% to 70%) covers 12936.58 ha. During the tenure of this working plan it is proposed to undertake plantation in 10% (4200 hect) of total allotted area of the Working Circle. This includes block plantation of 1200 ha in scrub areas, gap filling (plantation) of 2500 ha in open forest area and assisted regeneration covering 500 ha of moderately dense forest areas in this Division.

3.6 Special objective of management:

The broad objective of this working circle is to improve the stocks of the forest of this Division through plantation to fill the gaps and regeneration of the species. Specific objectives are given below:

- i) To restock existing blanks and scrub areas with species of higher utility & economic value (Hollong - Mekai – Nahar);
- ii) To re-habilitate degraded areas, & failure plantations;
- iii) To improve the moisture regime with soil conservation measure via bio-engineering;
- iv) To meet with the requirement of local population for fuel, fodder, fruit & small timber;
- v) Initiate research on tree improvement and genetic resources studies to enhance growth of Hollong, Hollock, Mekai and other such endemic species.

3.6.1 Analysis of the Crop: It is discussed in Chapter 3.2, Part-I.

The forest type of the overlapping working circle as per the classification made by Champion and Seth in their survey of forest types of India - Type IB/C1 Assam Valley Wet Evergreen Forest (*Depterocarpus*) or more commonly known as Upper Assam *Depterocarpus* - *Mesua* formation. It forms a part of the world heritage of tropical/subtropical wet evergreen forests, multi storied in structure and rich in biodiversity; more popularly known as Rain Forests. The forests of Dehing - Patkai Wildlife Sanctuary is characterized by multistoried layer of canopy. The forest in this working circle is under pressure and the canopy cover is less than 10 percent while some areas under 10 percent to 40 percent. There are movement of straying wildlife into the areas. There are movements of livestock grazing inside the reserve forest. The common flora are the remnant trees of *Artocarpus* spp., *Toona* spp., *Duabanga* spp., *Cassia* spp., *Mangifera* spp., *Bambusa tulda*, *Dendrocalamus hamiltonii* and weeds like *Mikania* spp., *Lantana* spp., *Eupatorium* spp., on the open areas. The signature species are generally found inside the reserve forest and very trees of *Dipterocarpus retusus*, *Shorea assamica*, *Michelia champaca*, *Mesua ferrea*, *Magnolia* spp., and *Canarium bangalensis*. *Artocarpus chaplasi*, *Altingia excelsa*, *Ailanthus grandis*, etc. are found in the area under this working circle. In some portion, in patches however two storey canopy cover can be seen. The undergrowth that forms the second canopy comprises of *Myrsine capitellata*, *Osbeckia* spp., *Michenia scandens* - an exotic which invades the forests, suppressing all shrubs and advance growths of trees and intercepting free falling seeds from reaching the ground. However in all the other areas wide canopy gaps exists.

3.6.2 Silvicultural system: The Working Circle shall be treated for regeneration only. Except removal of dead dying and wind fallen trees there shall not be any harvesting in the Working Circle. However, Improvement felling or regeneration felling or canopy manipulation works may be undertaken subject to mid term deviation with approval of the PCCF.

3.6.3 Thinning:

Thinning is considered as principal tending operation. The aim of thinning is to achieve appropriate stand density and enhance diameter growth. Digboi Forest Division, there is provision for thinning in each compartment. The thinning is targeted for sapling, pole and young tree within the compartments. Proper method for thinning operation is lacking in the Division. The spacing between the stems depends upon the size of stem to be retained after thinning. Number and average size of stem need to be assessed to fix the required number of stem in compartment. For this objective, the condition of pole and sapling in each compartment requires further assessment.

In the past, no thinning was done in the Plantation as timber harvesting was done by Clear Felling Coupes followed by Artificial Regeneration. Thinnings were prescribed in the plantations by taking into account the average site quality class of the area. Under this Plan, only four thinnings are prescribed. The first two thinnings are mechanical cum silvicultural and other two are silvicultural thinning. Though the number of trees to be retained after the first thinning is more, the same is being adopted in the present plan as the excess number of stems will compensate towards damages caused by wild elephants, which is quite common in this area. The details of the thinnings regime recommended are given below: -

- i. First mechanical cum silvicultural thinning at the 10th year by retaining about 70% of the total trees by marking the stems silviculturally in the alternative diagonals.
- ii. Second mechanical cum silvicultural thinning at the 20th year by retaining about 50% by marking the trees silviculturally in the alternate lines.
- iii. First silviculture thinning at the 30th year (leaving about 35% of the balance trees).
- iv. Second silviculture thinning at the 40th year (leaving about 15 % of the balance trees).

Guide for Thinning:

Thinning are to be carried out comparing the field stock with that given in yield table for certain age and specific site quality for ordinary C grade thinning.

- i. Site quality may be ascertained first by measuring top diameter and height of crop.
- ii. Age of the plantation to be ascertained from record or from age/dia curve drawn from yield table.
- iii. The basal area of the stock of plantation is to be determined using Wedge Prism or Relaskepe.
- iv. The basal area figure/ha thus obtained should be compared with yield table figure against the crop age and for that particular site quality class.

Thus requirement of thinning for a particular plot may be ascertained and to be followed by marking.

- v. In between marking and felling recheck is to be made in similar method as to whether the marking is adequate or not. Over thinning must be avoided.
- vi. The exercise must be done by an officer not below the rank of Assistant Conservator of Forests.

Marking Rules: The following instructions are included for guidance of marking for thinning.

- A.** In older plantations where growth differentiation has already set in-
 - i. Mark all dead, top broken, mid broken, uprooted and suppressed trees.
 - ii. Mark all mal formed or crooked trees provided no large gaps are created.
 - iii. Mark all stems of inferior species interfering with Teak.
 - iv. Crown dominants to be freed by opening the culture where there are more than 3 dominants or co-dominants
 - v. In case of any doubt regarding removal or otherwise of a tree, decide in favour of retention.
 - vi. At the end of final thinning (4th round), the spacing from stem to stem should be 10.5m x 10.5m.
- B.** In younger plots without crown differentiation-
 - i. Where material spacing is 1.83m x 1.83m, the five thinnings from 1st 5th year thinning is to be carried out. In the spacing of plantation is 2.24 m x 2.74m or more, the first thinning may be omitted.
 - ii. Remove dead, top broken, mid broken, uprooted and suppressed trees.
 - iii. The spacing out should be done mechanically by removing alternate stem in each thinning.
 - iv. The approximate spacing from stem to stem at the end of each round of thinning with an initial spacing of 1.83m x 1.83m would be-

1st thinning = 2.6 mts

2nd thinning = 4.2 mts

3rd thinning = 7.5 mts

5th thinning = 10.5 mts

Importance is given to retain a definite number of trees after the thinnings. This is to ensure that any subsequent variation in the number of trees in the plantation at the time of thinning should not result in excess thinning of plantation.

The prescriptions laid down above should be followed in all the plantations where regular thinnings have been carried out in the past. But in case the thinning regime as given in the previous plan has not been followed in the past it is not desirable to reduce the number of stems as per these prescriptions at one stroke as such action may cause opening of canopy and consequently invasion of weeds and also make the stand susceptible to wind damage. In such cases, gradual reduction of excess number of stems during the next thinnings or over a period of time will be desirable. Modified thinnings in such plantations are proposed from this point of view. In case if more number of trees are found in certain pockets of the same plantation where overall number of trees per ha. is less in that case desirable number of trees may be felled to remove the congestion after verification and marked by the Deputy Conservator of Forests and Chief Conservator of Forests. Care should be taken so that sufficient number of trees per ha. is retained to fulfill the requirement of prescribed thinning regime for the particular closely spaced trees.

3.6.4 Regeneration:

Strategy

Block plantation will be carried out in scrubs, gap filling in open forest area and in moderately dense area natural regeneration or assisted natural regeneration shall be promoted. The regeneration capacity of the endemic species, elephant liking species shall be enhanced. A total ecosystem conservation concept will be adopted for conservation of the wildlife habitat and conservation of biodiversity in these forests. An effective naturalization plan needs to be devised based on principles for maintaining natural diversity. To enrich the low diversity areas, efforts should be made to restore native complementing natural species rather than planting as many different kinds of trees as possible without looking into the natural regeneration and the needs of the natural fauna of the site. Further, introduction of exotic species in the area will be restricted and plantation of both, slow and fast growing native species of herbs, shrubs, and trees shall be promoted.

Involvement of local communities especially youths, women from the forest and fringe villages shall be ensured in plantation and regeneration activities. The efforts, therefore, be to impose restrictions on local populations through participation in purview of legal and allow traditional practices to continue to ensure their long-term success. For this purposes capacity building programs may be taken up. Regular monitoring and updation of species data through R & D activities needs to be taken up taking the present data as the base. Ethno biological information also needs to be generated.

3.6.5 Measures for its protection

Measures for protection in this working circle is elaborated below under proposed plantation and regeneration working circle

- i) Strict ban on grazing in such areas.
- ii) No firewood removals
- iii) Soil and moisture conservation measures is to be ensured while planting and regeneration, soil compaction should be avoided
- iv) Protection from illicit felling
- v) Encroachments should be strictly avoided,
- vi) Illegal mining to be checked
- vii) Restriction on felling.
- vii) Silvicultural practices to be adopted to enhance the growing stock and carbon sequestration of the forest.

3.6.6 Method of treatment

Hollong being a shade bearing species in the early stage prefer diffused light and moist conditions with well drained soils. Two-storeyed high forest silvicultural system is to be followed where the crop will be obtained by under planting a high forest after it has been opened up removing the matured trees above some girth limits remaining the balance as advance growth. The general performance of Hollong, Mekai, and Nahor in this tract is presently not very encouraging perhaps due to the changing climate, anthropogenic disturbances and may be alteration of the hydrological regime. Regeneration and growths achieved except in few patches are not satisfactory, despite, almost all the areas are considered suitable earlier. Hence further planting of the species by clear felling of forest is not prescribed, though it may be raised along with other species in open and well drained areas where it performs better.

3.6.7 Prescriptions: The following prescriptions are recommended for ther Working Circle –

- a) Identification of good seed bearers and collect information on seed year.
- b) Select mother trees, collecting the geo-coordinates and marking those.
- c) Before a heavy seedfall, cleanings can be made beneath fruiting trees to form natural nurseries, which can be used later to plant forests with low natural regeneration or in secondary vegetation.
- d) Transplantation of naturally regenerated seedlings which are 45 centimeters to 55 centimeters, and 6 to 8 months old.
- e) For seeds raised in nurseries, it is advisable to sow seeds as soon as it falls, since it loses its viability very quickly. It is to be raised in biodegradable poly bags.
- f) All areas that are having gaps are to be planted with native tree species.
- g) Planting schedule to be followed is presented in Table 3.6.7.b.

Table 3.6.7.a: Target of Achievement during W.P Period

Activity	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Plantation and regeneration works 10 % of total allotted area of 41598.14 hect. = 4159.81 (say) 4200 hectares	525	525	525	525	525	525	525	525	-	-
Plantation and regeneration Working Circle (Maintenance)= 12075 hect	-	525	1050	1575	1575	1575	1575	1575	1575	1050

Table 3.6.7.b: Overview of month-wise work to be undertaken by Plantation and Regeneration W.C.

Period	Works to be done
August September	Survey & demarcation of areas under annual coupes, preparation of maps
October	Marking of annual coupes
November February	Timber operation and disposal
March	Advance work for plantation, nurseries
April - May	Seed sowing/ transplanting
June	1st Rain weeding
July	2nd Rain weeding
Aug-September	3rd Rain weeding
November - December	Winter weeding

Table 3.6.7.c: Planting schedule to be followed in Working Circle

Sl.No.	Items of Work	Operation to be completed
1.	Survey & Demarcation	31 st October
2.	Clearance of undergrowth i/c climber cutting, removal of unwanted tree species	31 st January
3.	Laying of line, clearance of line, Ranging, staking, pit digging & hoeing of soil, etc.	15 th March
4.	Planting out.	25 th March
5.	Direct sowing of seeds	25 th March
6.	Fire line cutting	25 th March
7.	Making of Inspection path	25 th March

3.6.8 Nursery Technique of Important forest species

1) Mekai (*Shorea assamica* Dyer)

English Name: White Meranti.

Distribution: Mostly found in Mixed deciduous, Evergreen, and Semi evergreen forest of India, Malaysia, Myanmar, Thailand. In Assam it is widely distributed in the forest of Upper ASSAM.

Description - Large deciduous tree grows up to 50 m tall, girth up to 7m. and straight bole.

Uses: Wood used in Ply wood industry and also in making boats, truck bodies and paper pulp etc.

Flowering Time: August to September

Seed collection time: March- April .

Seed viability: 7 days

Germination Period: 7 to 10 days .

Germination Percentage: 70 - 80 % .

No of seed per kg: 215 - 230 no's (Dry) Approx.

Nursery Technique: Seeds does not require any pre- treatment but it shows good germination if it is soaked in water for 7 to 8 hours before sowing. Seeds are sown in mother bed or in poly bag. Soil preparation is done by mixing the top forest soil with cow dung, organic compost etc. in 1:1:1 ratio. Healthy seeds shows rapid germination. In case of seeds sown in the mother bed, the seedlings are required to shift in to the poly bag immediately after one week of germination because the roots grows very rapidly in to deep soil hence the seedling may get injured if shifting is delayed. The poly bag size 6 x 8 cm or 8x12 cm is preferable.

The poly potted seeding are kept in moderately sunny area and do watering regularly. Seedling more than three month old can be kept in fully sunny area and they become ready for planting in the field in between six to one year of age.

Natural Regeneration: The natural regeneration percentage of Mekai is moderate.

Field observation: In recent times, Mekai regeneration has decreased immensely due to natural as well as over exploitation. During field visit it was observed that wild Parakeets thrive on the pre-matured seeds by eating the sap and the soft tissue of seeds, which damages the seeds and they fall down before getting matured. There are very few mother trees available.

2) *Dipterocarpus macrocarpus* (Hollong):

Healthy seeds are to be collected in the month of March and April. The clipping of the wings with a small scissor enables carriage of more seeds in gunny bags. These seeds are then spread thickly under shade of trees in moist conditions. Moist conditions should be maintained until the seeds germinate within 10 to 15 days. Germination percent is usually 80 to 90%.

Germinated seeds are kept in polythene sleeves of 10 inch x 6 inch (100 gauge both sides open) filled with humus rich forest top soil. Polythene sleeves are kept in row in sunken nursery beds where shade is provided by putting Jengoo leaves' on bamboo structures. As the seedlings attain a height of about 6 inches gradually shade is to be reduced. By June/July it attains a height of about 12 inches. It is kept in the nursery till next year, by then it attains about 3 - 4 feet height. They are transplanted in pits before onset of monsoon.

Artificial regeneration: Hollong is a shade bearer in its early stage. Hollong requires shade right from the seed fall till the seedling attains a height of about 6 inches. This period is very critical; and here it is highly susceptible to intense light. After that it is considered capable of withstanding sunlight and rather seen to grow faster if shade is reduced gradually.

For planting Hollong in open areas, before transplanting of the Hollong seedlings, seeds of cover crops such as *Crotolaria juncea*, *Tephrosia spp.*, *Indigofera spp.*, etc. should be broadcasted in thallis, so that by

the time the Hollong seedlings are transplanted, the cover crop can provide sufficient shade and prevent Mikania infestation.

3) *Toona ciliata* M. Roem:

Toona ciliata also known as Red Cedar, is a forest tree in the family Meliaceae which grows throughout Tropical Asia, Southern China, Himalayas to Australia. *T. ciliata* is a fast growing deciduous tree with large branches that create a spreading crown. It grows to between 10 m - 30 m in height. The rough bark is grey – brown and cracks into squares. *T. ciliata* is famous for its fragrant red wood that is much sought after for use in furniture making, building and ornamental wood work. The soft wood is easily worked and polishes to a rich red that is enhanced with age. Flowers are white, fragrant in a large pyramidal panicle at the ends of the branchlets. Individual flowers about 5 mm long. Flowering period is in spring. Leaves are alternate, pinnate, consisting of five to seventeen leaflets. Leaflets opposite or irregularly alternate, ovate – lanceolate, 4-13 cm long, often drawn out to a long point at the tip, unequal at the base. The fruits are green capsules that turn brown with age and split open into star shape, to release seeds. The seeds are small and winged. In India, the climate of the natural habitat comprises rainfall from 1100 -4000 mm per year and temperature range from about 0 -35°C. In Assam *T. ciliata* occurs in moist deciduous forests with *Tetrameles* species and *Stereospermum* species; other common associate tree species *Albizia procera*, *Amoora wallichii*, *Artocarpus chaplasha* and *Pterygota alaata* (Champion and Seth, 1968).

Toona ciliata is widely planted as a shade tree and for timber because it is fast growing. It is also drought tolerant. The timber is easy to work and very highly valued.

Method of propagation: *Toona ciliata* reproduces by seed. It is a prolific seed producer and establishes readily.

Propagation through seeds: Planning process to raise a nursery from seeds has to be initiated well ahead of fruiting season, which starts from May to June, so that good quality planting material can be obtained.

Seed collection and processing:

- When the fruits (capsules) on the mother trees become brown in colour, it is right time to collect them for the extraction of seeds.
- Fruits are collected by lopping of matured capsules bearing branches.
- From the lopped branchlets, the fruits can be plucked by hand and filled in gunny bags and transported without delay to the nursery site for processing.
- Drying ripe capsules can be pounded in mortar to remove seeds. Beating the capsules in sacks or big tray with stick can also be applied to extract seed.
- Each capsule with five valves and thin walls, typically 20-30 x 8-12 mm. There are around 5 seeds per locules, each 10-20 x 3-5 mm, light brown and membranously winged at one or both ends.

Seed collection period - May and June

Number of seeds/2.1gm - 1000

Seed viability - one month only

Germination percentage - 90-100%

Pre-sowing treatment - Not required

Sowing method - Mother beds

Moisture content of seeds - 18.65%

Germination period - 10 to 15 days

Nursery management - Care should be taken at the time of sowing of seeds and

Watering the beds as there are chances of damage due to very light weight of the seeds.

Nursery establishment:

Seed sowing in germination bed –

- a) Raised standard nursery beds of measuring 10 m x 1.2 m size can be used for raising seed-lings.
- b) It prefers a rich, deep, water- retentive soil and does not do well on wet compacted or poor sandy soils.
- c) pH of the soil range 5.5 - 8.0.
- d) Fill the raised beds with pure river sand and Seeds are sown at the depth of 0.5 cm to 1.0 cm in mother beds or trays.
- e) Keep the beds moist all the time by regular watering. Watering is done carefully so that seeds are not washed away.
- f) Make provision for shade over the beds (using agro shade nets or any other locally available material).
- g) The germination starts after 7 to 15 days of sowing and continues up to about three weeks.
- h) Due to low viability period seed should be sown immediately after collection. Depending on quality of fresh seeds and time of collection, over 90 -100% germination can be achieved.

Pricking out to polybag/ woven bag: Germination takes 7 -15 days. After about 45 days of sowing, seedlings are transplanted when they have sprouted and have at least two set of leaves and they become about six inches tall. Bags are filled with a mixture of soil, sand and compost in 1: 1: 1 ratio as potting media for potting the seedlings. Keep the soil continuously moist and never let it dry out. Seedlings are sensitive to lack of water (drought), fire and weed competition. Seedlings should be protected in partial shade to avoid bleaching of leaves. With good nursery practices the seedlings become ready for plantation after about 5 to 6 months of transplanting.

Plantation establishment:

How to prepare the field for planting-

- a) Select a suitable moist deciduous forests area to field plant the seedlings of *T. ciliata*.
- b) Weed the area to remove undergrowth and ground flora.
- c) Align the plot at a spacing of 2m x 2m. or more.

- d) Take pits of 30cm x 30cm x 30cm size for planting the seedlings.

How to field plant seedlings –

- a) Field plant the poly - potted seedlings, maintained in the nursery by the onset of pre monsoon showers in May - June.
- b) Remove the polythene covers without damaging the root system of the seedlings.
- c) Provide little terracing around the field planted seedlings to avoid stagnation of water.

Disease and pest management: Only one pest recorded on the Poma tree. One moth, shoot- borer, *Hypsipyla robusta* is a pest which eats out the new shoots pith. This moth larva is particularly a problem on juvenile trees and will cause premature branching out.

No major disease problems are recorded in the field planted seedlings of *Toona ciliata*.

Management of the disease:

- a) Plantation of saplings from the diseased nursery should be avoided.
- b) Removal and burning of infected leaves and twigs can be important in plantation by reducing residual inoculum level of the pathogen.
- c) The management practices like genetic selection of trees, proper scheduling of pruning and thinning, silvicultural manipulation to improve tree form and sand hygiene can be employed to minimize the damage.
- d) Attack by Moth larva can be controlled by the application of 0.03 % Roger 20 EC.

Plantation maintenance and growth of seedlings:

- a) Almost 80 per cent of the field planted seedlings survive during the first six months after planting.
- b) After plantation seedling should quickly start growing and sending out suckering root to form a clump.
- c) It grows quite quickly but can take up to ten years to get to its full height.
- d) Trees planted in open localities may flower and produce seed after 6 years.
- e) It coppices well and produces plentiful root suckers.
- f) The tree has a spreading superficial root system which may have adverse effect on the growth of Agricultural crops.
- g) The tendency to become branchy, it should be controlled by close initial spacing .Thinning is required from the 4th year and thereafter every 5 year are reported in the plantations of the species.
- h) Grazing to be prevented in the plantation.

4) *Michelia montana* Blume. (Pansopa):

Michelia is a historical genus of flowering plants belonging to the *Magnolia* family (Magnoliaceae). *Michelia* comprises about 30 species of evergreen trees and shrubs native to tropical and subtropical climate and is distributed in East and South- East Asia from India and Sri Lanka eastwards to southern Japan and Taiwan and southeastwards into Indonesia (not in Sulawesi and New Guinea). Today it is regarded as a synonym of *Magnolia*. The leaves, flowers and form of *Michelia* resemble *Magnolia*, but the blossoms of *Michelia* generally form clusters among the leaves, rather than singly at branch ends as *Magnolia* does.

Michelia montana (Pansopa) is a medium sized, ever green tree with a clean cylindrical stem growing in wet mixed forests of Joypur RF, Uper Dihing RF, Bogapani RF, Lakhpathar RF, of Dibrugarh, Digboi and Doomdoma division and scattered elsewhere under wet evergreen forests. *M. Montana* tree, becoming over 40 m tall and over 2 m diam. Young twigs glabrous. Terminal buds hairy at the apex only. Leaves glabrous, spirally arranged more or less elliptic, 9-30 (-35) by 4-13 (-20) cm; apex shortly acuminate, often obliquely folded when dry; margin entire; base alternate, decurrent on the petiole with two (faint) ridges for its entire length; nerves in 9-15 pairs, conspicuous, curved upwards and meeting in a rather conspicuous intra marginal vein, reticulation dense, prominent on both surfaces. Petiole thickened towards its base, without stipular scars, 15-35 mm long. Flowers 1 (or 2) terminal on a short axillary shoot (branchyblast), rarely terminal on the main twig. Branchyblast 5-20 mm, glabrous to (rarely) densely pubescent, with 1-3 stipular scars with or without a petiolar scar, when 2 scars the middle scar more or less halfway up; length of nodes 3-12 mm, pedicle 0.5 – 4 mm, silky or rarely glabrous. The flower bud surrounded at least by an outer and an inner spathaceous bract respectively inserted on the last 2 nodes below the pedicle; these bracts glabrous except the margins towards the apex. Stamens c. 10-13mm long including the c. 2mm long connective appendage; anthers lactrose, brownish or orange in vivo. Carpels 1- 4 together with the 4-8 mm long gynophore. Fruiting carpels free, 1-4 fleshy, lenticelled 2.5 – 6.5 by 1.8 -4 cm, pink or dirty purple in vivo dorsally dehiscent and the falcate dorsal nerve often finally becoming separate when the carpels disintegrate by rooting.

Soil and Climatic Requirement: In general *M. montana* grows well in deep, moist, shady, loamy or sandy loam, well drained, acidic fertile soils. It does not stand water logging. Tropical and sub tropical climate altitude ranging from 500 -1500 m with rainfall ranging from 2000 mm to 5000 mm.

Light requirement: It requires mean annual temperature (exposure) ranging from 7°C to 38°C. Though it is moderate light demander, it prefers shady site at early stage (seedling and sapling). The best location for *M. montana* is the place where it receives direct and ample sunlight in early morning but partial light for the rest of the day.

Flowering and fruiting: The flowers are protogynous and are pollinated by beetles, which feed on the stigmas, pollen, nectar and secretion from the petals. Flowers appear from May to June, fruiting occurs in August or later. Fruits should be collected in early September. *M. montana* is thought to hybridize with *Michelia champaca* giving rise to *M. alba* which rarely produce fruits and is unknown in the wild.

Uses: *M. montana* (Pansopa) growing up to 40 metres tall. The tree is harvested from the wild for its valuable timber. The dark yellow- brown to dark brown wood is light, fine grained and durable. It is used for house construction and buildings.

Method of propagation:

Natural Regeneration - Certain amount of natural regeneration comes up especially in the moist regions of the forest and fairly well in evergreen forests; in spite of the seed being destroyed by birds, mice and rodents in large quantities.

Artificial Regeneration- The most successful method of propagation of *M. Montana* artificially is by seed.

Propagation through seeds: Planning process to raise a nursery from seeds has to be initiated well ahead of fruiting season, which starts from August to September, so that good quality planting material can be obtained.

Nursery Practice: The pulp of the fruit around the seed should be removed before sowing because de pulped seeds give significantly higher percentage of germination compared to seed sown with pulp. Seeds are mixed with red-oxide to prevent its damage by the rodents. Seeds are sown soon after collection in August –September in shaded nursery beds (nursery beds of measuring 10 m x 1.2 m size) either broadcasted or drilled in 8-10 cm apart with a thin layer of earth sprinkled over the seeds. Due to low viability period seed should be sown immediately after collection. Germination starts after 15 to 20 days of sowing and continues up to 45 days. Seed should be sown in shades; which should be removed after germination.

Seed collection period - August and September

Seed viability - one month only

Germination percentage - 70%

Pre-sowing treatment - Seeds are mixed with red-oxide to prevent its damage by Insect, rodent etc. before sowing.

Sowing method - Mother beds.

Germination period - 15 -20 days

Nursery management - Germination of seed is generally poor and they should be treated with insecticide.

Pricking out to polybag/ woven bag: When the seedlings attain a 2 to 4 cm height. May also be picked into plastic tubes or container with a soil and cow dung mixture (3: 1) and left to grow for one year in the nursery. Keep the soil continuously moist and never let it dry out. Seedling can be out planted when they become 30 to 40 cm in height. They are kept in shaded bed under initial stage. Seedlings become ready for planting in the field by next rainy season.

Plantation establishment:

How to prepare the field for planting:

- a) Select a suitable evergreen forests area to field plant the seedlings of *M. montana*
- b) Weed the area to remove undergrowth and ground flora.
- c) Align the plot at a spacing of 2m x 2m. or 3m x 3m.
- d) Take pits of 30cm x 30cm x 30cm size for planting the seedlings.

How to field plant seedlings:

- a) The most successful method of propagating *M.montana* is by planting out nearly one year old seedlings at the break of the monsoon of the following year.
- b) Planting out with ball of earth or with naked roots though success chiefly depends upon congenial planting weather.

- c) The ball of earth being 7.5 to 10 cm in diameter and 15 cm long.
- d) Weeding will not be required after the second or third year as the plantation closes up rapidly.
- e) The first thinning in well-stocked plantation will normally be required in the 5th year if the spacing is about 2m x 2m.
- f) Stump planting is not suitable because it produces profuse number of shoots which, need to be pruned.
- g) Winter planting in November - December is also practised mainly to replace casualties.
- h) *M. montana* can be planted singly or along with the others as mixed plantations with suitable tree species (*Chukrassia tabularis*, *Schima wallichii*, *Artocarpus chaplasi*, *Terminalia myriocarpa*) of same growth rate.

Disease and pest management: During heavy rains some fungus attack are noticed in germination beds. The disease caused by *Rhizoctonia solani* appears in the rainy season and causes severe damage in the seedlings. Controlling this disease by using appropriate sanitation and cultural method is recommended. Disease can also be successfully controlled by spraying of Copper oxychloride fungicide.

3.6.9 Monitoring of Plantations:

Monitoring of plantations has been a weak point with the Forest Department. Although regular inspections are made by officers of various ranks, these serve little purpose as plantations visited are usually of the same year (and therefore have a good survival percentage) and little can be done by way of improvement once the work has been done. Monitoring of plantations should lead to better ways of doing things and ensure improved survival of plants. Towards this end the following guidelines are suggested:

Monitoring of plantations begins with the nursery. The better the quality of the nursery stock, the higher the rate of plantation survival. Therefore, regular visits to nurseries by the RFO, ACF, DFO and the CF are essential. Apart from physically checking the numbers and quality of the stock each such visit should aim to impart some knowledge and skills to the nursery labour. Nursery labour including the forest workers should be retained in their postings for as long as feasible and regularly imparted training. The visiting officers need to write their observations and comments in the nursery journals while seeing that it has been properly and regularly updated wherever feasible, touring officers should find out and look at areas to be taken up for planting in the next year. For larger areas (> 5 ha), the ACF should be asked to prepare a rough site specific plan using GPS and camera to document site conditions prior to planting. When this is done, the plan requires to be approved at the appropriate level so that it is not subject to usual norms of plantation that apply uniformly to all areas. Site specific planning and approval is useful and important especially to tackle very degraded and recalcitrant areas successfully. Plantation journal must be maintained recording all activities undertaken in the plantation site. In order to make this a useful document it is important that visiting officers record their observations, suggestions in these journals. The use of photographs to capture progress of plants and so forth needs to be encouraged amongst the staff. Provision for third party monitoring of plantation shall be introduced.

The Divisional Forest Officer may exceed these annual targets & may alter the sequence of planting depending upon the availability of the area, budget & administrative considerations.

3.6.10 Control records:

The following records are to be maintained:

(a) Control Book: This should be maintained annually as prescribed in the form 3 and form 4. These forms show the thinning prescription of this plan, the work actually carried out and yields obtained.

(b) The record of works: This will be a record of all operations carried out in accordance with the working plan in connection with the management of plantation. Care must be taken in recording each item carefully every year in the Form IIb.

(c) The Plantation journal: All the operations carried out in the plantations from time to time should be entered there, as it is a permanent record of the history of a plantation from its formation up to its final exploitation.

(d) The Control map: It will be maintained in GIS domain in 1:25000 scale duly showing the plantations where various operations as prescribed in the plan are carried out.

3.6.11 Associated regulations and measures

1 Closure: All areas taken up for plantation will remain closed for 10-15 years to establish the crop. It has, however, been the experience that closures were not effective in the past wherever they were done. High security fencing like border fencing will only work. Otherwise there is no use of spending money undertaking plantation works.

2 Fire Protection: Fire line and road side clearing be done yearly through JFM groups.

General

1. On the issue of outsourcing plantation works, it has been seen from instances that execution of plantation works are not successful. It was revealed in number of literatures about poor technical competence of the service contractors that the service contractors were to a large extent incompetent. They went on to say that the contractors do not have the required technology to execute the function. On the other hand the knowledge on silvicultural regeneration techniques and experiences gathered by forest personnel in training and during service life can never be acquired by a contractor or his workers. Utilizing these knowledges and experiences of forest staffs in plantation works resulted successful plantations in the past. It is, therefore, suggested that plantation works should not be outsourced but to execute utilizing knowledge and experiences of forest staffs.

2. Plantation journal be prepared & all operation done from time to time be properly entered, along with expenditure incurred.

3. Grasses or any other fodder removed by right holders, from such plantations should also be assessed to ensure the productivity of the area & increase in per capita income of local population.

4. Each plantation site must have a sign board showing the year of plantation, species raised,

compartment, name of the working circle & extent of area, if possible sketch plan of plantation showing the distribution of species in the plantation area be also depicted on such plantation sign board.

5. To facilitate inspection, inspection path be constructed along the contour.

6. Causes of mortality due to natural calamity must be recorded in plantation register.

7. Inspecting officers must issue inspection note and give his/her observations & guidelines to field functionaries whenever such plantations are inspected by them. These inspection notes must contain there in, the date of inspection & name of inspecting authority for ready reference in a sequence. The general tendency of keeping them in loose form and not in plantation journal/register should be avoided.

8. Documentation of successful model plantation be done & shown to public & other field staff during various interaction held with them from time to time. If possible trips be organized for them to see the site so that they are also sensitized & more closure of area is sought with their active cooperation.

9. Grazing should be restricted till the plantation is fully established in a period of 10-15 years

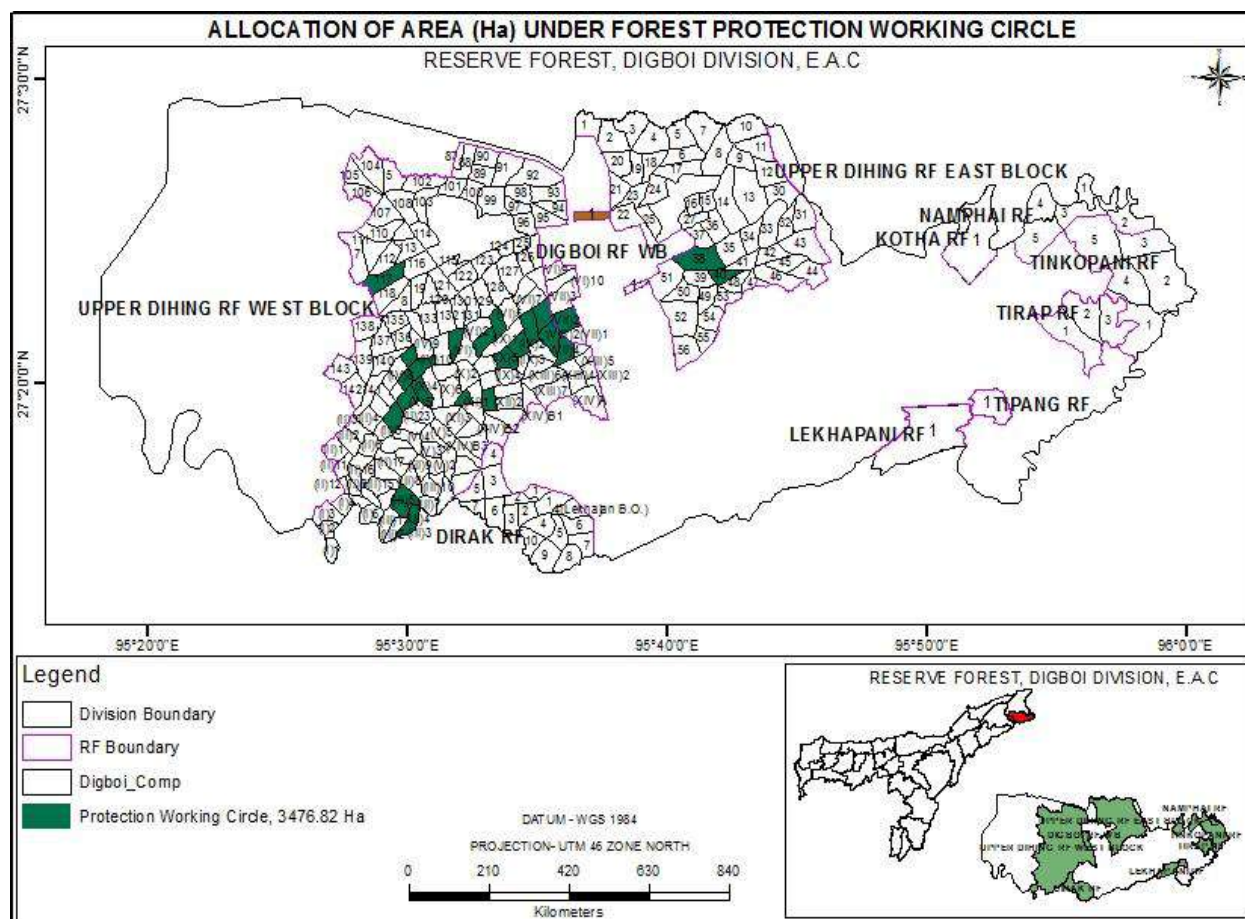
CHAPTER 4

FOREST PROTECTION WORKING CIRCLE

4.1 Name of the working circle

Name of the Working Circle is “Forest protection Working Circle”. The detail map of this working circle is shown in Figure 4.1.

Figure 4.1: Map showing proposed areas under forest protection working circle



4.2 General constituents of the working circle

This working circle includes the area, which certainly requires specific treatment being susceptible to high degradation due to various biotic, climatic and edaphic factors. From the view point of forest protection, this Working Circle shall include complete forest area of the Division. All the wetland of Reserved Forests shall be a part of this Working Circle. Such areas shall not be worked for timber or other NTFPs but shall be preserved by providing highest degree of protection. These areas should be seen as the ones which sustain the flow of ecosystem services to the fringe forest areas/JFMC areas as well as to the non-forest areas. Hence, it becomes absolutely essential to keep the core of the forest areas/ representative ecosystems intact and free from human disturbances. After many years in future, when the ecosystem

starts functioning again at its peak productivity, sustainable extraction from these forests may be allowed. Till that time, these forests shall function as nature's laboratories, which will keep on imparting insights about the functioning of the nature, to a keen observer.

The ecological and environmental role of forests has precedence over all other roles one can think of. Forests are the natural resources which are to be passed on to the posterity with least disturbance to the natural processes they are being subjected. Keeping this mandate in view, the protection working circle is carved out.

These forests include areas of unique flora and fauna with rich biological diversity and genetic resources. The forests of Digboi Division form a very important wildlife area for white winged wood duck. It is essential to maintain these areas to protect from extinction and preserve the unique wildlife habitat. The Division, serves as catchments of the principal Rivers of the tract with their swift drainage system during the heavy monsoon renders it absolutely essential to maintain a permanent vegetation cover over the catchments. The role of the forests in these catchments, which receive very heavy rainfall in a short span of four months from June to September, needs no emphasis. Forests contribute in no small measure in preventing soil erosion and flash floods and in regulation of stream flow that is necessary to prevent drought during summer months and to maintain high ground water table throughout the year. In the past, these forests were worked repeatedly and heavily in accessible areas and along riverbanks. These areas need complete rest now. Any change in the core belt of Digboi forest will have the drastic impact on climatic condition and rainfall pattern of rest of the State therefore it is very important to protect the area as it exists. The Division also deals with part of the fragile mega bio diversity hot spots of the world and therefore, needs to be preserved and protected.

4.3 General Characteristics of Vegetation:

Forests of the Division is a part of global bio-diversity hot spot (Myers, 1988; 1991) and has great biodiversity significance. The region is rich in medicinal plants, tea etc. The high biological diversity found in the district is often related to its forest cover, which is categorized into tropical wet evergreen forests. Some important tree species found in such forests include Hollong (*Dipterocarpus macrocarpus*), Guijan (*D. tubinatus*), Mekai (*Shorea assamica*), Kurta (*Palaquium polyanthum*), Nahor (*Mesua ferrea*) and Sianahor (*Keyea assamica*), Khagori or Khag (*Phragmites karka*), Nal (*Arimdo donax*), Ekra or Ikora (*Erianthus ravannae*), Ulu kher (*Imoperata cylmderica*), Meghela or Bhutang (*Saccharum arundinaccuin*, *S.procerum*), Kohuaor Kash (*S.spontaneum*). Other plant species found in the Division are *agerstroemia speciosa* (Ajhar), *Mansonia dipikae* (Badam), *Morns laevigata* (Bola), *Biscofia rnmnica* (Uriam), *Cordial dichotoma* (Bual), *Bombax ceiba* (Simalu), *Lagerstroemia parviflora* (Sida), *Delonix resia* (Radhasura), *Canarium benealensis* & *C resiniferum* (Dhuna, Dhup), *Ficus hispida* (Dimoru), *Premna bengalensis* (Gohra), *Caeslpima pulcherima* (Krishnasura), *Tetrameles mdiflora* (Bheleu), *Euclptus sp..* *Artocarpus intern fblia*(Ka\ha\). *Psiditm miowt* (Madhuriam), *Dillenia indiea* (Oulena). *Melia azedarch* (Ghoraneem), *Gravelia robusta* (Silver oak), *Gmelina arborea* (Gomeri), *Adina oligocephala* (Haludsopa), *Terminalia chebula* (Silikha), *Terminalia myricarpa* (Holock), *Anthocephalus mdicus* (Kadam), *Michelia manii*

(kathalsopa), *Magnolia baillonii* (Khorika sopa), *Ervthrina stricta* (madar), *Shorea assamica* (mekai), *Mesua ferrea* (Nahor), *Michelia montana* (Pan sopa), *Artocarpus chama* (Sam), *Sepium baccatum* (Seleng), *Saimalia malabarica* (Simul), *Albizia lebbek* (Sirish), *Dalbergia sissoo* (Sissoo), *Michelia doltsopa* (sopa), *Michelia champaca* (titasopa), etc. The shrubs and herbs vegetation includes mainly *Justicia adhatoda* (Bahaka), *Bambusa mastersii* (Betibah), *Cannabis sativa* (Bhang), *Solatum indicum* (Bhekuri), *Alpinia nigra* (Bogitara), *Pseudostachyum polymorphum* (bajal bah), *Pyrenaria barringtoniaefolia* (bon-madhuriam), *Sarauia roxburghii* (bon-pasala), *Centella asiatica* (bor manimuni), *Cassia tora* (daridinga, bon-medelua), *Clerodendron infortunatum* (dhoptita), *Litsaea salicifolia* (dighloti), *Sclerostachm fissa* (ekra, bata), *ricinus communis* (Eragoch), *Pinanga gracilis* (gereguatamol, ramtamol), *Hydrocotyle rotundifolia* (haru-manmani), *Zalacca secunda* (haukabet), *Antidesma ehaesembilla* (heloch), *Eupatorium odoratum* (jarmom bon), *Bambusa tulda* (jatibah), *Calamus tennis* (jatibet, rangi bet), *Licuala peltata* (jengu, japipat), *Calamus floribundus* (lejai bet), *Dendrocalamus hamiltoni* (kakobah), *Musa camellata* (kasodoria, kachidria), *Coffea benmlense* (kathandaphul), *Phrynium placentarium* (kawpat), *Saccharum spontaneum* (kusi), *Moghania strobilifera* (makhioti), *Saccharum narenga* (meghela), *Phragmites karka* & *Arundo donax* (nal), *Schumannianthus dichotomus* (patidoi), *Melastoma malabathricum* (phukuta), *Laportea crenulata* (sorat), *Phlogacanthus thrsiflorus* (titaphul), *Livistonia ienkinsia* (tokopat), *Bambusa paludici* (wakthoi, makai bak) etc. along with climbers such as *Thunbergia coccinea* (Chonga lata), *Dalbergia stipulacea* (datbijla, datbijili), *Pegia munda* (Dhindau - bagori lata), *Entada phaseoloides* (syn-e scandens), (*Ghilla. Barghilla* / Ghila -lewa), *Vitis latifolia* (syn- ampelocissus latifolia), *Thunbergia grandiflora* (kukua loti), *Mikania merantha* (manikilata), *Bauhinia vahle* (Nak-lati-lewa) etc. The forest water bodies and their bank acts as a bed for numerous free floating aquatic plants such as *Eichhornia crassipes*, *Azolla pinnate*, *Pistia stratiotes*, *Lemna trisulea*, *Spirodela polkyrrhiza* and submerged plants such as *Halophila ovata*, *Hydrilla verticillata*, *Potamogeton crispum*, *Potamogeton crispum*, *Ruppia maritima* etc. They cover the surface of the water bodies throughout the year with plentiful growth during the summer season.

4.4 Felling Series, Cutting Section: As the nomenclature “Forest Protection Working Circle” indicates that the activity of the Working Circle shall limited on protection measures only, there shall not be any felling or cutting and as such felling series or cutting sections are not constituted.

4.5 Blocks, compartment

A total of 3681.054 hectare area is allocated under this Working Circle. Area under different RF's and compartments to be covered in this working circle is provided in the table 4.5.

Table 4.5 Area details under the Forest protection working circle of Digboi division, Assam

Reserve Forest	Total RF area (ha)	Compartment Number	Area allocation under Forest Protection WC (ha)	RF area (ha) allocated to WC
Digboi WB RF	825.158	(VII)2	187.303	187.30
Upper Dihing EB RF	11686.54	38	349.559	474.04
		40	124.848	

Upper Dihing WB RF		102	204.227	3019.34
		117	240.039	
		(II)21	139.862	
		(II)24	122.361	
		(III)3	70.0382	
		(III)4	85.7054	
		(III)5	131.323	
		(III)6	69.4654	
		(IV)11	135.849	
		(IV)6	74.8634	
		(IV)7	87.9716	
	23594.74	(IV)8	138.57	
		(IX)2	139.592	
		(IX)5	153.979	
		(VI)3	130.826	
		(VI)4	122.924	
		(VII)4	150.985	
		(VIII)1	161.328	
		(VIII)2	173.42	
		(VIII)3	162.927	
		(X)5	144.916	
		(X)7	65.4221	
		(XII)1	112.75	
Grand Total	36106.44		3681.054	

4.6 Special Objectives of Management:

The broad objective of this Working Circle is to protect the reserve forests from all sort of forest degradation factors. Specific objectives are given below:

- i) To protect the forests of the Division from all sorts of forest degradation drivers including encroachment, illegal felling, lopping, grazing, illegal collection of NTFP, illegal clearance of forests for coal mining, illegal removal of minor minerals etc.
- ii) Augmenting forest growth including restotation of degraded forest to maintain environmental stability and ecological balance wherever it has been disturbed. And to protect the biological diversity of the area.
- iii) To determine the status of existing boundaries/boundary pillars of forests of various categories and to digitise the locations of existing boundary pillars and to locate the missing boundary pillars on ground using distance and bearing values provided in RF/PRF/PF notifications.
- iv) Ejection of encroachers from these areas shall be accorded highest priority. Efforts shall be made to restore the evicted areas to their pre encroachment status. Eviction and Post-eviction plans shall be meticulously prepared. Positive efforts shall be made to rehabilitate evicted families.
- v) To completely shift grazing, lopping, shifting cultivation and other forms of forest degrading activities to the fringe forests or JFMC working circle areas.

4.6.1 Silvicultural system: The Working Circle shall be treated for protection activities only. Except removal of dead dying and wind fallen trees there shall not be any harvesting in the Working Circle. However, Improvement felling or regeneration felling or canopy manipulation works may be undertaken subject to mid term deviation with approval of the PCCF.

4.6.2 Strategy for forest protection: The strategy to be adopted to protect forest is of integrated approach and it shall be applied at various fronts by undertaking collective measures based on situation and time. The strategy shall be direct / field oriented in a participatory manner with active involvement and co-operation of local people specially members of JFM Committees. In comparison to the unsecured forest boundary the number of forest staffs is very less Therefore there is a need to seek the co-operation of local people in forest protection. The main components of strategy are given below.

1. Existing forest needs to be well protected and developmental works like soil and moisture conservation measures, natural and artificial regeneration works and other cultural operations shall be carried out in order to increase productivity of forests.
2. Regulation of grazing and controlling fire.
3. Seeking co-operation and active participation of local people in all operations of forest management and employment generation to local people during lean period.
4. Fulfilling the demands of local people for forest produce.
5. Effective utilization of existing infrastructure, strengthen and updating infra-structural facilities, improvement in communication facility and mobility of the forest staff.
6. Installation of new Check posts at hyper sensitive and sensitive points.
7. Patrolling sensitive forest areas along with the local people/ JFM Committee members.
8. Intelligence gathering including introducing Rewards, Awards and informer system and making forest offences high risk low gain process.

4.6.3 Protection measures:

4.6.3.1 Inspection on transit: Though there is no check gate to control and regulate transit of forest produce, yet the DFO may arrange to check transit of forest produce. Section 40 of Assam Forest Regulation (Amendment) Act'1995 is to be enforced strictly.

4.6.3.2 Patrolling: To control illicit felling, regular patrolling is essential in sensitive and hyper sensitive beats where illicit felling takes place. Separate day and night patrolling around the sensitive, highly sensitive areas and on roads leading from jungle to High way shall be carried out. Record or register should be kept in Range Office regarding patrolling. ACF should supervise this type of patrolling and also he should participate in such patrolling at least once in the month. Smart patrolling initiatives may be designed. GPS based patrolling to be introduced so that effective monitoring is possible. Every Range shall have a mobile squad under leadership of a Deputy Ranger or senior Forester. Forest offense register should be maintained and Offence Registered should be pursued in proactive manner to ensure conviction.

4.6.3.3 Protection Squad: There should be a protection squad in each Range. Sufficient Guards should be posted in Protection Squad. Minimum one vehicles shall be at the disposal of Protection Squad. Sufficient fund shall be provided for mobilizing the Squad day and night. Head Quarter of Protection Squad shall be at Range Head quarter. The RO should closely monitor the work of Protection squad and should obtain weekly reports to monitor the protection activities.

4.6.3.4 Wireless network: Presently there is no wireless network in this Division. In the present day society offenders possess modern communication systems like mobile phones while committing forest offences and transporting forest produce. Cellular phones may be provided to the entire staff for effective protection of the forests.

4.6.3.5 Mobility of staff: In Digboi Division Government vehicles are provided to DFO, and RFOs. With the existing road network by using modern speedy vehicles, the forest offenders easily transport the illicit material. It is necessary to provide Bolero or other SUV vehicles to the territorial RFOs and ACFs for effective forest protection. Each Range should have at least two good conditioned vehicles. AFPF battalion shall be posted in each Range and in vulnerable Beats.

4.6.3.6 Provision of Arms: Sometimes offenders use modern weapons like fire arms in committing forest offences. For forest staff without modern weapons, it is difficult to tackle those offenders from committing forest offences. With a view to combat such attempts by illegal doers and for self defence, Forest personnel are to be equipped with weapons. Every Range Officer including Protection Squad Range Officer and ACF should be sanctioned Government pistol/revolver and at least five rifles to be issued to each Range. Fire arms may also be provided even to the lower rank staff those who involve in forest protection duty. Fire arms should be handled carefully following all protocols.

4.6.3.7 Territorial Inspections: Beat checking: It is necessary that the staff is required to carry out patrolling in their respective jurisdictions and the officers concerned will exercise effective supervision and control at all levels. It is necessary to report every forest offence promptly as per directions given in the standing order. For effective protection of forest the following prescriptions are made.

- (1) Review the offence cases beat wise, every month.
- (2) To enforce the provisions of Assam Forest Regulation 1891 (Amendment) Act'1995 strictly.
- (3) Forest Offences in arrest cases should invariably be submitted to the court within the prescribed time. Delay in the submission of charge sheets in the courts is viewed seriously.
- (4) Use IPC provisions for the effective control of the illicit felling.
- (5) The data related to offence cases shall be analyzed with the help of computers using available software.
- (6) Monitor the occurrence of all the offence cases daily through wireless.
- (7) Identify and list all the paths used for the transportation of illicit material.
- (8) Place effective patrolling squad at all important routes to prevent the transportation of illicit material.
- (9) Emphasis shall be made to arrest and prosecute the offenders rather merely seizing the material.

- (10) Plan in such a way to have young guards in the hyper sensitive areas.
- (11) History sheets of all the offenders along with their photo and bio-data are maintained at Range and Division level.
- (12) Prepare list of offenders, showing the offence cases involved by him, against each offender.
- (13) Use Cr.P.C. 110 provisions with respect to habitual offenders.
- (14) Provisions of IPC 395 shall be used by registering the complaint in the police station for the offences wherein five or more than five offenders are involved. The DFO shall co-ordinate with the Superintendent of Police to see that stringent sections of IPC will be used in the F.I.R.
- (15) Every Beat shall maintain a register of stumps in a specific format. Every stump is registered by a serial number followed by and year, for example, if tree number is 129/08. Here 129 is tree number and 08 is year. Every year from January 1st, onwards start the new series. After one year all the high stumps be dressed to ground level to obtain good coppice. The supervisory officers, during the beat inspection, verify the registered stumps and unregistered stumps. The beat officer shall be held responsible for non-registering the illicit stumps.
- (16) Every Range and Division office shall maintain the Xerox copies of the judgement of all forest cases for the guidance and improvement purposes.
- (17) Court Guard duties be assigned to a special duty FG for each Range Office and as well as Division office to monitor the dates and for timely communication to the witnesses.
- (18) All officers including DFO, ACF, RFO, Deputy Ranger, Forester and Forest Guards are to submit fortnightly diary mentioning their performance and activities.

4.6.3.8 Fire protection: Fire caused damage to the forest specially regeneration, forest growth, ground flora, soil organisms and the soil productivity. Prevention of fires and effective control of fires as prescribed in the plan is essential for forest development. The leaf litter on the ground and highly combustible under growth of grasses etc. catch fire and spread instantly. In summer high speed of winds spread fire easily before it could be brought under control. Fire line with appropriate width as per the guide lines shall be maintained and patrolled by fire watchers.

4.6.3.9 Grazing Control: Grazing causes lot of damage to regeneration due to trampling. The incidence of grazing is high in and around the forest areas where the villages are situated and the impact of grazing, illicit felling, fire encroachment is also tremendous around the villages. Therefore the forest areas around villages are deprived of regeneration. In many places especially areas around villages, the ground story is completely missing. To control grazing, grazing units are to be formed in the Division. The number of cattle heads per each unit are to be fixed as per the carrying capacity of the area. Grazing shall be allowed as per the carrying capacity of each class of forests.

4.6.3.10 Encroachment: The National Forest Policy 1988 in para 4.8.1 envisages that-

“Encroachment in forest land has been on the increase. This trend has to be arrested and effective action taken to prevent its continuance. There should be no regularization of existing encroachment.”

The problem of encroachment is common in almost all the areas specially the forest areas located adjoining human habitations. Out of total 53751.034 hectare of forest land in Digboi Division 5160.93

hectare (9.6%) of forest land are under encroachment. Population increase and requirement of land for agriculture and settlements besides greed of land hungrys are the main cause of encroachment. The problem aggravated because of apathy and laxity of forest staffs. Though the encroachment is a clandestine and gradual process, resisting and reporting of such encroachment had never been distinguished. In order to mitigate the problem, it is essential to take up survey and demarcation works on top priority. Boundary pillars shall be erected after the survey is over which can be completed in a phased manner.

All encroachments are to be evicted as early as possible. The following instructions shall be followed regarding encroachments.

Out of total 53751.034 hectare of forest land in Digboi Division 5160.93 hectare (9.6%) of forest land are under encroachment. Requirement of eviction per year shall be 516 hect and accordingly, the DFO subject to availability of fund execute the eviction operations.

- (1) Eviction of encroachers from forest land as per the provisions of Rules framed under section 72(c) of the Assam Forest Regulation' 1891 is a normal duty of the Forest Department, which should be carried out regularly by the Department as and when required subject to availability of logistic support. The procedure laid out in the The Assam land and revenue Regulation'1886 together with Section 434 of IPC and Section-7, 24, 25, 59, 61 and 66 of Assam Forest Regulation 1891(Amendment) Act1995 shall be followed.
- (2) All external boundaries shall be demarcated with concrete pillars. All sensitive and important boundaries and wherever disputes are there, be surveyed and concrete pillars be laid immediately. Multy-strand concertina (Rajor) wire fencing 2.00 meter high with precasted 150 mm x 150 mm RCC posts 2 meter apart shall be erected in strategic places so as to prevent human trespass into the forest.
- (3) All encroachments shall be listed with their names, age, residence, profession whether belongs to SC, ST, OBC/NT, extent of encroachment, sl.no. and location of encroachment. Offence Report (OR) shall be drawn against such encroacher and be sent to Court for prosecution. Repeated drawing up of offence reports will definitely discourage encroachment.
- (4) Eviction drive should be a big operation comprising staffs from entire division and nearest divisions.
- (5) If the encroachments in a village are more in number, police protection be obtained for the operation. Use of Cr. P.C. provisions like section 106 and 110 be used to smoothen the eviction operations as well as to prevent the tendency of future encroachments.
- (6) For the encroachments on the un-classed forests, FIR shall be lodged in the concerned police station for the prosecution.
- (7) To prevent the tendency of encroachments, improved crop techniques be propagated in the problematic villages to enhance the crop productivity with the help of Agricultural Department.
- (8) After the listing of all encroachments, sample verification shall be carried out by all supervisory officers to detect unregistered encroachments.

- (9) In the month of May, a drive for encroachment prevention be taken up in all the sensitive areas by taking meetings in the villages and by distribution of leaflets and posters.
- (10) Keep a watch on all the sites meant for debris cleaning, plugging etc., in the month of May, so that encroachments are removed even before the sowings. In the recent past the tendency for encroaching forest land for cultivation increased the actual encroached area is higher than that of recorded one.
- (11) The causes of forest encroachments shall be examined thoroughly and corrective measures shall be taken.
- (12) All necessary support should be extended to evict the encroachments as early as possible. The boundary management and standard administrative guidelines will help to control the encroachment.
- (13) RFO must inspect at least 50% of the boundary demarcation, ACF at least 10% of the boundary demarcation, DCF at least 2% of the boundary demarcation. RFO Mobile Squad shall check 2 % of the boundary demarcation.
- (14) Not reporting of encroachment by any officer/staff under his jurisdiction shall be deemed as abatement in encroachment.
- (15) All encroached areas, after result oriented eviction operation shall be undertaken under massive plantation.

4.6.3.11 Role of Joint Forest Management: JFM committee will contribute to a large extent in protection of the forest from illicit felling, encroachment, fire, grazing, etc provided if the forest staff has a constant dialogue with the JFM committees and involve them for joint patrolling, management and development of the forests. The JFM committees shall be entrusted with specific area earmarked for the protection, management and development of the area. The JFM committee members need to be given training in technical matters of protection at the same time they should be provided with gainful employment by taking up management and developmental activities. Visit of JFM Committee members to successful areas in the state may be undertaken.

4.6.3.12 Capacity Development and training of frontline staffs: Government policies in personnel management for professional Foresters, while aiming at optimum utilization of their professional skill, would endeavour to enhance their status attracting qualified and motivated personnel, keeping in view particularly the arduous nature of duties performed, often in remote and inhospitable areas. Frontline staffs should be deputed for undergoing training for capacity development. They should be exposed to various successful States to inculcate modern techniques and to generate love to the forest bringing attitudinal change. Apart from deputing staffs to the SFTIs, training to field staff shall be organised by DFO from time to time on the issues of various Acts, preparation of offence cases, tackling assault on staff, framing charge sheets, filing court cases, recording evidence etc. For this purpose help of police officers, ex- army men, advocates, forest officers should be sought to train field staff. Three trainings are proposed in one year for a batch of 25 Foresters and Forest Guards. Necessary budget provision shall be organised for training.

4.6.3.13 Use of GIS/GPS: Geographic Information System (GIS) and Global Positioning System (GPS) technologies have important applications in forestry. A GIS Centre for monitoring of forestry activities need to be established in the Division.

4.6.3.14 Legal Cell: In order to have speedy disposal of forest offences to file and pursue court cases, a legal cell headed by one Forest Prosecutor may be constituted at Digboi Division with supporting staff.

4.6.3.15 Provision of lock-ups: Some forest offences are of non-bailable nature and for prosecution of offenders it is necessary to provide lock-up cells at every Range head quarter. It is prescribed that lock-up cells shall be established at every Range head quarter and will be manned with two Forest Guards in three shifts.

4.6.3.16 Collection of intelligence and information: The RFO/ Beat Officers should frequently interact with villagers to collect information regarding illicit felling, encroachment, poaching, illegal grazing etc. through its intelligence network and keep that information, suggestions in a register in his personal custody. Through the intelligence network, village wise record of habitual offenders must be prepared by RFO in consultation with Beat Officers and Round Officer in the proformae given below and this register must be updated regularly. A secrete fund to gather intelligence and information is proposed to setup under the control of DFO.

4.6.3.17 Register of habitual offenders Name & address of the offender Previous record POR No./qty/Action taken Modus – operandi Photograph if available

4.6.3.18 Rewards: The existing provisions of rewards to subordinate staff for exemplary work in detection and prevention of offence cases need to be reviewed. The reward amount may be enhanced and maximum amount may be granted. It is proposed that the scheme may be extended to gazetted officers also.

4.6.4 Consolidation of Boundary: It is imperative that the status of existing boundaries/boundary pillars of forests and missing boundary pillars on ground using distance and bearing values provided in RF notifications needs to be surveyed.

Maintenance of boundaries and Pillars: To avoid legal disputes in the future, maintenance or boundary pillars is necessary especially the State boundaries. Inspection path of 3 m wide all along the boundary should be prepared for inspection and protection. The boundary pillars must be numbered and written. The Beat Officers should keep the records of boundaries of their beats in the Beat Book. The programme repair of Boundary Pillars should be followed as given in the Protection Working Circle. The dimensions of Main Pillar and Sub Pillar shall be as per estimates prescribed by Assam Forest Department. The estimated costs are as per prevailing rate of wages and cost of construction material (in 2019) and approved estimate. Such estimate shall be revised as and when felt necessary.

The following proposal is prescribed based on the need to maintain Pillar after every 3 year period. Cost of maintenance is 25 % of cost of creation of Boundary Pillar.

Total Number of Pillars Proposed to be Constructed

Total no Pillars to be Consructed (10 year)						
SL	Item	Length of	No of Pillars	Total No of	No of Pillars	Required no of

No		Boundary of All Reserve Forests (km)	(per km)	Large pillars required	existing at present in the division	pillars to be established (10 year)
1	Main Pillars	188	1	188	-	188
2	Sub Pillars	564	3	564	-	564

Apart from Boundary Pillars, fencing, of the design of border fencing, should be erected in strategic places to check biotic pressures inflicted on plantation and nursery, to check illegal felling and to check encroachment. Estimates for construction/erection of such fencing shall be prepared with the help of competent engineer and shall be materialized.



4.6.4.1 Target of Achievement:

Activity	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
a) Intensive protection measures will be taken for protection of those forest areas with over 60 percent canopy cover, grassland of reserve forests. b) Ejection plan. (2000 hect.)	500	500	500	500						
c) Boundary pillars (Main pillars 1 every kilometer and sub pillars 3 every 1 km) = 188 nos	26	26	26	26	26	22	22	14		
d) Sub Pillars = 564 nos	74	70	70	70	70	70	70	70	-	-
Creation of barriers including rajor-wire permanent fencing etc. to check biotic interference wherever necessary. = 20 KM(approx)	4	4	4	4	4	-	-	-	-	-

4.6.5 Ejection Plan for Digboi Division:

Objective 1: To determine the encroachers and encroached land: To achieve the objective the following strategies/actions are proposed.

Strategy / action	Time required	Remarks
Survey the encroached area with GPS demarcation.	90 days	Subjected to support and help from District administration to tackle law and order situation and good weather conditions.
Preparation of GPS based demarcation maps in kml format.	15 days	
Enumeration of encroachers <u>Options:</u> Referral of the General	1200 days	

Demographic Census report / preparation of a list of encroachers' households village-wise, with the help of Ranges and Civil support through Socio Economic Survey		
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Objective 2: To make the area free from encroachment: In order to achieve the objective, the following strategies are proposed.

Strategy / action	Time required	Remarks
Through Ejection operations (U/S 72 of AFR' 1995)	Time limit to be set after the initial survey of households to be ejected	For ejection operation, separate budget allocation shall be required and to be prepared and for effective execution of the ejection operation.
Domination over the ejected area	During course of ejection process	Immediately after the ejection operation, camping of adequate security personnel would be essential to dominate over the area, in order to avoid further encroachment recurrence.

Objective 3: Restoration of ejected land: To achieve the objective, the following strategies/ action are proposed.

Strategy / action	Time required	Remarks
Building up of infrastructures such as camps/barracks	During course of ejection process	1. Adequate numbers of camps and barracks are to be constructed once the ejection process is effected. 2. Repairing of existing roads and construction of new roads will be most essential. 3. Vehicles shall be required for effective patrolling duties and surveillance. 4. A budget needs to be prepared separately for effective execution.
Posting of staff and security personnel, creation of new forest Beat offices	Immediately after the ejection process	Posting of additional staff and armed forces shall be essential in each camp/barrack. In order to accommodate new forest beat offices/camps, new requirement of staff is a prerequisite.
Creation of Nurseries and plantations	5 Years	1. Adequate nurseries will have to be created in different locations for plantation. 2. Plantation will be created engaging labour and local people. 3. Maintenance of the plantations will be essential at least for 5 years. 4. Separate budget will be required for these activities and demand for releasing fund will be placed accordingly in time.

4.6.5.1 Logistics for executing Ejection:

Table 4.6.5.1.a: Logistics that would be required in each ejection operation

Truck for Labour	Truck for seized materials	Bus for Security personnel	Small vehicle for Staff	Ambulance with Medical Team	JCB	Kunki / Elephant	Labour	Remarks
1	1	1	2	1	1	1	50	1 JCB and 1 No. Kunki/ elephant and a truck for

							seized materials are to be required to facilitate smooth eviction drive at Telpani R.F. for 2 Days.
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Table 4.6.5.1.b: Tools and Equipment

Daggers / Chisels	Hammers	Spade	Saw / Power Saw	Ropes	Measuring
10	10	2	2	50 Kg	2

4.6.5.2 Post ejection/eviction measures: Posting of security personnel would be essential after the eviction operation to dominate the area for which tents and accommodation would be required.

4.6.5.3 Plantation: Plantations in the ejection areas are to be carried out immediately. For which Nurseries are to be created in four different locations under Digboi Division.

Table 4.6.5.3: Number of nursery for raising planting materials for ejected areas

Total area for Plantation	Area of each nursery	Total nursery proposed
2000.00 Ha.	1.5 Ha	5 Nos.

4.6.6 Associated regulations and measures: The fringe villages around RFs are dependent on forest for grazing and fuelwood. It is not possible to stop grazing or collection of fuelwood due to socio-economic consideration. However, uncontrolled grazing needs to be regulated as it suppresses regeneration and promotes soil compaction and is detrimental to wildlife. Pole, firewood etc. derived from thinning operation may be given to the JFMCs on priority basis.

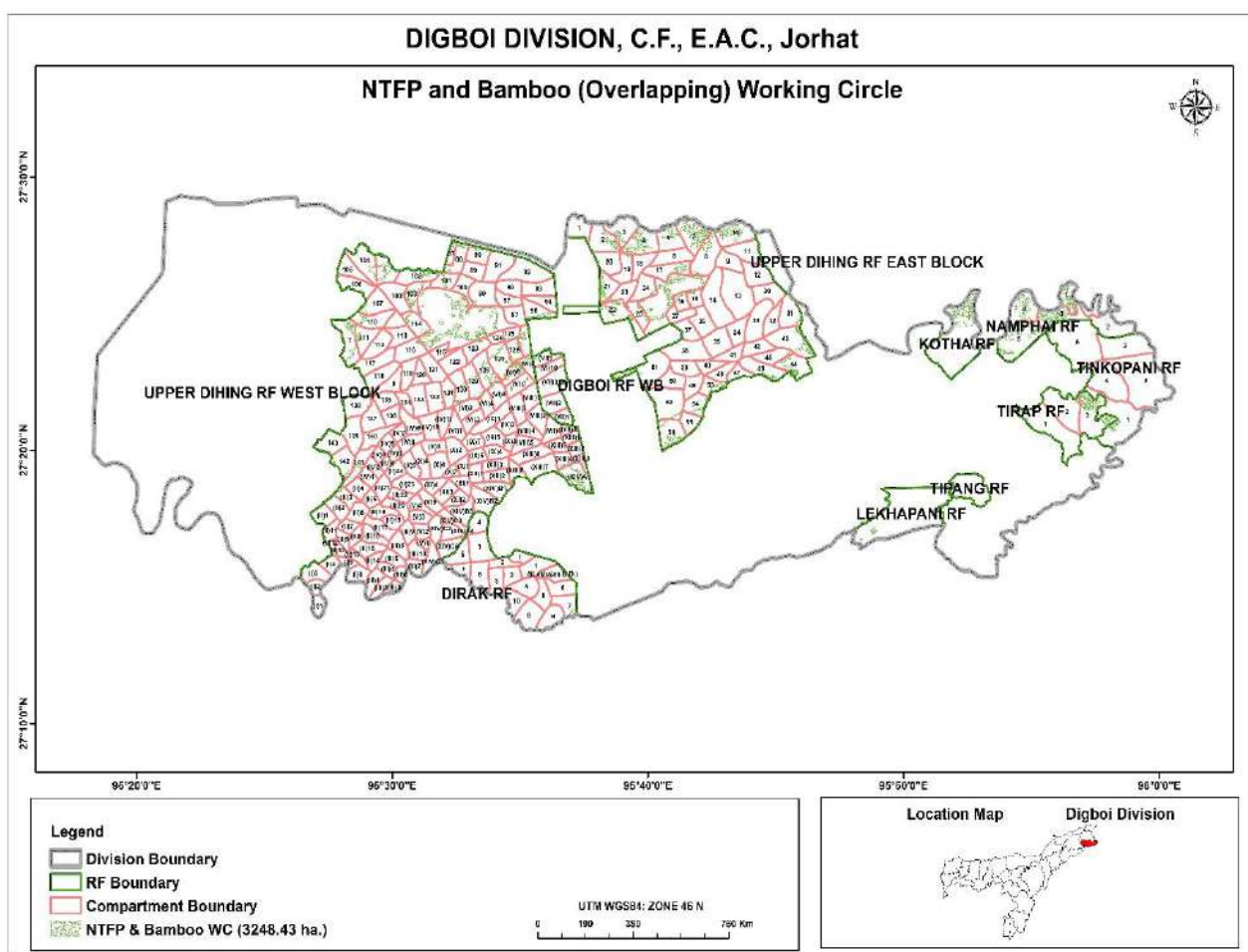
CHAPTER 5

NON TIMBER FOREST PRODUCE & BAMBOO (OVERLAPPING) WORKING CIRCLE

5.1 Name of the working circle

Non timber forest produce and Bamboo (overlapping) working circle. The detail map of this working circle is shown in Figure 5.1.

Figure 5.1: Map showing area under NTFP & Bamboo (Overlapping) working circle



5.2 General constituents of the working circle:

The NTFP working circle shall comprise largely of fringe forest areas or such other areas, which are fit for extraction of a particular NTFP at a rate that does not lead to the long term decline of the biological diversity so as to maintain its potential to meet the needs and aspirations of present and future generations. Closure of an area for the collection or extraction of particular forest produce for a specified

period (closed area); restricting or banning the collection or extraction of any forest produce for certain period or periods of a year (closed season); limits on quantities of any forest produce to ensure sustainable harvesting for the future (sustainable harvesting limits); sustainable harvesting/ collection practices etc. NTFPs shall be managed on JFMC areas, fringe forest areas, community forest areas with the help of community after imparting proper training to them regarding time of harvesting, grading and storage for sustainable management and value addition etc.

5.3 General characteristics of vegetation: The forest type of the overlapping working circle as per the classification made by Champion and Seth in their survey of forest types of India-Type IB/C1 Assam Valley Wet Evergreen Forest (*Depterocarpus*) or more commonly known as Upper Assam Dipterocarpus-Mesua formation. It forms a part of the world heritage of tropical/subtropical wet evergreen forests, multi storied in structure and rich in biodiversity; more popularly known as Rain Forests. The forests of Dehing-Patkai Wildlife Sanctuary is characterized by multistoried layer of canopy; the predominant species like *Dipterocarpus retusus* reaches a height of 50 meters and above and girth up to seven meters. *Shorea assamica* is also visible in the top canopy along with *Dipterocarpus retusus* over a limited locality especially in slightly higher elevation with good drainage. Other species which are found covering the place in the top canopy are *Michelia champaca*, *Mesua ferrea*, *Magnolia spp.*, and *Canarium bangalensis*. *Artocarpus chaplasi*, *Altingia excelsa*, *Ailanthus grandis*, etc. The important NTFPs available in the division are:

Edible Fruits Outenga, Kol, Silikha, Bel, *Emblia officinalis*, *Artocarpus spp.*, *Syzygium spp.*, *Mangifera indica*, *Zizyphus species*, Poniya, Jalphai, Leteku, Kachu, Kathalu,

Other NTFPs Dalchini, dhuna, Monisal, Jengu, Tokou, Bah, Bet

Animal products Honey, wax

Medicinal plants Bhedai lata, Dhekia, Kochu, Kathalu, Manimuni, Jamlakhuti

5.4 Blocks, compartment & JFM areas

A total of 3248.43 ha is allocated under this working circle. Areas under different RF's and compartment and the area to be covered in this working circle are provided in the table 5.6.

Table 5.6 Area (Ha) details under the working circle of Digboi division, Assam

Reserve Forest	Compartment	Area (Ha)
Bogapani RF	1	26.82
Digboi EB RF	1	18.35
Digboi WB RF	(VI)10	2.63
Digboi WB RF	(VI)9	9.66
Dirak RF	1	3.37
Dirak RF	3	0.56
Dirak RF	4	10.53
Dirak RF	6	0.45
Dirak RF	7	10.57
Kotha RF	1	168.82
Lekhapani RF	1	18.46

Reserve Forest	Compartment	Area (Ha)
Namphai RF	1	89.71
Namphai RF	3	112.60
Namphai RF	4	109.03
Namphai RF	5	138.66
Tinkopani RF	1	16.96
Tinkopani RF	4	0.92
Tinkopani RF	5	25.46
Tirap RF	1	25.33
Tirap RF	2	10.50
Tirap RF	3	96.77
Upper Dihing EB RF	1	3.87
Upper Dihing EB RF	2	32.18
Upper Dihing EB RF	3	31.52
Upper Dihing EB RF	4	79.49
Upper Dihing EB RF	5	25.60
Upper Dihing EB RF	7	132.71
Upper Dihing EB RF	8	47.89
Upper Dihing EB RF	10	90.08
Upper Dihing EB RF	11	0.70
Upper Dihing EB RF	12	0.21
Upper Dihing EB RF	15	8.38
Upper Dihing EB RF	16	8.71
Upper Dihing EB RF	17	34.01
Upper Dihing EB RF	19	5.90
Upper Dihing EB RF	20	8.47
Upper Dihing EB RF	21	36.87
Upper Dihing EB RF	22	67.58
Upper Dihing EB RF	23	6.89
Upper Dihing EB RF	24	12.73
Upper Dihing EB RF	25	25.32
Upper Dihing EB RF	27	2.74
Upper Dihing EB RF	30	4.77
Upper Dihing EB RF	31	15.75
Upper Dihing EB RF	43	61.75
Upper Dihing EB RF	44	47.08
Upper Dihing EB RF	45	6.68
Upper Dihing EB RF	46	27.27
Upper Dihing EB RF	47	3.86
Upper Dihing EB RF	48	0.32
Upper Dihing EB RF	51	1.37
Upper Dihing EB RF	52	5.98
Upper Dihing EB RF	53	24.83
Upper Dihing EB RF	54	20.19
Upper Dihing EB RF	55	9.98

Reserve Forest	Compartment	Area (Ha)
Upper Dihing EB RF	56	61.48
Upper Dihing EB RF	Forest Village	158.17
Upper Dihing WB RF	5	37.95
Upper Dihing WB RF	7	74.29
Upper Dihing WB RF	8	1.84
Upper Dihing WB RF	87	12.51
Upper Dihing WB RF	88	20.51
Upper Dihing WB RF	90	18.48
Upper Dihing WB RF	91	0.50
Upper Dihing WB RF	94	1.33
Upper Dihing WB RF	95	31.69
Upper Dihing WB RF	96	2.02
Upper Dihing WB RF	99	6.91
Upper Dihing WB RF	100	7.00
Upper Dihing WB RF	101	17.16
Upper Dihing WB RF	102	17.98
Upper Dihing WB RF	103	43.48
Upper Dihing WB RF	104	23.53
Upper Dihing WB RF	105	4.30
Upper Dihing WB RF	107	17.71
Upper Dihing WB RF	108	9.37
Upper Dihing WB RF	110	24.84
Upper Dihing WB RF	111	15.47
Upper Dihing WB RF	113	6.04
Upper Dihing WB RF	114	26.44
Upper Dihing WB RF	116	8.60
Upper Dihing WB RF	118	0.41
Upper Dihing WB RF	123	8.01
Upper Dihing WB RF	124	9.49
Upper Dihing WB RF	125	12.43
Upper Dihing WB RF	126	9.58
Upper Dihing WB RF	127	38.11
Upper Dihing WB RF	128	43.50
Upper Dihing WB RF	129	19.83
Upper Dihing WB RF	130	18.50
Upper Dihing WB RF	131	14.78
Upper Dihing WB RF	132	8.55
Upper Dihing WB RF	138	7.18
Upper Dihing WB RF	139	7.63
Upper Dihing WB RF	141	17.33
Upper Dihing WB RF	142	17.36
Upper Dihing WB RF	143	24.00
Upper Dihing WB RF	(I)3	4.78
Upper Dihing WB RF	(I)4	3.22

Reserve Forest	Compartment	Area (Ha)
Upper Dihing WB RF	(II)1	6.37
Upper Dihing WB RF	(II)2	6.11
Upper Dihing WB RF	(II)3	9.00
Upper Dihing WB RF	(II)4	5.21
Upper Dihing WB RF	(III)2	4.81
Upper Dihing WB RF	(III)3	0.17
Upper Dihing WB RF	(IV)1	3.35
Upper Dihing WB RF	(IV)11	3.92
Upper Dihing WB RF	(VI)1	0.62
Upper Dihing WB RF	(VI)2	5.16
Upper Dihing WB RF	(VI)4	10.22
Upper Dihing WB RF	(VI)5	8.52
Upper Dihing WB RF	(VI)6	34.27
Upper Dihing WB RF	(VI)7	5.82
Upper Dihing WB RF	(VI)8	24.43
Upper Dihing WB RF	(XIII)4	8.00
Upper Dihing WB RF	(XIII)7	5.44
Upper Dihing WB RF	(XIII)8	3.30
Upper Dihing WB RF	(XIV)A	79.92
Upper Dihing WB RF	Forest Village	321.65
Total		3248.43

5.5 Special Objectives of Management:

The broad objective of this working circle is to improve the stocks of NTFPs in the forest of this Division by regeneration and plantation. Specific objectives are given below:

1. To conserve and augment existing non timber forest produce including medicinal plants resource in its natural habitat.
2. To increase the yield of NTFPs by encouraging regeneration and supplementing with artificial regeneration by intensive cultivation.
3. To involve the local communities in protection and management of forest resources. To encourage for Sustainable use of forests through sustainable collection, harvesting of NTFP adopting sound silvicultural principles.
4. To encourage cultivation of commercially important species of medicinal plants on private lands.
5. To develop a system of pricing the wild harvest so as to reflect both the conservation costs and the community benefits.
6. To encourage public-private-community partnership for building capacity for cultivation, value addition and processing of raw material before export from the state.
7. To promote the use of commercially viable medicinal plants by the state owned and private pharmaceutical units and subsidiaries engaged in value addition.
8. To maximize yield of medicinal plants through sustainable natural and artificial regeneration and scientific exploitation.

5.6 Analysis of the Crop:

The entire tract has many useful shrubs, herbs, fungi which have been exploited from time to time. The area produces large quantities medicinal species like amla, behera, aam, bel, ritha and so on. A list of commonly used or economically extracted medicinal produce and plants occurring naturally are given in the Table below:

Table 5.6.a List of plants with local name, habit, local name, part used and medicinal use

Sl. No.	Scientific name	Habit	Local name	Parts used	Uses
1.	<i>Acorus calamus</i> Linn.	Herb	Bos	Rhizome	Decoction of rhizome is given in abdominal pain during menstruation cycle of women.
2.	<i>Caesalpinia crista</i> Linn.	Shrub	Letaguti	Fruits	Cold and cough. Whooping cough.
3.	<i>Curcuma longa</i> Linn.	Herb	Halodhi	Rhizome	Swelling of fingers of hands and legs.
4.	<i>Drymaria cordata</i> Linn.	Herb	Laijabori	Leaves	Stomach disorder and hairfall.
5.	<i>Phyllanthus emblica</i> Linn.	Tree	Amlokhi	Fruit	Dysentery, diarrhea, piles,
6.	<i>Hydrocotyle sibthorpioides</i> Lam.	Herb	Horumanimuni	Leaves, Roots	Rheumatism, menstrual Problem and also used as Digestive.
7.	<i>Centella asiatica</i> Urb.	Herb	Bor manimuni	Whole plant	Used as digestive, heals Dysentery, diarrhea.
8.	<i>Litsea salicifolia</i> (Roxb. Ex Nees) Hook. F.	Tree	Dhiglotti	Leaves	Leaf paste is taken twice a day with lukewarm water to cure loose motion
9.	<i>Leucas aspera</i>	Herb	Durunbon	Leaves, roots	Lack of appetite, sinusitis, Stomach complaints, headache, roots are used to treat ringworms, boils, swellings, Pneumonia and also in relief of snakebite.
10.	<i>Macrothelypteris 2quati</i> (Wall. Ex Bedd.) Ching	Shrub	Bihlongoni	Leaves	Tender leaves are cooked With chicken to feed mother to increase the milk production for newborn baby.
11.	<i>Mangifera indica</i> Linn.	Tree	Aam	Leaves, ba	Decoction made of leaves and bark is taken in empty stomach in treatment of dysentery
12.	<i>Mimosa pudica</i> L.	Herb	Nilaji bon	Roots	Tooth worm, menstrual problem.
13.	<i>Ocimum sanctum</i> Linn.	Herb	Kola tulokhi	Leaves, flowers	Cold and cough.
14.	<i>Bambusa balcooa</i> Roxb	Shrub	Bholuka bah	Shoots	Pain killer in insect bites and menstrual problem.
15.	<i>Musa balbisiana</i> Colla	Tree	Bhimkol	Fruit, root	Dysentery and other Stomach problems. Roots are used to treat pneumonia.
16.	<i>Piper nigrum</i> Linn.	Climber	Jaluk	Fruits	Indigestion, body-ache, also in post labour ailment and in bone fracture and pneumonia.
17.	<i>Ageratum conyzoides</i> L.	Herb	Gendhalibon	Leaves	Stops bleeding.
18.	<i>Ananas comosus</i> L.	Herb	Matikothal	Tender leaves	Leaf base is crushed and extract is given one time daily for amoebic dysentery and intestinal worms.
19.	<i>Bambusa tulda</i> Roxb.	Shrub	Jatibah	Root	Promote flow of urine.
20.	<i>Cinnamomum tamala</i> (Nees and Eberm)	Tree	Tezpat	Leaves	Rheumatism, gonorrhea, Diarrhoea, diabetes
21.	<i>Clerodendrum colebrookianum</i> Walp.	Shrub	Nephaphu	Tender leaves	Kills intestinal worms, reduce blood pressure.
22.	<i>Dillenia indica</i> L.	Tree	Outenga	Sepal of fruit	Fleshy calyx is used for stomach disorder. Jelly like pulp of fruit is

					applied to scalp for curing dandruff and falling hair.
23.	<i>Ficus racemosa L.</i>	Tree	Dimaru	Leaves and latex	Latex is used for piles and diarrhoea.
24.	<i>Paederia foetida L.</i>	Shrub	Bhedailota	Leaves	Malaria.
25.	<i>Naravelia zeylanica L.</i>	Climber	Gopsori	Leaves	Wounds and ulcer.
26.	<i>Oldenlandia corymbosa L.</i>	Herb	Bonjaluk	Whole plant	Plant is diuretic, stomachic and used as liver tonic. It is also used in jaundice.
27.	<i>Psidium guajava L.</i>	Tree	Modhuriam	Tender leaves	Amoebic dysentery.
28.	<i>Sarcochlamys pulcherrima (Roxb.) Gaud.</i>	Shrub	Mesaki	Leaves	Consumption of young leaves is believed to be protective measure from the tapeworm and fat minimizes agent when cooked with pork. Also leaves are useful for diarrhea, dysentery and also used as digestive.
29.	<i>Scoparia dulcis L.</i>	Herb	Senibon	Leaves	Fever, cough, diabetes.
30.	<i>Zanthoxylum nitidum (Roxb.) DC</i>	Shrub	Tejmooi	Leaves, stem, bark	Toothache or gum problem. It is stomachic.
31.	<i>Alocasia cuminata Schott</i>	Shrub	Dalkochu	Leaves, stems	Prevents anaemia.
32.	<i>Amaranthus spinosus L.</i>	Shrub	Hatikhutura	Leaves, stems	Constipation
33.	<i>Azadiracta indica A. Juss</i>	Tree	Mohaneem	Leaves, stem	Skin itching, boil, pimples.
34.	<i>Corchorus capsularis L.</i>	Shrub	Titamora	Leaves	Good digestion and get rid of intestinal worms.
35.	<i>Diplazium esculentum (Retz.) SW</i>	Herb	Dhekia	Leaves	Useful for good vision (eye).
36.	<i>Garcinia cowa Roxb</i>	Tree	Kujithekera	Tender leaf	Dysentery, reduce blood pressure
37.	<i>Hibiscus subdarifa L.</i>	Shrub	Boga Tengamora	Leaves	Dysentery, diarrhea.
38.	<i>Houttuynia cordata Thunb</i>	Herb	Mosundari	Fruit, Leaves	Diarrhoea, dysentery.
39.	<i>Nyctanthus arbor-tristis L.</i>	Tree	Hewali	Leaves	Malaria, diabetes and cough
40.	<i>Oxalis corniculata L.</i>	Herb	Horutengesi	Flowers, Leaves	Indigestion.
41.	<i>Basella rubra</i>	Herb	Bortengesi	Whole plant	Indigestion.
42.	<i>Spinacia oleracealracea</i>	Herb	Pirali paleng	Whole plant	Stomach trouble.
43.	<i>Chenopodium L.</i>	Shrub	Jilimili	Whole plant	Anaemia.
44.	<i>Aloe barbadensis</i>	Herb	Sal kuwari	Leaves	Genital herpes, burns, wounds, skin Infection.
45.	<i>Ageratun conyzoides</i>	Herb	Huhonibon	Whole plant	Red spots on tongue. Apply and rub on affected area.
46.	<i>Eclipta prostrate</i>	Herb	Keharaj bon	Leaf	Dysentery.
47.	<i>Bryophyllum calycinum Salisb.</i>	Herb	Dupor tenga	Flower	Menstrual pain.
48.	<i>Terminalia chebula</i>	Tree	Hilikha	Tender leaves	Jaundice, indigestion.
49.	<i>Alternanthera sessilis L.</i>	Shrub	Matikanduri	Leaves	Jaundice, indigestion.
50.	<i>Murra koenigil</i>	Tree	Narasingha	Leaves	Stomach trouble.
51.	<i>Mentha arvensis</i>	Herb	Pudina	Whole plant	Indigestion.
52.	<i>Baccupa monnieri L.</i>	Herb	Brahmi	Tender leaf	Improvement of memory and eye power.
53.	<i>Citrus limon L. Burm</i>	Tree	Nemu	Leaves	Black spot in face, indigestion.
54.	<i>Cajanus cajan</i>	Tree	Rahar dali	Fruit and tender leaves	Jaundice.
55.	<i>Sponolias mangifera</i>	Tree	Amora	Tender leaves, Seed	Tonsillitis.
56.	<i>Ipomea 3quatic</i>	Shrub	Pani kolmou	Leaves	Urinary disorder.
57.	<i>Clerodendron colebrookianum L.</i>	Tree	Dhopat tita	Leaves	Malaria, hypertension.
58.	<i>Cannabis sativa</i>	Shrub	Bhang	Tender leaves	Body ache.

59.	<i>Catharanthus roseus</i> L.	Shrub	Nayantora	Flower, Leaves	Diabetes.
60.	<i>Costus speciosus</i>	Herb	Jomlakhuti	Rhizome	Burning, Snakebite.
61.	<i>Ocimum gratissimum</i> L.	Shrub	Ram tulsi	Leaves	Cough, asthma.
62.	<i>Phlogocanthus thyrsi florus</i>	Shrub	Titaphul	Leaves, Flower	Indigestion.
63.	<i>Pogostemon benghalensis</i> (Burm.) Kuntze	Tree	Sukloti	Leaves	Diabetes, liver problems, wounds.
64	<i>Rauwolfia serpentine</i>		Surpagandha		Sex stimulant
65	<i>Andrographis paniculata</i>		Kalmegh		Cancer

Bach

Acorus calamus L.
(Acoraceae)

Uses- Tuber in epilepsy, loss of memory, as brain tonic, as appetizer. Used in flavouring food stuffs, gins and beers.



Chunga lota

Aristolochia cathcartii
Hook.f.
(Aristolochiaceae)

Uses- Root paste in snake bite, flow of urine, treatment of hydrocele.

Nilakantha

Aristolochia saccata Wall.
(Aristolochiaceae)

Uses- Root paste used in spleen and urinary diseases, used as an antidote to snake poisoning, as a tonic, stomach ailments.



Belikol

Aristolochia tagala Cham.
(Aristolochiaceae)

Uses- Root is tonic. Used in rheumatism, malaria, increase in milk of lactating mothers, stomach ailments.

Shatamul

Asparagus racemosus Willd.
(Asparagaceae)

Uses- Root used in epilepsy, leprosy, cardiac debility, bronchitis, tuberculosis, tonic and as aphrodisiac.



Sarpagondha

Rauvolfia serpentina (L.) Benth. ex Kurz
(Apocynaceae)

Uses- Root is used as a sedative, hypertension. It is used for reducing blood pressure, Useful in epilepsy, insomnia, dysentery and diarrhoea.

Darik-ada

Boesenbergia rotunda (L.) Mansf.
(Zingiberaceae)

Uses- Rhizome is used in peptic ulcer, diarrhoea, dysentery, flatulence, expelling round worms and as aphrodisiac. It is referred to as *Thai Ginseng* in trade.



Jyotishmati

Celastrus paniculatus Willd.
(Celastraceae)

Uses- Bark is used as brain tonic. Seeds are used in treating leucoderma, leprosy, paralysis, asthma. Seed oil in beri-beri. Seeds are very strong memory enhancer.

Morata

Chonemorpha fragrans (Moon) Alston
(Apocynaceae)

Uses- Roots in jaundice, diabetes, leprosy and cardiac debility. Juice of the root is used in helminthiasis and bronchitis. The seeds contain the most important molecule *Camptothecin* used for treating ovarian and colon cancer.





Satkora

Citrus hystrix DC.
(Rutaceae)

Uses- Juice used in rheumatism as massage, stomach ailments, jaundice, as flavouring agents in foodstuffs. Pericarp for digestion, flavouring dishes specially *Dals* and *Meat* dishes.

Talmuli

Curculigo orchioides Gaertn.
(Hypoxidaceae)

Uses- Rhizome is aphrodisiac, used as tonic, useful in asthma, bronchitis, gonorrhoea, jaundice and treating piles.



Kola- haldhi

Curcuma caesia Roxb.
(Zingiberaceae)

Uses- Rhizome is used in bronchitis, asthma, piles, tuberculosis. It is widely used in cosmetic industries. Used also as tonic for brain and heart.

Gos-alu

Dioscorea bulbifera L.
(Dioscoreaceae)

Uses- The tuber is aphrodisiac, tonic. Used in piles, syphilis, diseases of lungs, kidney and spleen.



Bakul-lota, Vai-vidanga

Embelia ribes Burm. f.
(Myrsinaceae)

Uses- Seeds used for anaemia, jaundice, chest complaints, as brain tonic, preparation of contraceptives, asthma, skin diseases, leprosy, heart diseases, expulsion of tape worm.

Lemtem, Chaulmoogra

Gynocardia odorata R. Br.
(Flacourtiaceae)

Uses- Seed oil is used in scrofula, skin diseases, treatment of psoriasis, chronic rheumatism and gout.



Gandh- kacu, Sugandhi-mantri

Homalomena aromatica Schott.
(Araceae)

Uses- *Sugandhimantri* oil is calming, anti-inflammatory, anti-spasmodic, reduces pain and fights against infection. It is destructive to bacteria. The essential oil has high demand in perfumery industry.

Chaulmoogra, Dalmugra

Hydnocarpus kurzii (King) Warb.
(Flacourtiaceae)

Uses- Oil of seeds is primarily used for treating leprosy, skin diseases. Also used in treating psoriasis.



Chandramula

Kaempferia galanga L.
(Zingiberaceae)

Uses- Oil of the rhizome is antifungal. Used in treating mental disorder, rheumatism, insomnia and dyspepsia.

Kola-ada

Kaempferia parviflora Wall. ex. Baker
(Zingiberaceae)

Uses- Rhizome is used in colic and gastric. It stimulates vitality to the body and stamina. It is traded in commerce as *Malayasian Ginseng*.





Bhumi champa

Kaempferia rotunda L.
(Zingiberaceae)

Uses- Rhizome is used in kidney and gastric problems. It is also used for reducing swellings in wounds. In cosmetic industries it is used for lotions of hands and feet.

Bandor kekoa

Mucuna pruriens (L.) DC.
(Leguminosae)

Uses- Used as tonic for enhancing sexual vitality. Used also as nervine tonic and aphrodisiac. Seeds used for gonorrhoea, general debility. Also useful in treating *Parkinsons'* disease.



Tuk-chini

Smilax glabra Roxb.
(Smilacaceae)

Uses- Tubers useful in syphilis, kidney and bladder diseases, for sexual impotence, rheumatism, gout, hypertension, used as a general tonic and for muscle building.



Heluka, Maida lakri

Litsea glutinosa (Lour.) C.B.Rob.
(Lauraceae)

Uses- Oil from berries and root is used in rheumatism. Oil is anti-fungal and anti-bacterial. Paste of the bark is used as plaster in case of broken limbs.

Bhatghila

Oroxylum indicum (L.) Kurz
(Bignoniaceae)

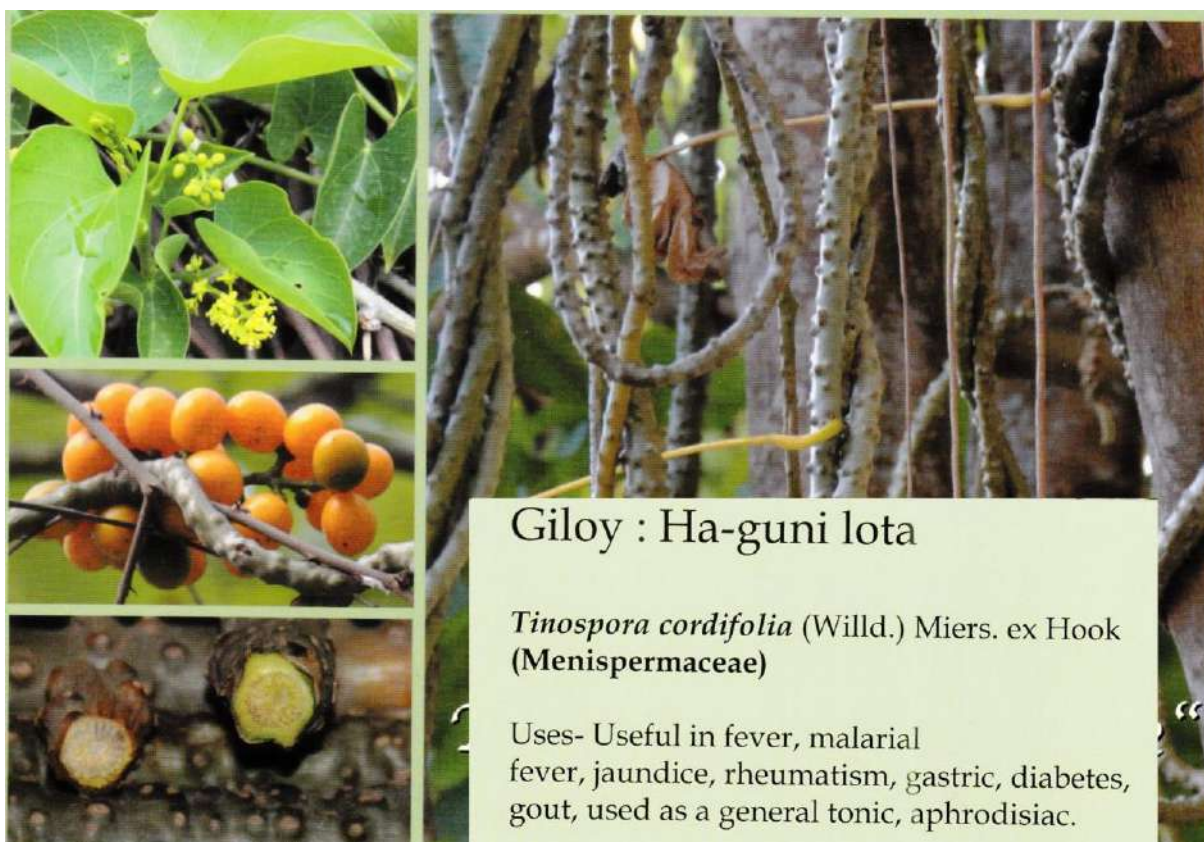
Uses- Root used in rheumatism, dropsy. Decoction of root used in cough, asthma, gout. Bark possess anti-cancer properties.



Boga Agyachit, Chitraka

Plumbago zeylanica L.
(Plumbaginaceae)

Uses- Root is used in leprosy, skin diseases, ulcers, gastric, epilepsy, rheumatic pains. Also useful in chronic diarrhoea and as anti-tumour action.



Courtesy: The State Medicinal Plants Board, Govt. of Assam

5.6.1 Stock Maps: As the medicinal plants are mostly herbs and shrubs found on annual or perennial basis, stock mapping is not possible.

5.6.2 Calculation of Yield: No yield can be prescribed as the most NTFPs are extracted through right holders. However, proper record of all the NTFPs exported through JFMCs and the department, shall be maintained annually and entered in respective compartment history files.

5.6.3 Rotational Extraction: Unscientific and unsystematic extraction of medicinal plants is likely to reduce the yield and quality of the plants and may even lead to disappearance of the species. A four year extraction cycle of the medicinal plants is already in force.

5.6.4 Subsidiary Silvicultural Operations: As no silvicultural system is prescribed, no specific operations are proposed. However, when the medicinal plants are raised in the nurseries or plantations, the regular operations like closure, weeding, bush cutting, protection from fire, grazing etc. are to be carried as in case of tree species.

5.7 Policy on introduction of Medicinal Trees in Forests:

It is now the State policy that in different plantations of the forest department about 30% of the trees being planted need to be of medicinal value and also native to the tract where plantation is being done. There is

thus a need to identify and grow suitable medicinal trees for different altitude zones in a particular forest division. It is important that these species need to be grown as Tall plants in the nurseries before being planted out.

5.7.1 Conservation and Development Plan:

For all other NTFP species forest department needs to intervene in the following manner. Important NTFP species should be retained as reserves in coppice coupes while marking. NTFP species should be given due importance in plantation programme. Exclusive NTFP plantations should be raised at suitable sites. Elsewhere 5 to 10% of the seedlings of NTFP species be planted at suitable locations in plantation areas. Healthy nursery stock of such species should be made available to the private people desirous of planting them in their fields.

Villagers should be encouraged to include NTFP species in JFMC micro plans. District administration should be requested to provide all help to the local people in establishment of small scale processing and marketing units for NTFPs. This will help in making collection/ growing of NTFPs remunerative.

5.8 Stakeholders

5.8.1 Primary and secondary stakeholders are -

- i) Local people for their daily needs,
- ii) Local health practitioners,
- iii) Cottage industries,
- iv) Petty sellers,
- v) Dhobi or washer man.

5.8.2. Difficulties faced are-

- i) Absence of fixed price for NTFP,
- ii) Absence of marketing facilities,
- iii) No standard procedure for collection or harvesting,
- iv) Involvement of middlemen,
- v) Ring formation at the time of tender cum auction sale,
- vi) Lack of processing units,
- vii) Ignorance of people about the availability of local resources.

5.9 Strategy: A very ambitious plan which can bring a drastic change in rural economy is thought of.

Cultivation of Agar wood trees (*Aquilaria agallocha*) through JFMCs at strategic areas creating a buffer belt to protect the forest is intended to be materialized. The areas through which men and cattles trespass into the forest and cause damage including illegal felling, lopping, grazing and also encroached shall be taken up for Agar wood cultivation. This will create a barrier around the core forest areas and will protect the forestry species (trees) and forest land from encroachments besides uplifting socio-economic condition of rural community.

Non timber produces such as Cane, bamboo, jengu leaves, caupats, patidoi, seeds and flowers of different trees, barks, roots, tubers, leaves etc. which have commercial value will be encouraged in JFMC areas. Methodology of closure of an area for the collection or extraction of particular forest produce for a specified period (closed area); restricting or banning the collection or extraction of any forest produce for certain period or periods of a year (closed season); limits on quantities of any forest produce to ensure sustainable harvesting for the future (sustainable harvesting limits); sustainable harvesting/ collection practices etc. will be adopted. NTFPs shall be managed on JFMC areas, fringe forest areas, community forest areas.

5.10 Method of treatment: Collection of NTFPs including Cane, bamboo, jengu leaves, caupats, patidoi, seeds and flowers of different trees, barks, roots, tubers, leaves, Dhupa Seeds, Dalchini leaves, Soapnut, Seekakai, Punarpuli and Honey will be allowed to communities involved in JFMC with strict adherence of JFMC Rules and under supervision of Forest Officials. Harvesting must be sustainable. Regeneration of NTFPs will be done involving local communities.

5.10.1 NTFP collection by JFMCs: Wherever JFMCs are formed, the collection of NTFP has to be entrusted to JFMCs, so that there can be a stake for the local communities to take interest in their proper collection and protection. No agents, outsider will be allowed to collect NTFPs from the Division.

5.10.2 Method of sale: NTFPs collected from areas other than JFMC areas and surplus NTFPs beyond domestic use will be put to sale in public auction or through tender process. The quantities of NTFPs will be ascertained from past records and auction rates for each NTFP items were fixed on weight basis. The sale will be held in the Range Offices. The entire collection and disposal of NTFPs should be done by JFMCs assisted by the department. Revenue collected from these will be deposited to the JFMC account. Any dispute will be resolved by the Range Officer.

5.10.3 Status of NTFP species: No systematic study of NTFP studies has been conducted. The information regarding their distribution, regeneration and productivity is must before a suitable strategy is involved. During the current Working Plan data on these lines should be collected. Apart from the items tendered by the department, local people do collect NTFP items for food and medicinal purpose. Data on such collections is required to assess the sustainability of removal of those NTFP items.

5.11 Prescriptions: The following prescriptions are suggested for the Working Circle –

- a) In consultation with the forest officials, JFMCs are allowed to collect NTFP from the area under JFMCs without damaging any part of the tree or trunk.
- b) Collection of bark of any tree is strictly prohibited.
- c) Only flowers, leaves, fruit and nuts are permitted to collect.
- d) A list of endangered species has to be prepared by the department time to time and collection of NTFP from such trees has to be banned.

- e) While collecting NTFP some trees in the area may be identified and left as mother tree./ tree for seed resources.
- f) Only authorised member of the VFC with their Identity card are permitted to enter into the forest and collect the NTFP.
- g) JFMCs are permitted to collect the NTFP only through the members of the VFCs from the permitted micro plan areas.
- h) The collected NTFPs in the VFCs areas should be stored in a declared Godown properly after processing and disposed by tender–cum-auction sale in the presence of the forest officials.
- i) JFMCs are to raise NTFP and bamboo species species in their land.

5.12 Target of Achievement:

Activity	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
a) NTFP Plantation Creation, 5% of total allotted area of 3248.43 = 162.42 (say) 170 hect.	25	25	25	25	25	25	20	-	-	-
Maintenance = 490 hect.	-	25	50	75	75	75	75	70	45	-
b) Bamboo Plantation Creation, 5% of total allotted area of 3248.43 = 162.42 (say) 170 hect.	25	25	25	25	25	25	20	-	-	-
b) Bamboo Plantation Maintenance = 490 hect	-	25	50	75	75	75	75	70	45	-

5.13 Management of bamboo: Bamboo extraction was never taken up in a regular way in this Division, as bamboo exists in pocket. However, as & when required bamboo was extracted to meet the domestic requirement of the people. This can be continued as extraction in such small patches in a scattered manner. If flowering of bamboo is reported harvesting of green bamboo is essential in the patches where it is available. Dead and dried bamboos are susceptible for fire hazards. Bamboo will be harvested from the JFMC area. The bamboo plantations inside the reserve forest meant for enhancement of wildlife habitats are not proposed for harvesting. The following cutting Rules are prescribed for proper management of bamboos.

- a) Cleaning and cutting of bamboos should start from uphill side and should progress downward.
- b) Cleaning and cutting of bamboos should be carried out at the same time and not be done separately.
- c) The cutting should commence from the middle of November and be continued till middle of April and Transportation of extracted bamboos should be completed before onset of monsoon to prevent damage to natural regeneration.
- d) All dead and decayed bamboos should be removed. Young and healthy culms are to be retained. This will help in getting good support to younger culms. The current year shoots, one year and two-year–old bamboos should not be cut.

- e) Bamboo clumps to be worked from the centre to outer periphery. If the clump is congested it should be opened from one side and worked in horse-shoe pattern.
- f) Each clump must be treated as a unit of working and the total number of bamboos to be cut should be such that a minimum of 12 culms are left in each clumps. If the number of culms in the clump is less than 12 it should not be taken up for extraction.
- g) Bamboo culms should be cut 6"-18" above ground the cut should be in slanting manner, just above the first node to prevent accumulation of rainy water in it.
- h) In case of sporadic flowering the flowered clumps should be cut first but it should be done only after shedding of seed from clumps.
- i) All the seeds should be allowed to fall, before taking up extraction of dead bamboos.
- j) Complete sweeping of forest floor should be avoided
- k) New vehicle paths should not be formed in the area to prevent damage to regeneration
- l) Extraction of clumps should be taken up from only one side, instead of working from all sides
- m) Extraction should be started after rainy season and be completed as early as possible
- n) Strict fire protection measures have to be taken up to prevent occurrences of accidental fires in the forest, casing any damage to dead bamboos and also to protect the young regeneration.
- o) Such areas should be kept completely closed from grazing till the clumps are completely established. Normally this period is 12-15 years.

5.13.1 Bamboo felling: The felling series is to be further divided into four annual cutting areas. The areas harvested in the first year will again be harvested in the fifth year. Similarly, the area harvested which will be harvested in the second year will again be harvested in the sixth year. Likewise, all the cutting area will be harvested. Each of the cutting areas will be divided into coupes. The coupes will be annual in operation. The areas where bamboo and other NTFPs grow in continuous stretch are considered for exploitation by the local people and the bamboo based industries.

5.13.2 Felling / cutting rules for bamboo

1. Harvesting should be as per the prescribed yield only.
2. All culms should be cut as low as possible but not above 30 cm from the ground level. The actual cut should be immediately above a node. This needs to be strictly enforced and regular inspections by officers should be carried out to ensure that this is done. If this is not enforced, the whole clumps will deteriorate in years to come.
3. Only mature culms will be removed. At least six mature culms should be retained in each clump in addition to all the one-year old culms.
- 4 For large-scale operation the felling should commence in the month of October and shall continue up-to the end of May every year.
5. The culms left out should be uniformly distributed as far as possible.
6. No cutting should be allowed from the periphery except for above 3 (three feet) wide passage for removal from inside the clump. A horse shoe pattern of cutting should be allowed.

7. All the dead bamboo should be cut and removed.
8. Any occurrence of flowering (gregarious) should be reported to the Principal Chief Conservator of Forests, Assam with a copy to Silviculturist, Assam Forest Division, Basistha. The flowered clumps should be extracted by clear felling depending on the extraction facilities and demand.

5.13.3 Method of regeneration of bamboo

Bamboo can be propagated both by conventional and non- conventional methods:

1) Conventional methods:

- i) Propagation through seeds
- ii) Propagation through rhizome / off- set planting.

2) Non- conventional methods:

- i) Propagation culm cutting.
- ii) Propagation through branch cutting.
- iii) Propagation through macro proliferation.
- vi) Propagation through layering and macrotting.
- v) Propagation through tissue culture.

Bamboo flowers in an interval of 10-120 years depending upon the species. Viability of seeds gradually decreased after one / two months, if it is not stored with proper aeration for seed respiration and protection from insect and rodents. Therefore, seeds should be sown as soon as possible after collection and processing. The collected seeds are to be cleaned properly, dried in the sun for 2-3 hours then stored in properly aerated gunny bags. Simultaneously, humidity and temperature should be controlled to 8-10% and 10° -14° C respectively. The seeds are soaked in clean water for 10-12 hours to break the dormancy and water is drained out properly 10-20 minutes before sowing. After treatment, the seeds may be sown in nursery bed, polythene bags or pots.

Prepare a raised nursery bed of 10 x 1.5 m. by deep digging or hoeing and fill it with a mixture of soil, sand and fully decomposed FYM in 2:1:1 ratio. The week before sowing, drench the nursery bed with insecticide (Aldrin) and fungicide (Bavistin) to prevent termite and fungal attack for each bed use 40 litres 0.05% Aldrin prepared by adding 0.5 ml. of Aldrex 30 EC per liter of water and 30 liters of 0.05% (a.i) prepared by adding 1 gram of Bavistin 50 wp'per liter of water.

The sowing should be done in bed of overhead shade protected preferably by thatch or bamboo split. Sowing in furrow of 2cm depth is advisable covering with thin layer of top soil and watering lightly once in a day. Seeds start germination after 3-7 days in favorable climatic condition and continue up-to 15-25 days.

a) Propagation through rhizome / off- set planting: Rhizome or off - set planting is the most commonly practiced and age old traditional method in home grown bamboos; however, it has several limitations too. The 1-2 years old culms are selected for off-set / rhizome planting - cut the culm keeping 2-3 internodes (1-2 m) high from ground level with active bed and excavate alongwith portion of rhizome. The rhizome

must be separated by cutting from neck carefully to avoid damage. This rhizome should be transferred to the planting site as early as possible to avoid mortality. The planting should be done in well advanced dug pits of size 45 cm x 45 cm x 45 cm for small sized bamboo and 60 cm x 60 cm x 60 cm for large sized bamboos. Prior to one month planting pits should be treated with insecticide and dried FYM or, any well decomposed manure.

b) Propagation through runner / cuttings: The runners of 1-2 years old having viable buds are selected and are excavated very carefully without injuring and disturbance. The selected runners are then cut with sharp secateurs / knife keeping 3-4 internodes are taken in prepared nursery bed of size, 10 m x 1.5 m. Before burying under the soil, rooting hormones are applied by dipping the base of cut end and buried into the nursery bed in a furrow depth of 2-3 cm and covered with top soil. Water the bed lightly daily till it is rooted. The propagules start sprouting and produce shoot after 1-2 months and rooting after 2-3 months.

The well rooted plants are taken out from nursery bed and each node with sufficient rooted plants are separated and transplanted in the poly bags. The polybags are kept overhead protected bed and again watered regularly. After 4-6 months, seedlings are ready for planted in the field. The best time for this method is during dormant period in the month of January-February.

c) Propagation through culm cutting: Propagation by culm is a viable and alternative method and has several advantages over other methods. This method involves treatment of culm cutting with growth regulation for root induction. The method is applicable for most species of economically importance bamboos.

The 1-2 years old mother plants are selected and trimmed by keeping 10-15 cm. long lateral branches and made the culm cutting keeping 2-3 internodes. Bore / open a hole between chemical solution of IBA or NAA @ 200 ppm up-to the cavity level. Then wrap the hole with polythene bag or, cellotape tightly.

Prepare 2-3 noded cutting with sharp knife or, hacksaw leaving 5-7 cm on either side of the nodes.

The prepared culms are buried in a furrow at 4-5 cm. depth at a distance of 45-60 cm and covered with top soil in well prepared bed. Shooting takes place after 1-2 months and roots emergence take place 4-5 months. Frequent watering should be given till proper root development. Rooted culms are taken out after flooding the field or during rainy days when bed is loosened. Best time for propagation of bamboo in this method is during rainy season, ie. March-May. Thick walled bamboo such as: *Bambusa bambos*, *Bambusa balcooa*, *Dendrocalamus asper*, *Bambusa vulgaris*, etc. can be propagated under this method.

d) Propagation through branch cutting: This method is mostly used in thick walled sympodial bamboos. The 1-2 years old branches with 3-4 internodes to be selected for planting materials. The propagation should be made during active growth stage. Cutting should be placed horizontally below 7-10 cm in sand bed or, mist chamber. Then well rooted plants are transferred to polybags and in green house or, overhead shaded bed, Bamboo species: *Bambusa vulgaris*, *Bambusa nutans*, *Dendrocalamus hamiltonii*, *Bambusa balcooa*, *Bambusa pallida* are recommended for propagation through branch cutting method.

e) Propagation through macro proliferation: The multiplication of bamboo seedling by rhizome separation leading to mother sized planting materials is known as macro-proliferation. This is generally practiced in small seedlings usually raised through seeds.

When the seedlings are of 5-6 months having more than 2 plants with prominent rhizome development it is separated and is repeated every year till it overgrows. The culm with piece of rhizome and roots are carefully separated with the help of sharp knife after washing or, shaking the attached soil. The separated seedlings are planted in the poly bag and stored under proper nursery conditions.

5.14 Subsidiary silvicultural operations: In order to encourage yield, subsidiary silvicultural operations such as cleaning, weeding, soil working should be carried out. The area may be fenced with locally available thorny material. If there are some small streams passing through the site, it is beneficial to construct check dams and vegetative gully checks for moisture conservation. Climber cutting, thinning etc, should be done at regular intervals to have better yield.

5.15 Measures for its protection: No bamboo harvesting is allowed from inside the reserve forest where it is planted for enhancement of wildlife habitat. No collection and harvesting of barks of tree. NTFP should be sustainably harvested. People other than JFMCs are not allowed to collect NTFP from the division.

5.16 Cultivation of Agarwood (*Aquilaria agallocha*)

Agar oil and wood are highly sought after products around the world, and Agar trees can offer lucrative global trade options to locals in this Division. Agar (*Aquilaria agallocha*) could be the driver of an economic empowerment for the marginalised aboriginal, native, tribal and forest dwelling communities in this Division. Such rural communities may be guided for exploring the green economic opportunities by planting Agar trees. Such plantation drives will not only work to combat climate change and pollution but exploring livelihood opportunities naturally would alleviate poverty by empowering marginalised communities. Hundreds of hectares of forest land are lying barren without any production. These barren lands can be brought under cultivation of Agar trees.

Aquilaria malaccensis locally known as Xasi or Agar, acts as a world class perfumery fixative and is highly sought after and priced by European perfumers for making their best grade scents. It acts as a stimulant, cardiogenic, carminative, aphrodisiac, alternative anodyne, antidiarrheal, antiasthmatic, astringent, laxative stomachic and tonic.

A cost and benefit analysis done by Kumar Deepak, an environmentalist working with the United Nations Development Programme (UNDP) reveals that around 3,000 *Aquilaria agallocha* trees in two hectares of farmland over a 20 year time period adds up to a total expenditure of about Rs 7.5 lakh. Anticipated yield and income generally comprise two phases. As an interim yield, 40% of the selected Agar plants were harvested in the first phase in thinning operation. The yield of distillable wood (Low quality Dum/Boya) from 10 years old tree (about 20 kg per tree) sells at about Rs 10 per kg. And the Dum quality wood from a 20 year old tree (about 50 Kg per tree) sells at Rs. 50 per kg. Batli Mal/kalagachi of a 20 year old tree (about 0.5 Kg per tree) sells at Rs. 2,000 per Kg. So the gross return from a two hectare field over two decades was Rs. 65 lakh.

Forest land being fertile and natural abode of Sashi (*Aquilaria agallocha*), introduction of cultivating the species by JFMCs will be promoted. This will definitely boost livelihood opportunities of local communities.

Regeneration of Agarwood (*Aquilaria agallocha*)

Distribution: North-Eastern States of India namely Assam, Meghalaya, Manipur, Mizoram, Arunachal Pradesh and Nagaland.

Climate and Soil: This is a tropical tree which grows over high rainfall tract throughout humid regions. The region experience low temperature variations between 20°C to 28°C and relative humidity around 80%. It grows over sandy loam and slightly acidic soils.

Propagation Material: Seeds.

Nursery Technique:

Raising Propagules: Seeds mature during July-August. It loses viability soon. Thus seeds are sown within a week of collection. Raising seedlings in poly-bag is preferred. Seed germination is more than 80%.

Propagule Rate and Pretreatment: 4500 plants/ha are required.

Planting in the Field:

Land Preparation and Fertilizer Application: Before transplanting of seedlings, land should be thoroughly ploughed and harrowed to bring it up-to a good tilth. FYM @ 20 t/ha may be applied at the time of land preparation supplemented with NPK @ 60:60:40 may be applied in split doses. The fertilizer level is increased with age from 3rd year onwards.

Transplanting and Optimum Spacing: Seedlings when attain a height of 30-40 cm should be transplanted in the field during rainy season (April-June) at optimum spacing of 3X 3 meter.

Intercropping System: Annual or biennial medicinal herbs viz. *Andrographis paniculata* (Kalmegh), *Withania somnifera* (Ashwagandh), *Rauwolfia serpentina* (Sarpagandha), *Bacopa monnieri* (Bhrami), *Piper longum* (Pippali) etc. may be cultivated as catch crops till the trees attain growth.

Inter-culture and Maintenance Practices: Spading and simultaneous weeding at 90 days after transplanting is required.

Irrigation Practices: Rainfed plantation.

Weed Control: Hand weeding is done after 90 days of transplanting, thereafter Gramoxone @ 0.5 kg/ha may be applied when necessary. Glycel @ 1.5 kg/ha may be applied to eradicate weeds.

Disease and Pest Control: Attack of *Heortia vitessoides* is observed during May-August. This causes defoliation of whole tree. Application of Thiodan @ 2 ml/lit at 15 days interval during infestation is found to control the pests effectively.

Harvest Management

Agar-wood develops a peculiar, persisting strong odour because of infestation by a fungal identified as *Zeuzera conferta*, it penetrates the hard wood, through wounds, injury or borers. All attempts to induce artificial infestation have failed; it is a natural phenomeon. It develops black patches and stores resinous

oil which is separated through distillation of the woody chips. This oil has high value in medicine and perfumery industry.

Crop Maturity and Harvesting: Time of harvesting depends on disease infestation in hard wood. Agar is regarded as a pathological product formed as result of infection. Black patches in the bark indicate occurrence of infection and can be used for harvesting hard wood to commercial use.

Post-harvest Management: Wood chips or chips powdered mechanically without generating heat are soaked in water for 2-3 days and transferred to stainless steel vessel which is part of a distillation unit. The distillation is done for 30-36 hours. Oil and water is collected in a separator and stored. The oil and water ratio in the condenser is kept low on account of the high boiling point. Oil is stored in closed container preferable in Aluminum bottles.

Chemical Constituents: The woody chips have an essential oil commonly known as Agar oil from 0.8% to 2.2% in fungal infested wood of 8-50 years old plant. The wood contains hexadecanoic acid (25.0%), pentadecanoic acid (6.7%) and oleic acid (4.9%); other constituents range from 0.1 to 2.1%.

Yield and Cost of Cultivation (Hectare): This oil is exceptionally costly.

5.16.1 Treatment prescribed: Areas allotted under JFMC Working Circle and NTFP Working Circle will be selected for Agarwood cultivation. 30 % of such area shall be brought under Agarwood cultivation under JFMC agenda. Regeneration expenditures, as in other JFMC plantation, shall be borne by Forest Department. Protection of the Crop shall be done by the JFMCs. Sharing of harvested crop shall be as per norms of the JFM.

CHAPTER 6

SOIL AND WATER CONSERVATION (OVERLAPPING) WORKING CIRCLE

6.1 Name of the working circle

Name of the Working Circle is “Soil and Water Conservation (overlapping) Working Circle”. The detail map of this working circle is shown in Figure 6.1a and riparian areas detail is shown in 6.1b.

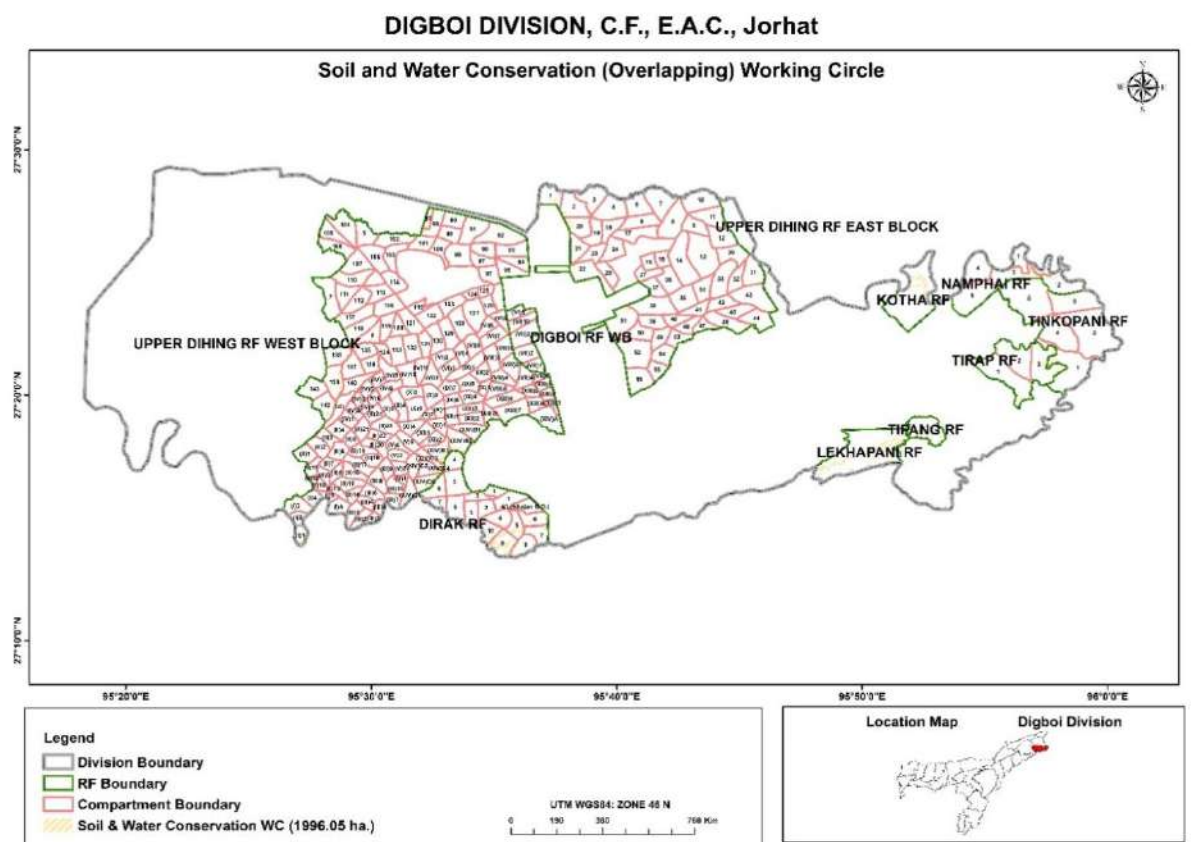
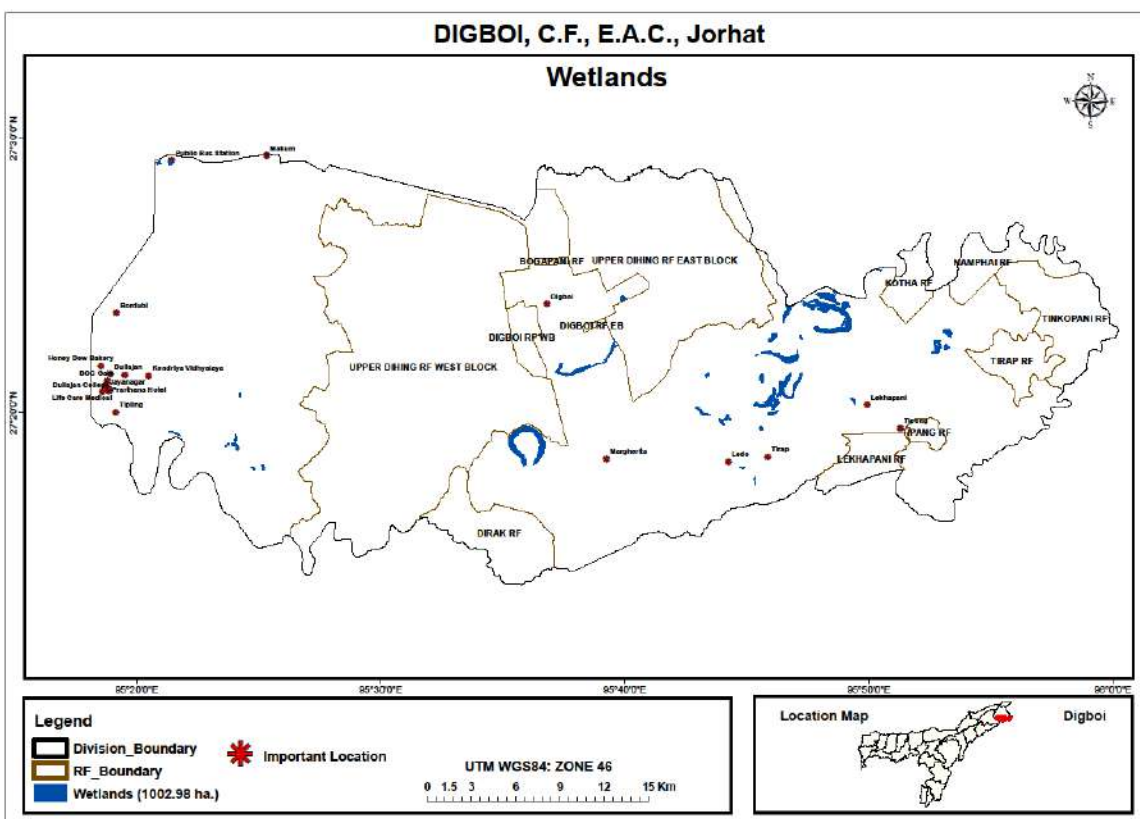
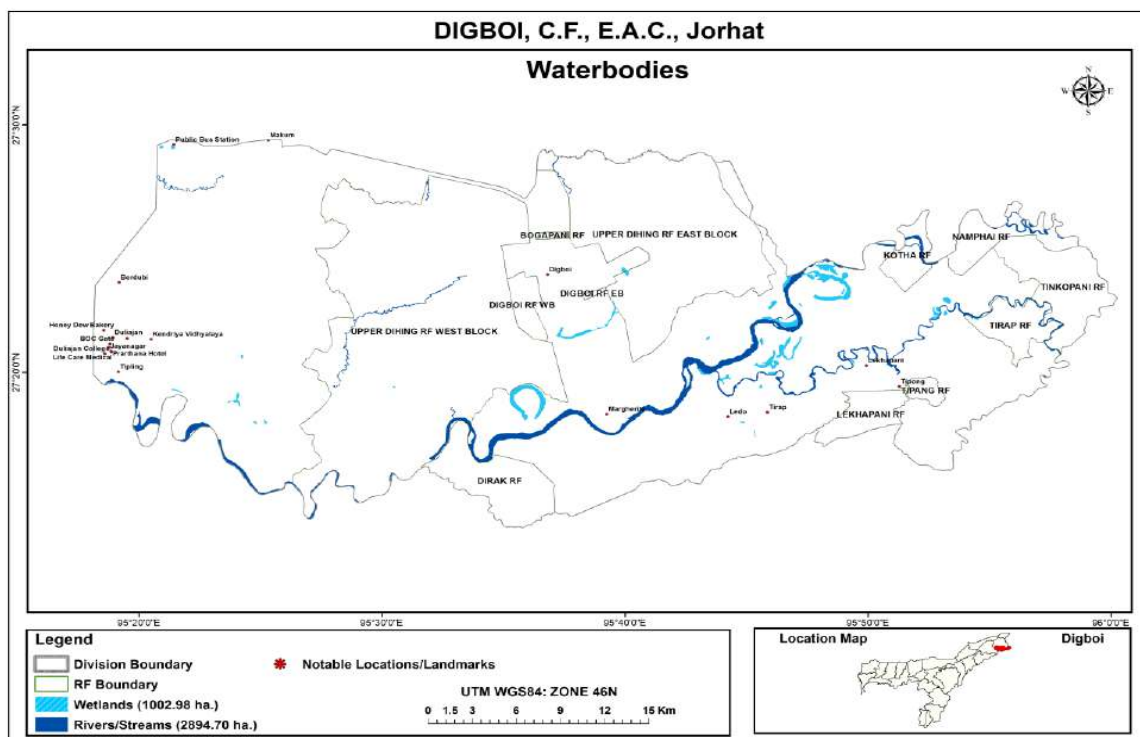


Figure 6.1a: Map showing area under SWC (Overlapping) working circle



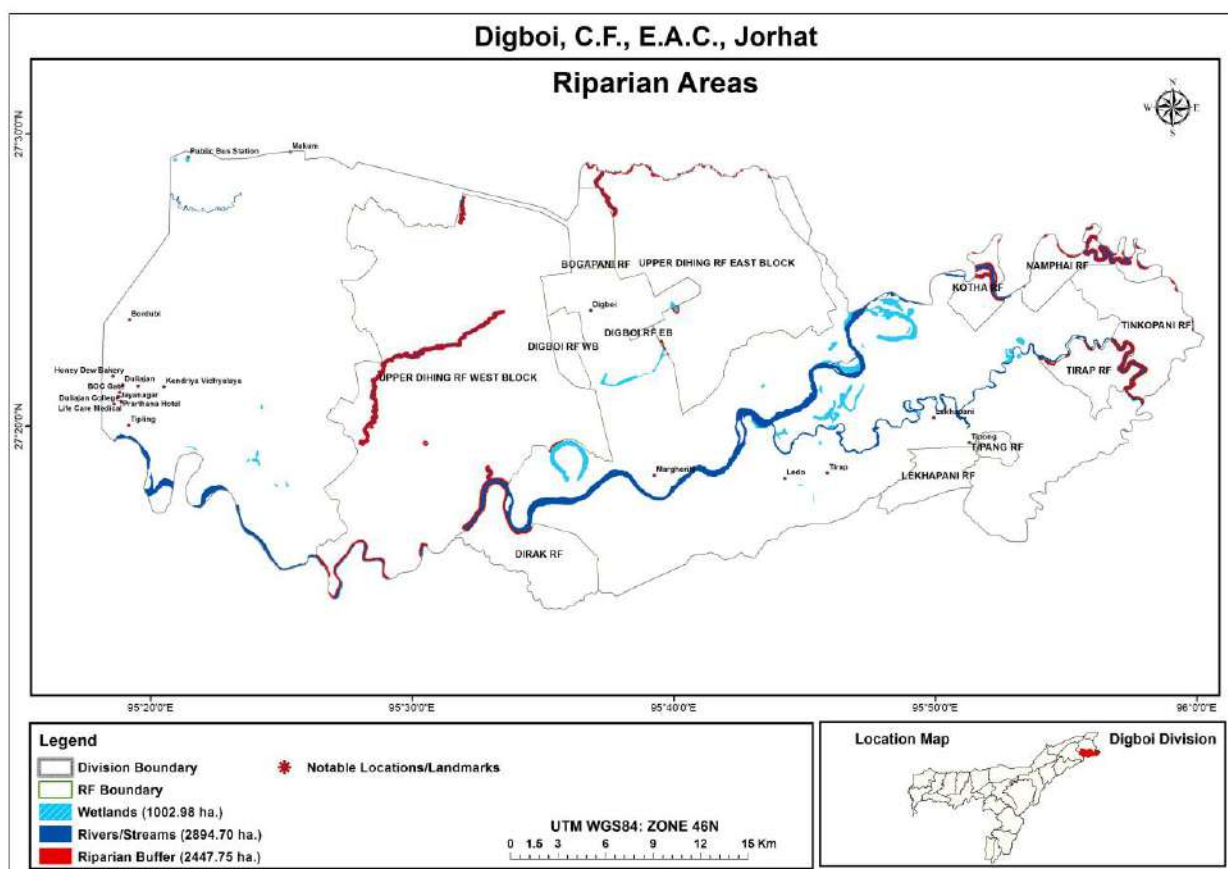


Figure 6.1b: Map showing area riparian areas buffer under SWC (Overlapping) working circle

6.2 General constituents of the working circle

All forest areas which are prone to soil erosion and all areas where hydrological regime are in vulnerable condition are included in this Working Circle. Soil and water play a vital role in growing and sustenance of vegetation. The forests, reciprocally, are sources of water (surface, sub-surface and ground water). The effective soil conservation measures along with the catchment and watershed management are the pre conditions for a sustainable forest management. The main emphasis is to reduce top soil erosion and minimize soil loss from the floods. Over exploitation of the ground water resources results in a decline in ground water levels; there is an urgent need to augment the ground water resources through suitable management interventions. It is desirable to have forest management practices dovetailed with the principles of watershed based development approach especially in the source areas of water. Such areas should have restrictions on tree felling but there should be operations to improve the water regimes and natural regeneration. Many water streams originate from the R.F.'s of the Division and many streams and rivers originated from other states pass through the R.F.'s of this Division. There are two major wetlands, namely, Mota Beel and Bor Beel, and many small water bodies within the reserve forests of the Division. Special provisions shall be made in the working plan to sustain water resources and to address the livelihood issues of the people living in and around the natural inland water sources. Further, areas

susceptible to soil erosion such as steep slopes and areas in the vicinity of perennial streams shall be focused for soil and water conservation using mechanical or vegetative control measures.

6.2.1 Need for Soil and Water Conservation (SWC) for Forest Development:

Soil and water conservation measures are absolutely essential for forest development particularly in degraded sites where availability of moisture in soil is very low and the top soil is either eroded or prone to erosion. Tree growth responds more to water stress than any other perennial factors of the forest site. Thus soil water is the key to forest site productivity for many species.

Soil-water stress plays an equally important role in the radial growth of trees. It affects the annual growth, and thus forest productivity, and various wood properties, particularly, wood specific gravity.

Forest floor, if denuded and subjected to heavy erosion, loses the top layers of the soil. The topmost layer, unique to forest soils, contains organic matter, partly or well decomposed, and the next horizon in the soil profile is that of mineral soil mixed with organic matter. These are the layers that supply nutrients to plants and contribute to forest growth. Thus once these layers are removed due to erosion, the forest plants suffer from lack of food and become dependent on supply of fertilizers for survival and growth. Sustaining forest growth by external application of fertilizers is not an economic measure. Heavy erosion of the forest soil also destroys its physical properties like soil texture, structure, porosity etc. The physical properties of the solid, liquid, and gaseous phases of soil have a substantial influence on the supply of water, nutrients and oxygen for metabolism, and the availability of physical space to anchor the underground plant structures. Providing physical support for above ground tissues is of particular importance, because plants must properly orient themselves to capture sun's energy for use in photosynthesis. In shallow and poorly drained soils, wind throw is common because of limited physical space in the former case, and anoxic (without oxygen) condition in the latter. Thus arrest of soil erosion in forest floor is essential for survival and growth of forest trees.

6.3 General Characteristics of vegetation: The forest in this Division is rich in diversified flora and fauna. It has signature species which are habitat species. Its regeneration requires moist conditions. Conservation of soil and water is very important considerable. The forest type of the overlapping working circle as per the classification made by Champion and Seth in their survey of forest types of India - Type IB/C1 Assam Valley Wet Evergreen Forest (*Depterocarpus*) or more commonly known as Upper Assam Dipterocarpus- Mesua formation. It forms a part of the world heritage of tropical/subtropical wet evergreen forests, multi storied in structure and rich in biodiversity; more popularly known as Rain Forests. The forests of Dehing - Patkai Wildlife Sanctuary is characterized by multistoried layer of canopy; the predominant species like *Dipterocarpus retusus* reaches a height of 50 meters and above and girth up to seven meters. *Shorea assamica* is also visible in the top canopy along with *Dipterocarpus retusus* over a limited locality especially in slightly higher elevation with good drainage. Other species which are found covering the place in the top canopy are *Michelia champaca*, *Mesua ferrea*, *Magnolia spp.*, and *Canarium bangalensis*. *Artocarpus chaplasi*, *Altingia excelsa*, *Ailanthus grandis*, etc.

6.4 Blocks & compartment:

A total area of 253.932ha is allocated in this working circle. Area under different RFs and compartment and the area to be covered in this working circle is provided in the table 6.6a and riparian areas buffer covering 1996.05 ha is provided in 6.6b.

Table 6.6a: Area (Ha) details under the working circle of Digboi division, Assam.

Reserve Forest	Total RF area (Ha)	Compartment Number	Area allocation under Soil and Water Conservation (overlapping) WC (Ha)	RF area (Ha) allocated to WC
Upper Dehing EB	11686.54	34	186.238	186.238
Upper Dehing WB	23594.74	87	67.6941	67.694
Total				253.932

Table 6.6b: Riparian areas buffer area (Ha) details under the working circle

Reserve Forests	Compartment	Area (Ha)
Dirak RF	1	2.83
Dirak RF	2	7.87
Dirak RF	3	20.86
Dirak RF	4	29.95
Dirak RF	5	45.71
Dirak RF	6	20.68
Dirak RF	7	26.09
Dirak RF	8	20.68
Dirak RF	9	119.00
Dirak RF	10	37.51
Kotha RF	1	119.81
Lekhapani RF	1	248.19
Namphai RF	1	78.06
Namphai RF	2	45.56
Namphai RF	3	67.07
Namphai RF	4	7.21
Namphai RF	5	0.77
Tinkopani RF	1	76.20
Tinkopani RF	2	6.53
Tinkopani RF	3	5.31
Tipang RF	1	62.28
Tirap RF	1	38.02
Tirap RF	2	9.36
Tirap RF	3	92.82
Upper Dihing EB RF	1	34.78
Upper Dihing EB RF	2	19.69
Upper Dihing EB RF	3	17.23
Upper Dihing EB RF	4	5.00
Upper Dihing EB RF	5	4.25

Reserve Forests	Compartment	Area (Ha)
Upper Dihing EB RF	7	8.40
Upper Dihing EB RF	10	5.26
Upper Dihing EB RF	20	17.15
Upper Dihing EB RF	38	0.28
Upper Dihing EB RF	51	17.26
Upper Dihing EB RF	52	1.07
Upper Dihing WB RF	8	24.76
Upper Dihing WB RF	87	26.04
Upper Dihing WB RF	88	5.47
Upper Dihing WB RF	119	12.17
Upper Dihing WB RF	120	12.89
Upper Dihing WB RF	121	10.95
Upper Dihing WB RF	122	17.59
Upper Dihing WB RF	123	4.53
Upper Dihing WB RF	127	2.74
Upper Dihing WB RF	128	21.59
Upper Dihing WB RF	129	7.13
Upper Dihing WB RF	130	5.27
Upper Dihing WB RF	131	6.57
Upper Dihing WB RF	132	9.12
Upper Dihing WB RF	133	19.66
Upper Dihing WB RF	134	5.22
Upper Dihing WB RF	135	10.77
Upper Dihing WB RF	137	11.42
Upper Dihing WB RF	138	28.66
Upper Dihing WB RF	139	44.22
Upper Dihing WB RF	140	8.18
Upper Dihing WB RF	141	14.91
Upper Dihing WB RF	142	23.03
Upper Dihing WB RF	(I)1	36.70
Upper Dihing WB RF	(I)2	29.64
Upper Dihing WB RF	(I)3	19.94
Upper Dihing WB RF	(I)4	12.21
Upper Dihing WB RF	(I)5	9.74
Upper Dihing WB RF	(I)6	31.24
Upper Dihing WB RF	(II)23	0.00
Upper Dihing WB RF	(III)1	12.02
Upper Dihing WB RF	(III)2	1.63
Upper Dihing WB RF	(III)5	0.78
Upper Dihing WB RF	(III)6	12.24
Upper Dihing WB RF	(III)7	2.29
Upper Dihing WB RF	(X)5	4.56
Upper Dihing WB RF	(XI)1	0.02
Upper Dihing WB RF	(XI)2	0.13

Reserve Forests	Compartment	Area (Ha)
Upper Dihing WB RF	(XIII)7	4.45
Upper Dihing WB RF	(XIV)B2	38.71
Upper Dihing WB RF	(XIV)B3	57.79
Upper Dihing WB RF	(XIV)C3	17.09
Upper Dihing WB RF	(XIV)C4	6.68
Upper Dihing WB RF	(XIV)C5	46.53
	TOTAL	1996.05

6.5 Special Objectives of Management:

The broad objective of this working circle is to conserve soil and water in the Division. Specific objectives are given below:

1. To check soil erosion and to maintain the hydrological regime of Division.
2. To adopt appropriate planting technique for the non-agricultural land in the watersheds to ensure control of erosion, improvement of moisture regime and production of fuel wood, fodder, small wood as an additional component. This includes management of forests and afforestation of degraded lands.
3. To reduce runoff by ensuring extensive absorption and percolation of rain water and consequent better recharge of wells for domestic uses and for irrigation, wherever possible.
4. To adopt corrective measures on land to prevent erosion by water and wind, gully formation etc.
5. To provide for storage of available rain water in situ and re-use it within watershed for crop production.
6. To prepare land and a drainage system for optimum use of scarce water.
7. To reclaim eroded land and restore it to productive use.
8. To generate adequate employment opportunities through improved crop and plant management and also through animal husbandry.

6.6 Strategy: Watershed management approach to protect soil and water would be undertaken in the Division. Involvement of local communities especially youths, women from the forest and fringe villages will be ensured.

6.6.1 Watershed management

A watershed is a drainage basin or catchment area of a particular stream or river. Watershed is defined as a hydro-geological unit of area from which the rainwater drains through a single outlet.

Watershed Deterioration: Deterioration of a watershed means decline in the status and productivity of the natural resources – land, vegetation and water – that comprise the watershed. The deterioration may occur due to many factors. These include:

- Faulty agricultural, forestry, and pasture management leading to degradation of land;
- Fire (however there is no impact of fire in this Forest Division)
- Unscientific mining and quarrying;

- Faulty road alignment and construction;
- Industrialization;
- Lack of awareness of the people.

Results of watershed deterioration

- Poor returns from agriculture, forests, grass lands, fruit orchards due to degradation of land;
- Increased erosion hazards resulting in decreased biomass production;
- Quick siltation of reservoirs, lakes and riverbeds;
- Poor water yield in terms of quantity and quality;

Importance Watershed Management

- To maintain a sufficient and quality water supply
- To avoid and contain erosion
- To improve planning and reduce risk of floods and droughts
- To be prepared for the impacts of climate change

Concept of Integrated Watershed Management

Integrated watershed management involves integration of technologies within the natural boundary of drainage area for optimum development of land, water and plant resources to meet the basic minimum needs of people in a sustained manner. Integrated Watershed Management is thus

- Multi-technology initiative – technologies relating to forests, agriculture, land management, management of water resources, management of animal resources etc.
- Management by Multi-stakeholder – appropriate departments of the government, local bodies, Panchayet Institutions, local people.
- Multi-subjects of focus – land, water and plant resources within the watershed area.

Objectives of Integrated Watershed Management Plan

The objectives of Integrated Watershed Management plan are-

- (a) To adopt optimum agricultural cropping system for all culturable land backed by an appropriate package of inputs (seeds, fertilizer etc.)
- (b) To adopt appropriate planting technique for the non-agricultural land in the watersheds to ensure control of erosion, improvement of moisture regime and production of fuel wood, fodder, small wood as an additional component. This includes management of forests and afforestation of degraded lands.
- (c) To reduce runoff by ensuring extensive absorption and percolation of rain water and consequent better recharge of wells for domestic uses and for irrigation, wherever possible.
- (d) To adopt corrective measures on land to prevent erosion by water and wind, gully formation etc.
- (e) To provide for storage of available rain water in situ and re-use it within watershed for crop production.
- (f) To prepare land and a drainage system for optimum use of scarce water.
- (g) To reclaim eroded land and restore it to productive use.

(h) To generate adequate employment opportunities through improved crop and plant management and also through animal husbandry.

Land and Water Conservation Practices

Soil and water conservation practices are the primary step of watershed management program. Conservation practices can be divided into two main categories: 1) *in-situ* and 2) *ex-situ* management. Land and water conservation practices, those made within agricultural fields or young forest plantations, like construction of contour bunds/trenches, field bunds, terraces building, broad bed and furrow practice and other soil-moisture conservation practices are known as in-situ management. These practices protect land degradation, improve soil health, and increase soil-moisture availability and groundwater recharge. Moreover, construction of check dam, farm pond, gully control structures, pits excavation across the stream channel is known as *ex-situ* management. *Ex-situ* watershed management practices reduce peak discharge in order to reclaim gully formation and harvest substantial amount of runoff, which increases groundwater recharge and irrigation potential in watersheds.

Crop Diversification and Intensification

The crop diversification refers to bringing about a desirable change in the existing cropping patterns towards a more balanced cropping system to reduce the risk of crop failure and provide yields of multifarious products. For forest crop it is always advisable to try judicious mixture of indigenous species suitable for the agro-climatic zone in question. Crop intensification is the increasing cropping intensity and production to meet the ever increasing demand for food and forest products in a given landscape. Watershed management puts emphasis on crop diversification and intensification through the use of advanced technologies, especially good variety of seeds and planting stock, balanced fertilizer application and by providing supplemental irrigation.

Capacity Building

Watershed development requires multiple interventions that jointly enhance the resource base and livelihoods of the rural people. This requires capacity building of all the stakeholders from farmer to policy makers. Capacity building is a process to strengthen the abilities of people to make effective and efficient use of resources in order to achieve their own goals on a sustained basis. Capacity building program focuses on construction of low cost soil and water conservation methods, production and use of bio-fertilizers and bio-pesticides, income generating activities, livestock based activities, waste land development, market linkage for primary stakeholders and so on.

6.6.2 Soil Erosion

There are two major types of erosion, namely Geological Erosion and Accelerated Erosion.

Geological Erosion:

The wearing away of the land surface by running water, wind, waves, and moving ice generally has been looked upon as a normal geological process. Geological erosion is sometimes referred to as normal erosion or Natural erosion that represents the erosion characteristic of the land in its natural environment,

undisturbed by human activity. Geological erosion has contributed to the formation of our soils and their distribution on earth. This long term eroding process has given rise to most of our present topographic features like stream channels, valleys etc.

Accelerated Erosion:

Accelerated Erosion or what is normally referred to soil erosion represents the soil loss in excess of geological erosion. Soil erosion means the process of detachment of particles from the soil surface and their transportation to other areas through the agencies of water, wind or gravity. Soil erosion is caused primarily by two agencies- water and wind. Water erosion is further subdivided into Raindrop, Sheet, Rill and Gully erosion.

Factors involved in Erosion:

The major factors affecting soil erosion are –

- Climate
- Soil
- Vegetation
- Topography

Of the above factors, vegetation and to some extent soil may be manipulated or controlled. However, the climatic and topographic factors remain beyond human control. The factors affecting erosion are further described below.

Climate – Climatic factors affecting erosion are precipitation, temperature, wind, humidity and solar radiation. The influence of temperature and wind is most evident through their effects on evaporation and transpiration. Precipitation has a direct impact on runoff, as has been explained earlier. As the runoff increases, so does the soil erosion or soil loss. Soil- Physical properties of soil, namely soil structure, texture, organic matter, moisture content, density or compactness as well as chemical and biological characteristics influence the infiltration capacity and extent to which soil is likely to be dispersed or transported.

Vegetation-The major effects of vegetation in reducing erosion are –

- Interception of rainfall and thus reducing runoff
- Retardation of erosion by decreased surface velocity
- Physical restraint of soil movement
- Improvement of aggregation and porosity of the soil by roots and plant residue
- Increase biological activity in the soil and
- Transpiration which decreases soil moisture, resulting in increased storage capacity. It may, however be noted that the above influences of vegetation on erosion will vary with the season, crop , age of the crop, climate and nature of the vegetative material, i.e, roots, plant tops/crown and plant residues.

Topography –Topographic features influencing the erosion are degree of slope, length of slope, and size and shape of the watershed.

Accelerated erosion is attributable to the following causes –

- Faulty agricultural practices
- Faulty silvicultural practices

- Inadequate soil cover
- Uncontrolled grazing
- Large scale deforestation
- Fire
- Road construction on hills without adequate arrangements for drainage of water.

Water Erosion:

Water Erosion is basically of four types:

i) Raindrop Erosion: Soil splash resulting from the impact of raindrops directly on soil particles or on thin water surfaces is called raindrop erosion. On soil protected with vegetation or plant residues, raindrop erosion may be insignificant, but on bare soil as much as 100 tonnes per acre are splashed into the air during a heavy rain. Size of raindrop and its velocity are two characteristics of raindrop that affect erosion. Large drops increase sediment carrying capacity of runoff. The velocity of rainfall also greatly affects the soil splash and erosion. The soil characteristics that determine the ease with which soil particles may be detached and transported are soil detachability and soil transportability. In general soil detachability increases with the increase in size of soil particles and soil transportability increases with decrease in particle size. It means that clay particles are more difficult to detach than sand, but clay is more easily transported. The effect of raindrop splash is more pronounced on sloping fields than on level land.

ii) Sheet Erosion: The uniform removal of soil in thin layers from slopping land is called sheet erosion. The beating action of raindrops combined with surface slope causes the major portion of sheet erosion. From the energy point of view raindrop erosion is far more important because raindrops have velocities of about 20 to 30 fps whereas overland flow velocities are about 1 to 2 fps.

iii) Rill Erosion: Soil removes from small but well defined channels (rills) resulting from concentration of surface flow is called rill erosion. Rill erosion is more serious because runoff moves faster in these small channels than in surface slope.

iv) Gully Erosion: Rills are small enough to be removed by normal tillage operations. Gullies are defined as large channels that cannot be filled except by earth moving machines in addition to normal tillage. Gully erosion takes place when concentrated runoff from a vast slopping land in sufficient volume and velocity continues cutting the soil in the form of channels. Gullies are the spectacular results of erosion. The area under gully is lost for cultivation. The gully erosion is an advanced stage of rill erosion much as rill erosion is an advanced stage of sheet erosion.

Process of Gully erosion:

The rate of gully erosion depends on runoff producing characteristic of watershed. These are:

- Drainage area
- Soil characteristics
- Alignment, Size and shape of the gully
- Slope in the channel

Development of a gully is combination of a number of processes occurring simultaneously or in different stages. These processes are:

- Waterfall erosion at the gully head (See Fig.4.1)

- Channel erosion caused by water flowing through the gully or by raindrop splash
- Slides or mass movements of soil in the gully

Wind Erosion

Wind is one of the active forces causing soil erosion particularly in tracts subjected to frequent and heavy gales. The wind picks up lighter particles and transports them to great distances. This is particularly seen in the coastal and desert areas. Like water erosion, the loss of soil by wind involves two processes, namely, (a) detachment; and (b) transportation. The abrasive action of the wind results in some detachment of tiny soil grains from the granules or clods of which they are a part and transportation of the particles takes place in many ways.

Factors involved in wind erosion:

The major factors affecting wind erosion are

- Climate
- Soil
- Vegetation

Topography is relatively unimportant; though the length of the eroding surface greatly influences soil movement.

Climatic factors – factors influencing wind erosion are –

- Precipitation (Amount and distribution of rainfall and its effect on soil moisture);
- Temperature;
- Wind (velocity, direction, duration and turbulence) ;
- Humidity, viscosity and density of the air

(Temperature, wind and humidity influence evaporation and transpiration which deplete soil moisture. Depletion of soil moisture makes it more vulnerable to wind erosion.)

Soil factors - factors influencing wind erosion are –

- Texture
- Structure
- Density of particles
- Density of soil mass
- Organic matter
- Moisture content
- Surface roughness

Moisture content is the most significant factor, as relatively dry soil is more prone to wind erosion.

Effects of Soil Erosion:

- The fertile top soil is removed and along with it the plant nutrients are lost and less productive sub soil is exposed.
- Drought becomes more severe as the water is not stored in the sub soil to be used by the plants in the dry season.
- Erosion reduces cultivable area by cutting deep gullies; makes farming difficult and uneconomic.
- Fertile lands go out of cultivation due to formation of sand dunes by wind erosion.

- Erosion in reservoirs and tank catchments causes silting of those irrigation structures and reduces their capacity and finally render them to be abandoned.
- Erosion in river catchment results in silting up of the rivers. Consequently the bed is raised, thereby causing overflowing of rivers and flood.
- Soil erosion prevents replenishment of ground water supply and springs and wells.

Soil and Water Conservation Measures – Brief Outline

Erosion control measures are of two types structural and biological.

Splash erosion - Splash erosion may be checked by growing vegetal cover. Grass and shrubs are best vegetal cover. Dub grass (*Cynodon dactylon*), Cenchrus spp., Pennisetum, Spear grass (*Heteropogon* spp. in dry areas), trailers like Ipomea biloba, sabai grass etc. are good ground cover. In the hills Kudzu vine, Amlisho etc. are good cover.

Sheet Erosion - Areas under sheet erosion should be closed to grazing. If the area is closed to grazing and fire, chances and extent of erosion are much less. This may be done by erecting fencing or cutting cattle proof trenches etc. In the areas with moderately loamy soil contour trenches may be dug at suitable intervals depending on slope. This will intercept run off and help infiltration. In the south western region (Bankuara, Purulia, Birbhum) the major soil is laterite red loam having moderately heavy sub soil. The size of the contour trench should be sufficient to intercept at least 12 hours continuous run off. Staggered contour trenches with intermediate spaces are more effective than continuous contour trenches. The dug out soil is neatly piled the shape of a bundh. In the agricultural fields, contour bundhs are erected. Spillways are provided in staggered manner to drain out excess water. Please see Fig. 4.3

Vegetative Measures:

Soil completely covered with vegetation is in an ideal condition to absorb moisture and resist the inroads of erosion, provided the cover is continuous and the soil is well penetrated with roots. Under such conditions, erosion is limited to a normal, harmless rate. Close-growing vegetation serves to reduce or eliminate direct impact of rain on the soil. In open forest areas, species with low crown may be planted. Growth of grass need be encouraged. Perennial shrubs like Croton, Indigofera, Zizyphus etc. may be raised. In fact, shrubs are more effective to check erosion than trees. Even on steep slope, soil erosion is minimum in tea gardens with thick tea crop.

In agricultural land, erosion promoting and erosion retarding crop may be planted in alternate strips. Maize, Bazra, potato etc are erosion promoting crops, whereas legumes (pulses) are erosion retarding crops.

In the pasture land, rotational and regulated grazing need be practiced.

Rills should be closed by ploughing the land. Other measures prescribed for sheet erosion need be adopted.

Gully Erosion – Principal steps of control measures are given below. The major steps are

- To arrest water from coming into gullies. This is done by cutting diversion drains, catch water drains or ring bundhs.
- To smoothen the slope of gully head. It is done by cutting in slope of 1 in 2. The slope is grass sodded or pitched with stone masonry.

- To check the velocity of water flowing over the gully. For shallow gullies, this is effectively done by raising brushwood dams. Small barriers with thickly placed branches of *Vitex negundo*, *Ipomea* supported by live posts etc may be raised.
- To control velocity by constructing engineering structures. Rock check dams are constructed in small gullies.
- Storage in lower reaches. Earthen dam is constructed at lower reaches for storage purpose. It checks the velocity of water and arrests the soil. Earthen dams are provided with spillways.

6.6.3 Target of Achievement:

Activity	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Soil and water conservation works Proposed treatment area , Plantation 25% of total allotted area of 1996.05 = 499.01 (say) 500 hect.	-	250	250	-	-	-	-	-	-	-



CHAPTER 7

WILDLIFE MANAGEMENT AND BIODIVERSITY CONSERVATION (OVERLAPPING) WORKING CIRCLE

7.1 Name of the working circle: Name of the Working Circle is “Wildlife Management and Biodiversity Conservation (overlapping) Working Circle”.

7.2 General constituents of the working circle

The National forest policy 1988 aims at conserving the natural heritage of the country preserving the remaining natural forests with the vast variety of flora and fauna, which represent the remarkable biological diversity and genetic resources of the country. Forest management should take special care of the needs of wildlife conservation and forest management plans should include prescriptions for this purpose. It is especially essential to provide for ‘corridor’ linking of the protected area in order to maintain genetic continuity between artificially separated sub sections of migrant wildlife. For better management of wildlife and to preserve the bio-diversity, creation of protected areas (PAs) and their specific management practices are in force in approximately 4% of the forest area of the country. Apart from the PAs, other forest areas including Reserve Forests are also to provide cushion habitat to the wildlife.

Digboi Forest Division comprises the major part of Dehing Patkai Wildlife Sanctuary and also a part of Elephant Reserve-Dehing Patkai Elephant Reserve where a sizeable population of Asiatic elephants resides. Ever increasing man-elephant conflict is a difficult issue for the planners. There is a strong need of developing wild elephant habitat in almost all the R.F.s and civil areas of the Division to reduce man-elephant conflict. Rising population and shrinking habitat has led to increase in man- animal conflict and also resulted in maximum depredation to paddy and other agriculture crops raised by the people living near the forests. There is also necessity to bring some areas with water bodies and peripheral land mass into some special management under wet land conservation for proper management under this Circle.

Biodiversity represents variety of life forms. It includes diversity within species, among species of an ecosystem and among ecosystems. The contribution of individual species to the overall diversity within a community or ecosystem varies to a great extent. The coexistence of organisms that differ widely from each other contributes more to overall diversity than the co-existence of very similar species. Functional diversity is considered to be one of the main factors determining the long-term stability of an ecosystem and its ability to recover from major disturbances. Assessment of status of plant and faunal species and their periodic monitoring can be helpful in formulating strategies for conservation, maintenance and enhancement of overall biodiversity through sustainable management and use practices. Assessment of biodiversity especially the lower forms of life (algae, fungi, lichens, epiphytes, parasites, etc.) of a forest

Division must be made an on-going programme with the support from State Biodiversity Board as it may be difficult for the working plan officer (WPO) to do it within the time allotted for writing the plan.

Biodiversity is the totality of genes, species and ecosystem in a region. Richness of biodiversity of a region or country shows its richness of biological heritage, high conservation values and the richness of its population's socio-economic culture, as the biodiversity directly or indirectly affects the living standards of the human populations, health conditions and overall prosperity. In a bio-diversity rich country, there are multiple food choices, multiple choice of medicinal plants and multiple economic avenues. While biodiversity provides the people with a host of organic products, it is the people's duty to conserve the biodiversity which is the product of hundreds of millions of years of evolutionary history. In the recent past, biodiversity as a subject was not given the due importance. It is only after the Earth Summit held in 1992 at Rio de Janeiro, where on "Convention on Biological Diversity" (CBD) was adopted. The CBD having near universal membership has set out commitments for maintaining the biological resources underlining three main goals: (1) Conservation of biological diversity, (2) The sustainable use of its components, and (3) The fair and equitable sharing of the benefits from the use of genetic resources. India is a party to the CBD and committed to conserve the natural heritage. The State has prepared the strategy and Action Plan for Conservation of Biodiversity for Assam in 2010 by constituting Assam State Biodiversity Board and also framing Assam Biodiversity Rules, 2010. Later with prime goal of preservation of the rich Biodiversity of the State, The Assam Project on Forest and Biodiversity Conservation Society (APFBC Society) was launched by the Govt. of Assam in collaboration AFD French Government on 28th June 2012.

This will be an overlapping Circle to include wildlife management and biodiversity conservation. Areas under the jurisdiction of Dehing-Patkai Elephant Reserve, a part of Upper Dehing Reserve Forest (East block) and Dirok Reserve Forest has been covered under this Working Circle. Under this overlapping Working Circle activities proposed should be limited to habitat improvement, management for elephants corridor improvement and protection measures. Special emphasis shall be given for creation of plantation of fodder species and digging of water holes so that the herds get sufficient food and water within its habitat. Measures should also be suggested for combating man - elephant conflicts.

- i) The Upper Dehing Reserve Forest (WB) was notified vide Govt. Notification No. 5088 R dated 31.10.1898. The total area of Upper Dehing Reserve Forest (West Block) is 27,485.059 hectares.
- ii) The Dirok R.F. was notified vide Notification No. 1792 R in 18.05.1926. The total area of Dirok R.F. is 3042.510 hectare.

The Dirok River flows through the Southern part of the Dirok Reserved Forests and the Buri Dehing River flows through the boundary between Upper Dehing Reserve Forest and Jeypore Reserve Forest.

- iii) Part of area falling under Digboi Division surrounded by the Buri-Dehing River, Arunachal Pradesh and Namsang Tea Estate in the South.

The Dirok River borders the Southern boundary of the original Dirok RF. Tipam and Thongthong Beat area falling on the either side of the BuriDehing River while the Jorajan Stream divides the Sanctuary from the Upper Dehing Reserve Forests (West Block) on the Northern side.

Revenue villages like Kuruka and Mirika Majuli are situated North to the Upper Dehing Reserve Forest (West Block). The Tea Estates, the Revenue Villages and the three Reserved Forests form the Dehing Patkai Ecosystem.

7.3 Blocks and Compartment:

A total of 7972.39 hectare area is allocated in this overlapping Working Circle. Area under RFs and compartments to be covered in this working circle is provided in the table 7.6.

Table 7.6: Area (ha) details under the working circle of Digboi division, Assam.

Reserve Forest	Compartments	Area (Ha)
Upper Dehing RF(West Block)	1	88.0
	2	84.8
	3	140.8
	4	93.6
	5	112.0
	6	136.0
	1	125.0
	2	146
	3	110
	4	100.4
	5	97
	6	65
	7	89.06
	8	60.32
	9	120
	10	158.08
	1	132
	2	136.04
	3	110.12
	6	64.77
	7	80.97
	8	89.06
	9	87.44
	10	87.5
	11	100.4
	12	68.01
	13	80.89
	14	113.1
	15	140
	16	144
	17	144

Reserve Forest	Compartments	Area (Ha)
	18	177
	19	150
	20	99
	21	115
	22	91
	23	178
	(V) 1	122.4
	(V) 2	90.6
	(V) 3	123.2
	(V) 4	90.5
	(V) 5	134.8
	(V) 6	122.4
	(XI) 2	104.94
	(XI) 3	138.14
	(XI) 4	113.85
Dirok	(I)1	92.0
	(I)2	169.60
	(I)3	247.20
	(I)4	219.80
	(I)5	166.60
	(I)6	160.0
	(I)7	132.20
	(II)1	146.20
	(II)2	108.4
	(II)3	125.8
	(II)4	163.2
	(II)5	155.8
	(II)6	174.4
	(II)7	152.6
	(II)8	132.2
	(II)9	223
	(II)10	248.2
	TOTAL	7972.39

7.4 Objectives of the working circle

The aim and objective under this proposed overlapping working circle is to ensure wildlife habitat conservation, identification of corridors for movement of elephants and their protection, management options for reducing man-animal conflict, and conservation and preservation of biodiversity. Further the specific objectives of this working circle is divided into two sub-heads, one focusing wildlife management and the other focusing biodiversity conservation in the areas.

7.4.1 Wildlife management

- i) Habitat maintenance of important wildlife species available in the Division.

- ii) Ensure preservation of the rich biodiversity of the Division through man-induced actions.
- iii) Ensure reduction of man - wildlife / elephant conflicts.
- iv) To check wildlife trade and smuggling of wildlife and its products from the division.
- v) Initiating protection, conservation and improvement of habitat to ensure survival of all forms of animals including the endangered, threatened and rare species.
- vi) To maintain the terrestrial ecosystem in and around the wildlife habitat areas.
- vii) To initiate researches on the faunal diversity and their habitat.
- viii) Generate adequate publicity measures for conservation of wildlife.
- ix) Initiate projects on wildlife management and its protection.

7.4.2 Biodiversity conservation:

- 1) To ascertain the present status of various flora and fauna, especially the lower life forms, algae, fungi etc. and the IUCN Red Data book species, if any, and to monitor their status periodically. Various biodiversity parameters such as dominance, diversity, frequency, basal area, importance vegetation index etc. shall be calculated for each compartment.
- 2) To map herbs, shrubs and climbers, and to make inventories of various NTFPs and Medicinal Aromatic Plants.
- 3) To prepare and update people's biodiversity registers with the help of Biodiversity Monitoring Committees formed. The support of universities as well as interested NGOs shall also be taken for this.
- 4) To carry out various studies related to biomass productivity, regeneration potential, NTFP productivity, carbon sequestration, effects of climate change on species range shifts, species growth rates and biodiversity, etc. by establishing permanent sample plots, preservation plots, regeneration plots and NTFP plots at various representative locations within the forest. State government is expected to provide support to the division in form of instruments and subject matter experts.
- 5) To initiate non-polluting, non-degrading ecotourism activity in the areas which are representatives of unique ecosystems, such activities will provide livelihood support to locals and shall be largely aimed at awareness generation among tourists and locals.
- 6) To take up collaborative projects with local and international Educational Institutes, Academic bodies, Research and other Organizations, agencies.

7.5 General condition of flora and fauna:

7.5.1 Flora: The forest type of the overlapping working circle as per the classification made by Champion and Seth in their survey of forest types of India - Type IB/C1 Assam Valley Wet Evergreen Forest (*Depterocarpus*) or more commonly known as Upper Assam *Depterocarpus* - *Mesua* formation. It forms a part of the world heritage of tropical/subtropical wet evergreen forests, multi storied in structure and rich in biodiversity; more popularly known as Rain Forests. The forests of Dehing - Patkai Wildlife Sanctuary is characterized by multistoried layer of canopy; the predominant species like *Dipterocarpus retusus* reaches a height of 50 meters and above and girth up to seven meters. *Shorea assamica* is also visible in the top

canopy along with *Dipterocarpus retusus* over a limited locality especially in slightly higher elevation with good drainage. Other species which are found covering the place in the top canopy are *Michelia champaca*, *Mesua ferrea*, *Magnolia spp.*, and *Canarium bangalensis*. *Artocarpus chaplasi*, *Altingia excelsa*, *Ailanthus grandis*, etc.

The middle storey is dominated by *Messua ferrea* and *Vatica lanceafolia*. Other species found in this canopy are *Terminalia chebula*, *Syzigium cuminii*, *Sapium baccatum*, *Dysoxylum binectariferum*, *Terminalia belerica*, etc. In some areas, there occurs a third storey occupied by *Dendrocalamus hamiltonii*, *Bamboosa pallida*, *Livingstonia jenkinsonii*, etc.

The undergrowth comprises of woody shrubs like *Myrsine capitellata*, *Osbeckia spp.* *Laportea crenulata*, Shrubs like *Phrynium placentarim*, *Alpinia allughas* etc. Climbers are numerous and found growing profusely, common among them are *Thumbergia grandiflora*, *Bauhinia vahilii*, etc. wherever there is an opening *Michenia scandens* - an exotic, invades the forests, suppressing all shrubs and advance growths of trees and intercepting free falling seeds from reaching the ground.

7.5.2 Fauna: The wild animals noticed in the tracts of the proposed area of the overlapping Working Circle include the Asian elephant, Hoolock gibbon, Tiger, the clouded leopard, Field mouse, Fruit bat, Wood rat, jungle cat, Rhesus monkey, Pangolin, Sloth bear, Indian civet, Sambar, Bamboo rat, Pipstrelle, Mole, Tree shrew, Himalayan Black Bear, Small civet, leopard, common langur, Giant squirrel, Hare, The slow loris, Assamese macaque, fishing cat, Muntjac, Hog deer, mongoose, Goral, Porcupine, jackal, Wild boar, Common Otter etc.

Various avifauna namely residents, local migratory, migratory noticed within the area of the overlapping working circle include Baya, Copper smith, Rain quail, Crested Tree swift, House swift, Hawk Crested Honey Buzzard, Blue throated barbet, Large Racket tailed drongo, Indian Eagle owl, Red jungle fowl, Brain fever bird, All but buls, Brahminy duck, Spoonbill, House sparrow, Small skylark, Pariah kite, Jungle crow, White breasted water hen, Great pied hornbill, Magpie Robin, Spotted dove, Spotted owlet, Bank myna, Spot billed pelican, Green pigeon, Black headed oriole, Adjutant stork, Blossom headed parakeet, Brown Fish owl, Black winged stilt, Pheasant tailed jacana, Blue rock pigeon, Water cock, Bronze winged jacana, Red rumped swallow, Maroon backed imperial pigeon, Grey headed myna, Crow pheasant, Rufous wood pecker, Grey hornbill, White wagtail, Geese, Koel, Barn owl, Chestnut bitten, Red turtle dove, Indian lorikeet, Pintail, Palla's fishing eagle, Osprey, Common king fisher, Fire breasted flower pecker, Whit necked stork, Hoopoe, White backed Munia, Spotted Munia, Hill myna, Nakta duck, Fairy blue bird, Blue jay/ Indian Roller, Little Cormorant, Darter, Wire tailed swallow, Mallard, House crow, Black drongo, Little green bee-eater, Yellow backed sun bird, Painted snipe, Bar headed goose, Indian night jar, Scarlet minivet, King vulture, Gold fronted leaf bird, Ring dove/ collared dove, Pied king fisher, Open bill stork, Crested serpent eagle, All babblers, Yellow eyed babbler, Redvented bulbul, Paradise fly catcher, Common vulture, Common myna, Shama, Brahminy kite, Shikra, Emerald Dove, Teal, Haridan, Palm swift, Black partridge, Treepie, Large parakeet, Lapwing, Tailor bird, White winged woodduck.

Rodent's in the division include three striped palm squirrel (*Funambulus palmarum*), Jungle striped squirrel (*Funambulusublineatus*), Porcupine (*Hystrix indica*), Hare (*Lepus ruficaudatus*) and Jungle Rats and Moles.

Wild animals have occupied a place in the local folklore. Local people respected and protected wildlife however due to modernization, growing needs and changing in the mindset of the people, there were changes impacting killing of wildlife for fun or pleasure or other greed needs.

The Dehing- Patkai Wildlife Sanctuary is one of the prime habitats of innumerable flora and fauna and many of them are critically endangered. The flagship species of the Dehing - Patkai Wildlife Sanctuary is the highly endangered White Winged Wood Duck (*Cairina scutulata*) and the Hoolock gibbon (*Binopithecus hoolock hoolock*), the only Western Ape found in India. Both are Schedule - I species of the Indian Wild Life (Protection) Act 1972 and also listed in the Appendix-1 of Endangered Species under Convention of International Trade on Endangered Species (CITES), 1973.

The White Winged Wood Duck the 'State Bird of Assam' whose worldwide population is only 1200. The Hoolock Gibbon is considered as an endangered animal based on the criteria A2ac, C2a (i). This is also the prime habitat of Asiatic Elephant and part of Dehing - Patkai Elephant Reserve covering 340 square kilometers.

Elephant estimation carried out in the month of February, 2011 when 204 nos. of elephants were found in Digboi Division. There is regular movement of elephants in between Assam and Arunachal Pradesh and mostly through Dehing - Patkai Wildlife Sanctuary. This is considered to be one of the vital corridors of Asian elephant in the region which has established link with Myanmar.

During the last animal censuses carried out in 2011 & 2015, a total of 55 mammals have been recorded; 17 carnivore species have been camera-trapped in the Dehing - Patkai Sanctuary and in the adjoining forests, the highest of any site in India. In fact, it is the first site in the world where photographs have confirmed 8 species of cats co-existing within one landscape indicating the necessity to strongly protect and maintain the unique habitat. The endangered birds are the long-billed vulture (Critically endangered), White Winged Wood Duck and Greater Adjutant Stork. The Globally critically endangered tree *Vatica lanceaefolia* (Morhal) is among the plants of conservation importance. Some of the common birds found in the forests are the Great White Billed Heron, Lesser Adjutant Stork, Slender Billed Vulture, White Cheeked Hill Partridge etc. The primate census carried out during 2009 recorded 2359 nos. of primate. This includes 256 nos. of Hoolock gibbon under the Digboi division. Moreover, it is a breeding ground of different species of reptiles and invertebrates. The Forests of Dehing - Patkai Wildlife Sanctuary is classified as Assam Valley Tropical Wet Evergreen Forests. The evergreen forest cover has provided the safe and secured home to all living forms. The P.A. is significant for five tier tree canopy. The top canopy is formed by *Dipterocarpus retusus* and *Shorea assamica* forests.

7.6 Legal position

Wildlife (Protection) Act, 1972 is applicable for entire Assam. Indian Forest Act 1927 also deals with wildlife. The Wildlife (Protection) Assam Rules, 1980 are applicable. Assam Forest Policy, 2004 under IFA, 1927 hunting of wild animals has been completely banned as per the amendments made to the Wildlife (Protection) Act, 1972 in the year 1991 are in vogue.

The hunting and trading of wild animals and its trophies were strictly monitored after enactment of The Wildlife (Protection) Act, 1972, and subsequent amendments in this Act in 1991 and 2002, hunting of any animal included in the Schedules of Wildlife (Protection) Act 1972, (other than vermin), as game or sport, has been completely banned. The maintenance of biological diversity is the new mandate of National Forest Policy, 1988. Restriction of degraded habitats outside the protected areas is one of the strategies for action listed in National Wildlife Action Plan (2002-2016). Priorities of environmental concerns and biodiversity conservation have been dealt in this chapter.

The Biological Diversity Act, 2002 enacted to provide for conservation of biological diversity, sustainable use of its components and fair and equitable sharing of the benefits arising out of the use of biological resources, knowledge and for matters connected therewith or incidental thereto should be adhered to for related matters of Digboi Division.

7.7 Monitoring of Wildlife:

Some of the direct or indirect evidences to judge presence of wild animals and to monitor them are-

- i) *Sighting*: Near water holes, salt licks, grazing sites, near the roads, actual sightings of wild animals and their photography.
- ii) *Infrared photography*: Installation of photographic units on probable areas to get picture of the wild animal.
- iii) *Pug marks*: By keen observation of these pug/hoof marks we can identify the category of wild animals, their sex and age. This gives an indication, however for authentication of wildlife, evidence based photographic method should be applied.
- iv) *Grazing marks*: Identification of the category of herbivore by analyzing the nature of grazing and browsing, since all herbivores have different grazing.
- v) *Feces*: Collection and examination of animal feces for knowing the wildlife and getting idea on their population, food, etc.
- vi) *Antlers marks*: Before falling of antlers e.g. spotted deer's and Sambars rub their antler on some stem.
- vii) *By salt licks*: In forest some soil contains more percentage of salt and minerals and wild animals lick such salt bearing soil to get the required amount of salt. Sights of such indicates presence of wildlife.
- viii) *By sound*: Hearing sounds of wild animals a fair understanding of the wildlife presence, location can be ascertained.
- ix) *By wallowing sights*: Sambar, Wild Boars etc. like mud and they wallow in mud. By this they clean their skin and protect it from insects. Such signs indicate presence of wildlife

x) *Nail Marks*: Tiger and Bear with the help clear, sharpens their claws/nails by scratching the bark of some trees. Such signs indicate presence of wildlife.

The wildlife, which used to flourish in the forests of the Division, is threatened due to various anthropogenic factors, elaborated under 8.10.1: 1 to 9. Broadly due to increase in demand for wildlife products all over the world, poaching problems have increased over the years in the region and Wild animals of Digboi Division are very much susceptible to poaching . Hence, special efforts are required to be made by the division to protect the wildlife in the division. Migratory birds visiting the area mostly during winter also face threat from poachers and fishermen. There are many endangered insects and plants included in the schedule of Wildlife Protection Act 1972 in this division. The insects are threatened from the insecticides and pesticides that's gets leached into the division from the surrounding tea estates. These insects play a very important role in pollination of floral species and overall ecology of the division.

7.8 Strategy

For wildlife management the key focus is to ensure maintenance of wildlife habitats in the Division. This is to be ensured through spatial mapping of such areas and assisting regeneration of suitable species in those areas. For biodiversity conservation, natural regeneration or assisted natural regeneration shall be promoted. The regenerative capacity of the endemic species, elephant liking species shall be enhanced. A total ecosystem conservation concept will be adopted for conservation of the wildlife habitat and conservation of biodiversity in these forests. An effective naturalization plan needs to be devised based on principles for maintaining natural diversity. To enrich the low diversity areas, efforts should be made to restore native complementing natural species rather than planting as many different kinds of trees as possible without looking into the natural regeneration and the needs of the natural fauna of the site. Further, introduction of exotic species in the area will be restricted and plantation of both, slow and fast growing native species of herbs, shrubs, and trees shall be promoted.

Since the composition under the forest type found in Digboi has signature species namely Hollong, Mekai, Nahar, it is essential to protect and maintain the habitat. It is necessary to prescribe plantation of these signatures species to maintain the composition of the forest type in Jeypore reserve forest. High rainfall experienced in this division which facilitates dense undergrowth is another important factor that needs to be maintained.

Involvement of local communities especially youths, women from the forest and fringe villages will be sensitized in forest and wildlife protection issues identification and appropriate measures, participatory planning and sharing of responsibility and benefits needs to be promoted. Excluding local population can often lead to illegal activities which can cause further degradation of the flora and fauna. The efforts therefore shall be to impose restrictions on local populations through participation in purview of legal and allow traditional practices to continue to ensure their long-term success. For this purpose, capacity building programmes may be taken up.

Further efforts should be made to preserve as many patches of natural communities as possible. This will help to sustain regional diversity. Wherever possible, fragmentation of large patches of natural vegetation

shall be avoided. Even a narrow access road through a forest can act as a barrier to movement of small organisms and affect their habitats.

Ecotones between natural communities support a variety of species from both communities. Hence, these should be allowed to develop naturally between adjacent communities.

Regular monitoring and updation of species data through research and development activities needs to be taken up taking the present data as the base. Ethno biological information also needs to be generated for the species recorded in the Division.

7.8.1 Target of Achievement:

Activity	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Enrichment plantations = 10% of total allotted area of 7972.39 = 797.24 (say) 800 hectares.	100	100	100	100	100	100	100	100	-	-
Maintenance of plantation= 2300 hect	-	100	200	300	300	300	300	300	300	200
b) Establishment of 1 anti-wildlife depredation unit.	1	1	1	1	1	1	1	1	1	1
c) Elephant proof trenching of earthwork = 3,75,000 m ³ . (unit x1000 m ³)	75	75	75	75	75	-	-	-	-	-
d) Safe elephant corridors 4 nos. (Continuous for 10 years)	4	4	4	4	4	4	4	4	4	4
e) 160 nos. wildlife awareness camps.	16	16	16	16	16	16	16	16	16	16

7.9 Measures for its protection

Measures for protection in this working circle is elaborated below under proposed wildlife management prescriptions, and proposed biodiversity conservation measures.

7.9.1 Prescriptions proposed wildlife management

The main issues are hunting, poaching, illegal felling, and illegal removal of NTFP, encroachment, grazing, man-animal conflict, and livestock disease.

Hunting: It has been observed that in the past there were occasional attempts by miscreants to capture wild elephants. There were some cases of hunting of male wild elephants in the past. There were instances of organized community hunting by Tea Garden labours for bush meat. Though in recent time no such incident of hunting has taken place, yet the wild animals are very much susceptible to hunting. Forest staffs in the Division shall keep uninterrupted vigil to prevent hunting. The forest staff shall develop an intelligence system with the help of local people to gather information about any activities related to hunting and take appropriate steps accordingly for its prevention. Five watch towers proposed under anti depredation unit which may be utilized for vigilance against hunters.

Poaching: There were attempts to kill Hoolock gibbon in the forests and were thwarted timely. Staffs shall keep strict vigil to thwart such further attempts. The forest staff shall develop an intelligence system with

the help of local people to gather information about any activities related to poachers and traders of wild life and take appropriate steps accordingly to prevent any poaching in the division.

Illegal felling: Illegal felling is the major concern of all the forests of the State. Digboi Division is not exception to this activity. There have been illegal felling in the forest areas including the Dehing-Patkai Wildlife Sanctuary. Illegal felling has to be checked. All necessary legal measures shall be taken to stop illegal felling.

Encroachment and other illegal activities: A few boundary pillars were constructed in the protected area with proper demarcation during the last management plan period. Encroachment identified and the standard procedure of eviction of any such encroachment is to be done at priority. No new villages or new dwellers should be permitted to come out in future in close proximity of the wildlife habitats. Forest staffs must report about any attempt of encroachment. Not reporting of such encroachment attempt shall be deemed to be abetment on part of concerned staffs having jurisdiction of the area.

Grazing: The grazing is negligible in the forests of the Division. However, domestic cattle sometimes stray to the forests of the Division which are to be driven away from forest. All domestic cattle need to be immunized from timetotime. Initiation in this regard should be taken by facilitating vaccination camps for cattle of the fringe villagers.

Habitat management:

Due to anthropogenic pressure, the wild life habitat has deteriorated. Water, food, safe resting places for wildlife, breeding areas, and nesting areas is to be ensured in the Division. Wallows and salt licks are other factors. For this the following activities are proposed:

Creation of water holes: Water availability, or the scarcity of it, is one of the major factors that decide the health of wildlife habitat is regulated by availability of water. During water scares seasons, probability of wildlife increases near water holes or near villages and thereby increases their susceptibility to poaching. So it is proposed to create water holes, density shall be commensurate with the density of wild animals found in the area.

Fruit and fodder plantations: Plantation of fruit plants like *Dilenia* spp., *Syzygium* spp., *Guajava* spp., *Artocarpus* spp., *Mangifera* spp., *Tamarindus* spp., *Phyllanthus* spp. *Eugenia* spp., plantation of fodder species like *Musa* spp. *Bambusa* spp. *Bauhinia* spp., *Andropogon* spp., *Buchanania* spp., *Cassia* spp., *Croton* spp., *Dioscorea* spp., *Eragrostis* spp., *Eugenia* spp., *Ficus* spp., *Lagerstroemia* spp., *Saccharum* spp. etc. shall be undertaken. To improve the prey base, care of herbivores should be taken by improving the assured fodder availability in the forest. The open areas in wildlife rich zones should be developed with suitable fruit and fodder species as mentioned above.

Development of Nesting Sites: Especial emphasis should be given to improve and maintain the characteristic waterbodies for white winged wood duck. Water bodies, small and large should be developed and maintained for migratory birds and other bird species. To provide suitable nesting places to birds, seed sowing of *Ficus* spp. and its planting should be done near water-bodies and in the riparian

areas. No new villages or new dwellers should be permitted to come out in future in close proximity of such important wildlife habitats.

Establishment of wildlife anti depredation unit (ADU)

Establishment of anti depredation unit is proposed. Raising an wildlife anti depredation squad (ADS) is proposed for this Division. It should include DFO, selected ACFs, RFOs BOs and Forest guards. A committee will be constituted with the ADS members and local veterinary officer, prominent villagers from JFMC who have knowledge on wildlife. Discussions should be conducted to jointly find solutions for man animal conflict issues. The ADS should be equipped with wireless sets, high beam, tranquilizers, tranquilizing guns, GPS. Tranquilizers to be carefully used as per the Assam forest department standards incase of only straying small animals like cats, etc. For tranquilization the local veterinarian officer would be consulted. Five watch towers will be constructed to

It is proposed that under the anti depredation unit *koonkies (trained elephants)* should be kept at the division at all times to chase away *makhana* and other straying elephants, wild elephant herds from areas outside wildlife areas especially from human habitations/settlements/agricultural fields/towns,etc. Incase of elephant straying into habitations *koonkie* should be used to chase them away. It is proposed to keep four (4) *koonkies* during planting and harvesting seasons in the division as anti depredation measure. For this, it is proposed to catch two (2) numbers of elephants per year from the Digboi forest division as a measure to:

- i) control wild elephants which are already pocketed,
- ii) meet the future demand of *koonkie* in other forest divisions,
- iii) meet the future demand of elephants for the national parks, and sanctuaries for patrolling, and control the population of elephant.

Trenching: Straying out of elephant and other wildlife from the forests of the Division to human population is to be minimized. A total of 10 km length of fragmented trenches is proposed in identified patches.

In view of IGF and Director (Project Elephant) vide Notification issued on 11th November 2009 (see below) electric fencing, if any, posing danger to any wild life in tea estates in the Digboi forest Division should be removed.

"The Ministry is reviewing reports of death in tea/coffee estates aspecially in Assam and Karnataka due to unregulated voltage in the solar power fencing erected by them. This is a serious issue and in fact such an act tantamount to willful hunting as per section 16(b) and thus in violation of section 9 of the wildlife (Protection) Act'1972.

2. You are therefore requested to make it known to all the tea gardens, coffee estates and other located in the elephant areas to ensure that no such fencings are erected in future. Whenever deaths of elephants due to electrocution in such places have taken place, the management needs to be prosecuted for hunting and such fencing needs to be removed at once."

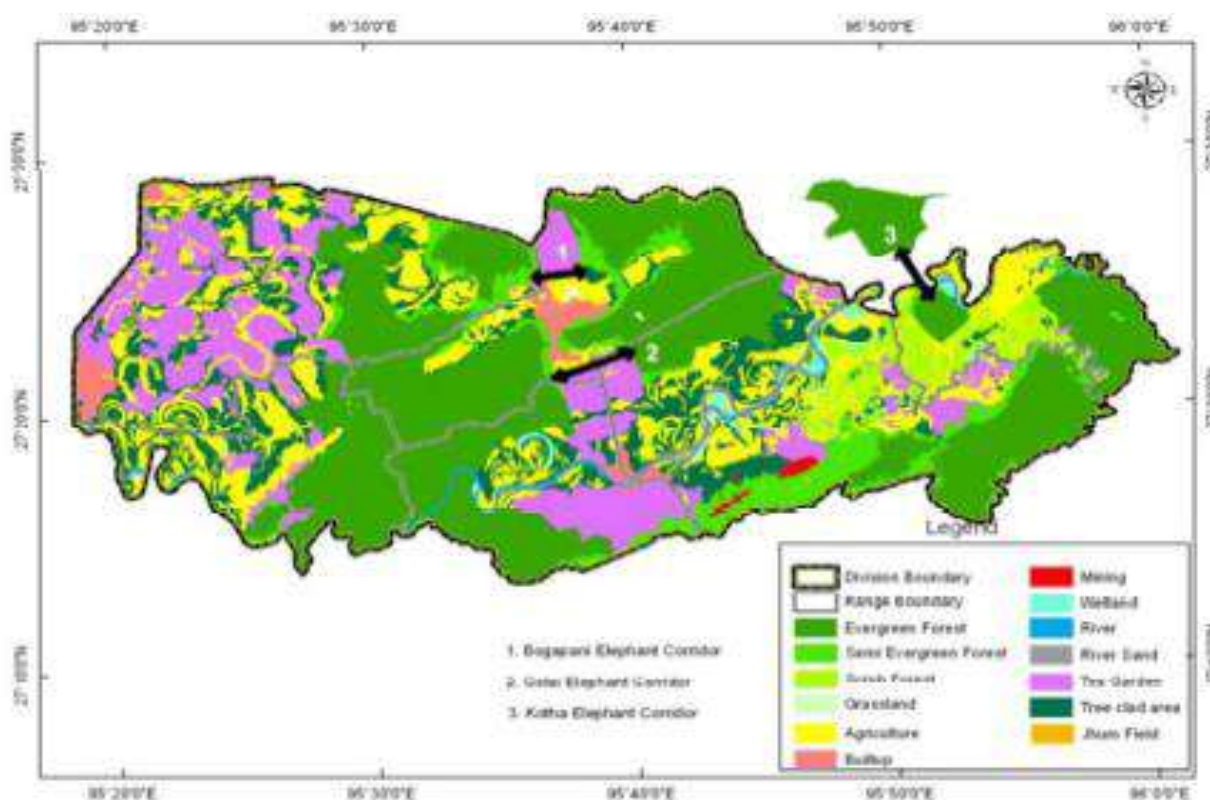
Wildlife first aid kit: Wild animals get wounds, injured by accidents or by disease. These wounds and injuries are so small that there is no need to get them to Veterinary doctor. Therefore, training of the forest staff on such injuries and first aid is to be organized so that they know about such wound, injuries, disease. Wildlife first aid kits should be kept in the division and be given to the needy animals as required.

Awareness Campaign: To ensure the participation of local communities in the conservation planning of the Dehing-Patkai landscape, awareness generation among them is a pre-requisite. Awareness activities can involve wildlife awareness and environmental awareness through medium of picture, videos and talks by resource persons. It is essential to make the community aware of the importance of protecting forest, wildlife and wildlife related laws, rules and regulation. Similar awareness activities can be carried out in a small scale approach involving the school children from the surrounding villages. In addition, to promote all these activities, preparation and installation of signage and hoardings at strategic places should be carried out. These signages in local languages can educate people on restrictions on hunting, logging and firewood collection, and punishments; information on mitigation of wildlife conflict; on the importance of forest and wildlife. Awareness in the public administration level can also be achieved by conducting meetings with the district administration to make them aware about the initiatives. Along with the conservation initiatives taken for the Dehing-Patkai sanctuary, parallel awareness generation programmes describing the mitigation measures of human-animal conflict in the region can also be taken up by the department. As villagers are unaware of compensation procedure, awareness about how to report crop depredation or injury and casualty is also essential.

Eco-tourism: Eco-tourism is another option which reduces peoples dependencies by providing jobs and it also sensitizes the visitors. In Dehing-Patkai infrastructure for tourism is very limited. There is no rest houses etc. where tourist could stay, neither capable guides are available. There is a need to develop amenities for the tourists in the sanctuary. Traditional houses consisting of 10 huts can be constructed for lodging of the tourist. Additionally a rest house can also be constructed.

Man elephant & wild animal conflict: Delinking of corridors, obstructions in movements of wild Asiatic elephant and other wildlife, habitats reduction, expansion of small tea gardens in the fringe areas, reduction of elephant preferable species are some of the key reasons leading to man-elephant conflict in the forest areas of this Division. Forest Department should notify corridors for elephants. Railways and Assam State Transport Corporation, Private Bus operators, Road Carriages Associations/owners/drivers are to be made aware of elephant corridors and wildlife corridors. Speed of trains should not be more than 30 Kms. /hr. while passing through these corridors. The drivers of the train should be sensitized. There should be coordination between forest department and railways. The treatment methods proposed for reducing man elephant conflict are elaborated in the subheads

Fig 7.9.1: Three major elephant corridors of Digboi division. Source: Aaranyak Publication 2016



Improvement of elephant corridor: Figure 7.9.1 – shows the major three elephant corridors in Digboi Division. The rapid development across the Digboi Division of Dehing-Patkai Elephant Reserve has resulted in forest cover decline and as a result the frequency of crop depredation by wild elephant has increased considerably. The Division witnessed >400 crop raid during last five years (2008-2012) (Department record, Digboi FD). This is supplemented with property damage and human killed by elephants. While in retaliation seven elephants had succumbed to death during this period. This forest of this reserve is connected to that of Myanmar and is an important landscape for a long ranging species like elephant. There was never any attempt on studying the population of Asian elephants in the region. There are three major wildlife corridors criss crossing the entire region. However, in recent time the usage of these corridors have vastly reduced and resulted into conflict with people. The elephant corridor inside the

Bogapani reserve through the area doesn't come under the purview of the Working Plan however since elephant corridor exists forest department will create awareness to the tea garden population and discuss matters with tea estate officials to ensure that the corridor is not affected.

1. **Upper Dehing East-Upper Dehing West at Bogapani** ($27^{\circ}25'16''$ N and $95^{\circ}36'34''$ E): This Corridor lies between the Upper Dehing East and West Blocks of forestland and passes through Bogapani tea Estate and a few settlements. Tea gardens, heavy traffic on National Highway 38 and a railway track (Digboi-Tinsukia) are the major obstacles for elephant movement. The railway track has caused the death of seven elephants in a single accident in 2001 (Menon et al, 2005).
2. **Upper Dehing East-Upper Dehing West at Golai** ($27^{\circ}21'54''$ N and $95^{\circ}38'06''$ E): This Corridor facilitates elephant movement between the Upper Dehing East and West Blocks. As a result of crop depredation by elephant, villagers have stopped cultivation in the area since 2000-2001. New settlement have started coming up in the corridor area.
3. **Kotha-Buridehing** ($27^{\circ}15'00''$ N and $95^{\circ}00'00''$ E): This corridor connects the Kotha Reserve Forest (Digboi Forest Division) facilitating the movement of elephant population of Changlang District of Arunachal Pradesh with the Buridehing Reserve Forest (Doomdooma Forest Division) thereby maintaining the linkage with Terai Reserve Forest, Kokojan Reserve Forest and Nalani Reserve Forest. The area is highly fragmented by tea gardens and human-elephant conflict is on the rise. The corridor covers an area of 6 KM² (length=6KM, breadth=1 KM) and is now highly fragmented because of Tea gardens and processing factories.

Source: Right to passage; Elephant Corridors in India, WTI

Treatment proposed for maintaining the elephant corridors include removal of constructions that are obstructing movement of elephants in the corridor. A 300 m width to be maintained for each of such corridors.



To initiate scientific studies on endangered and threatened flora, fauna and habitat:

Research is an important aspect in management of any protected area; a protected area cannot be managed without information on the various species of the area, their ecology, habitat and relevant issues in management. Thus research should be given due importance and there should be incentive and promotion of research at a protected area. A good manager can utilize the information given by researchers and can take a judicious decision on implementing recommendations for conservation of wildlife.

7.10 Proposed Biodiversity conservation prescriptions

Guidelines proposed on treatment prescriptions for preservation and conservation of biodiversity in Digboi division is as follows:

Important Value Index (IVI): Tree species having IVI is less than 5.00 will be promoted by planting and preservation.

Fruit trees: Fruit trees such as Outenga, Mango, Amla, Bel, Jamun, Arjuna, Bahera, Bot, Aahat, Bamboo, etc. will not be felled during any operation.

Promoting endemism: Areas infested with dense *Mikania micrantha*, *Lantana spp.*, *Parthenium spp.* (found on the areas nearby the villages) shall be replaced by useful economical species. Compartments or parts of compartments which have population of fruit trees, or trees of lesser known species shall be preserved against any exploitation activity.

Banning application of inorganic pesticides: Application of pesticides/ insecticides around a 5 km periphery of the forest in this division is to be completely banned. The forest houses diverse insects, birds and application of insecticides/pesticides by the surrounding tea estates affects the insect population of the forest division. It hampers pollination of important tree species and indirectly affects the birds and fish population.

Fire protection measures: Fire protection measures, though fires incidences are not reported to be done as a precautionary measure to protect the endemic biodiversity.

Natural regeneration: Natural regeneration or assisted natural regeneration shall be promoted. The regenerative capacity of the endemic species, elephant liking species shall be enhanced. A total ecosystem conservation concept will be adopted for conservation of the wildlife habitat and conservation of biodiversity in these forests. An effective naturalization plan needs to be devised based on principles for maintaining natural diversity. To enrich the low diversity areas, efforts should be made to restore native complementing natural species rather than planting as many different kinds of trees as possible without looking into the natural regeneration and the needs of the natural fauna of the site. Further, introduction of exotic species in the area will be restricted and plantation of both, slow and fast growing native species of herbs, shrubs, and trees shall be promoted.

Involvement of local communities: Involvement of local communities especially women in forest and wildlife protection through awareness, participatory planning and equitable sharing of responsibility and benefits needs to be promoted. Excluding local population can often lead to illegal activities which can cause further degradation of the environment. The efforts therefore shall be to impose minimum restrictions on local populations under the purview of the legal provisions and allow beneficial traditional practices for improving the habitat to initiate for ensuring long-term success. For this purposes capacity building programmes needs to be taken up.

Preservation of good patches: Efforts should be made to preserve as many patches of natural communities as possible. This will help to sustain regional diversity. Wherever possible, fragmentation of large patches of natural vegetation be avoided. Even a narrow access road through a forest can act as a barrier to movement of small organisms and effect their habitats. Ecotones between natural communities support a variety of species from both communities. Hence, these should be allowed to develop naturally between adjacent communities.

Biodiversity monitoring: Regular monitoring and updation of species data through R & D activities needs to be taken up taking the present data as the base. Ethno biological information also needs to be generated.

Permanent Preservation Plots: Due to increasing biotic pressure and imminent climatic change, the natural regeneration of most of the tree species has not been taking place. To preserve the natural floristics of the forest, it is proposed to establish a permanent preservation plots of Hollong, Nahar and Mekai in the selected compartments. Natural regeneration will be studied, areas will be identified and preservation plots for the above mentioned tree species will be initiated. Mother trees will be identified, marked and used as seed sources for artificial regeneration. The area preserved will be demarcated on the ground with instructions to avoid any disturbances. The various coordinates of longitude, latitude, altitude will be recorded and a map prepared. Preservation plots shall not be less than 3 ha area and will be studied for ecological succession and biodiversity of the area. No grazing shall be allowed in this area nor will any type of cultural operations be done. Biannual studies on composition and structure of the forest will be done. In case of trees, girth at breast height shall be recorded. The biodiversity will be recorded periodically as per NWPC, 2014 code. The Conservator of Research Circle shall inspect the area annually along with the Divisional Forest Officer of Digboi Division to record their findings. A copy of the findings should be sent to the Additional Principal Chief Conservator of Forests (RE&WP) for further investigations.

7.11 Proposal to constitute Dehing-Patkai a National Park

Dehing Patkai Sanctuary was declared as per Government notification dated on June 13th. The Sanctuary encompasses an area of 111.19 sq.km comprising entire Dirak Reserve Forest, part of Joypore Reserve Forest and part of the Upper Dehing Reserve Forests(West Block).

The Dehing Patkai Sanctuary is located in the midst of biodiversity hotspot of the region (North–East India). The Reserve Forests and high bio-diversity areas which when put together covers more than 500 sq km contiguous areas. The rich bio diversity areas in the tropical wet evergreen forest extending from Jeyrampur to Dilli RF in the districts of Tinsukia and Dibrugarh having their length running alongside the borders of Arunachal Pradesh are the home of various endemic, rare, endangered and threatened flora and fauna. Royal Bengal Tiger, Leopard, Clouded Leopard, Golden Cat, Marbled Cat, Fishing Cat, Jungle Cat and Leopard Cat live here which is the single instance of existence of 8(eight) cat species

The Wet evergreen patch provide abode to 48 different species of mammals which is amongst the highest for any Protected Area. It is the home of Elephants, Bison, Wild Dog, Crab Eating Mongoose, Malayan Sun Bear, Binturong, Hoolock Gibbons, Pig tailed macaque, Stump tailed macaque, Assamese macaque, Rhesus macaque, Slow Loris, Capped Langur (all 7 species of primates of NE India), Chinese Pangolin, Wild Dog(Dhole), Red Giant Squirrel, Malabar Giant Squirrel, Sambar, Barking Deer, Porcupine etc. The Preliminary Survey conducted by the Zoological Survey of India on Hoolock Gibbon for six months during 2015 found that there are more than 650 Gibbons (A non-human primate) in Dehing Patkai Sanctuary and Upper Dihing RF(East Block).

It harbors 396 species of avifauna including many are endangered and threatened species. It is the home of the Critically Endangered “State Bird of Assam”, the White Winged Wood Duck (the world population is around 1000 only). Most of the birds are residents while some are migratory. The summer visitors are less in numbers and diversity. 13% are altitudinal migrants who come from the heights of the Western, Central and Eastern Himalayas. 13 “Globally Threatened” species of birds including Greater Adjutant Stork, Lesser Adjutant Stork, Slender Billed Vulture, White Winged Wood Duck, Greater Pied Hornbill, Brown Hornbill, Beautiful Nuthatch, Greater Spotted Eagle, Tawny Breasted Wren Babbler, White Cheeked Hill Partridge, Oriental Darter are recorded. Schedule-I bird species of the Wildlife Protection Act are Khaleej Pheasant, Hill Myna, Grey Peacock Pheasant, Basra, Black Baza, Osprey, Wreathed Hornbill etc. The Sanctuary is considered to be 'Pollution free habitat' as it exhibits 350 species of butterflies and 600 species of moths. The Dehing Patkai landscape rises from a 350 feet altitude to a height of 1400 feet of the Hilikha Parbat of the Joypore Reserve which shows the geological variation of the area. It is humid and warm which expects heavy precipitation(4400 mm annual rainfall). Due to such features, the Sanctuary has established a number of eco systems and biomes.

Flora: Forest type of the entire patch from Jeyrampur to Dilli along Arunachal and Nagaland border is Wet Evergreen Forests. It is one of the unique rain forests in the nation where *Dipterocarpus retusus*, *Shorea assamica*, *Messua ferrea* combination dominates the forest. The Core of the Sanctuary is still primeval and virgin. Five layered canopies of floral growths covering this Assam Valley Tropical Wet Evergreen Forests with *Dipterocarpus* (Hollong) of the types 1/1/1B/C1 at the top. *Dipterocarpus retusus* (Hollong) is

the "State Tree of Assam". Morhal (*Vatica lanciafolea*) is under highlight of being a 'Critically Endangered plant' but, is found in large numbers and in this patch. Species of *Dicots*, *Castanopsis indica*, *Amoora walichi*, *Dillenia*, Figs etc. are abundant. Large aggregates of Bamboos, Canes, Wild Banana, Tree Ferns, Orchids, Mosses are one also abundant. Updated reports suggest 101 orchid species within 45 Genera which were marked in the forest patch. Amongst them, eight orchid species are critically endangered. It has earned the distinction of recording several new orchid species in the region. *Thrichospermum acuminatissimum* is a record which is new to India. There are 9 new records to Assam which are *Bulbophyllum ebulbum*, *Chrysoglossumerraticum*, *C.robinsonii*, *Eria connate*, *E.pudica*, *Hetaeria affinis*, *Thelasis pygmaea*, *Taeniophyllum crepidiforme* and *Zuexine clandestine*.

So far the canopies are concerned, the first canopy begins with the Hollong trees(*Dipterocarpus*), which also known as a Climatic Climax species of the region. Titasopa(*Michelia chamapaca*) and Borpat (*Ailanthus excelsa*) are it's associates. The second canopy is in tandem with Mekai(*Shorea assamica*), Sam(*Artocarpus chaplasi*), Nohor(*Mesua ferea*), Amari(*Amora wallichii*) and many other common species. The third canopy constitutes of Morhal(*Vatica lanceofolia*), Ajar(*Lagerstroemia*) and Moj(*Albizia lucida*) etc. The fourth canopy is highlighted by woody shrubs like Geruka tamol, tree ferns, woody climbers, Bogitora etc. The ground cover consists of various herbs and small shrubs like Dhopat tita, Dighloti, Heloch, Sorat, Kau pat, Pati doi, Ferns, Ekora, Elephant grass etc.

Over the years, parts of old glory have been degraded. However, last vestiges are still remaining and, if due care is taken, the lost glory can be retrieved. Forest degradation driver, Open cast Coal Mining and Crude Oil extraction have been existing for last 120-140 years. As per Departmental Records, mining and extraction of coal started in 1882. It had negative impact on the environment and took an extensive toll of the evergreen forests. Apart from Coal mining areas, presently there are 25 functional mining wells in the Digboi Division alone. Though all these Coal mining and Oil rigs are in operation much before the enactment of Forest Conservation Act, 1980, these require approval from the MoEFCC, Govt. of India. But Coal India Ltd. failed to obtain approval from the MoEFCC. The North Eastern Coal Field (NECF) of Coal India Limited has lease hold area of 26.88 sq. km in the luxuriant tropical rainforests of Digboi Forest Division. These coal mines are located on the south-eastern side of Burhi-Dihing River, northwest of which has dense forests of Margherita East Range and further west was Digboi Range; there is an elephant corridor between Digboi Range and Margherita east Range. The coal mines are located in Lekhapani Range which is situated on the south east of Burhi-Dihing River. The Margherita East Range is located on the south west of Burhi-Dihing River. All the mines listed fall under Tipong, Lekhapani and Tikak forest Ranges.

Under the ground there are natural resources which contribute to the nation's economy while over the ground there are globally important flora and fauna of natural heritage, existence of which can never be compromised. This is therefore, a big question whether the natural resources shall be exploited at the cost of these rare, endangered, threatened species destroying the luxuriant tropical rainforest of the east. The answer will be definitely no. If the answer is no, judicious and effective measures need to be taken to stop any non forestry activity inside this evergreen patch of forest.

In tune with the United Nations' General Assembly Resolution adopted unanimously on 25th September, 2015 under the official agenda "Transforming our world: the 2030 agenda for Sustainable Development Goals (SDG)", proposal for declaration entire area as the Dehing Patkai as National Park was submitted by the then DFO, Digboi Division. The proposal conforms to SDG no. 15 under the category of 'Terrestrial Ecosystems and their protection including the endangered species of flora and fauna, sustainably manage forests, combat desertification and halt and reverse land degradation and halt bio diversity loss.'

The "SDG 2030" was adopted by the Govt. of Assam and was launched on the 1st Day of January, 2016. In the light of the 'United Nation's Agenda 15 of SDG 2030', the Dehing Patkai landscape including Dehing-patkai Sanctuary with few Reserve Forests of Digobi, Dibrugarh and Sivasagar Division having contiguity and have already been declared as an Elephant Reserve with 735 sq.km. area, may be proposed as a 'National Park' U/S 35 of the Wildlife Protection Act, 1972.



CHAPTER 8

General financial Forecast & Financial Plan of operation

8.1 General: This Working Plan is devoid of harvesting prescription. The forests of the Division have been degraded to a considerable extent. Absence of harvestable crop led to restrain the WPO from harvesting prescription. However, regeneration and restocking are prescribed in the Working Plan. Huge regeneration and protection of crop from biotic interference will lead to achieve the goal. As there has been a paradigm shift of forest management from production forestry to protection forestry and there is a need to evaluate the intangible benefits of forests it is justified to spend money on reforestation without counting its tangible benefits.

Costs and prices are influenced by market forces and depend on supply and demand. It further depends on the principle of management and pattern of exploitation adopted from time to time. Therefore, it is not possible to estimate with reasonable accuracy the expenditure and revenue during the period of this working plan. The estimates given below are based on the current prices of various items of forest produce and the cost involved in carrying out the prescriptions of the plan at current rates.

8.2 Past Revenue and Expenditure: The details of past revenue and expenditure have been given in the following table 8.2.

Table 8.2: Past revenue and expenditure (Rs. in lakhs)

Year	Expenditure incurred	Revenue generated	Surplus
2008-2009	220.95	65.31	Shortfall
2009-2010	239.08	71.49	Shortfall
2010-2011	343.74	81.12	Shortfall
2011-2012	374.34	131.67	Shortfall
2012-2013	453.51	39.48	Shortfall
2013-2014	467.42	123.14	Shortfall
2014-2015	460.78	92.96	Shortfall
2015-2016	457.67	94.89	Shortfall
2016-2017	445.73	192.04	Shortfall
2017-2018	481.67	308.42	Shortfall
2018-2019	462.84	322.04	Shortfall
2019-2020	421.21	167.71	Shortfall

8.3 Future Revenue: In this Working Plan there is no harvesting prescription. This is in view of necessity for restocking the already degraded forest. As such, no revenue is forecasted from harvesting of forest produce.

8.4 Future Expenditure: The estimated expenditure includes all development works during the Working Plan period of 10 years. The estimates are as per price index prevailed in current year. The estimated expenditure may increase subject to increase of price index and

deviation(alteration/inclusion/modification) of plan. Estimated expenditure for various Working Circles are given as under.

8.4.1 Estimated expenditure for Joint Forest Management Working Circle

8.4.1.1 JFMC Nursery

Table: 1.1: Proposed estimate for development of nursery under Joint Forest Management working circle in Digboi Division for the period of 2019-20 to 2028-29.(in terms of mandays)

Item No	Details Item of Works	Qty	Number of man-days
1.	Nursery development LS	10	923
2.	Sapling raising – 1,50,000 saplings will be produced per nursery/JFMC	-	13,838
3.	ContingencyL.S	-	1,476
4.	Total		16,236

8.4.1.2 JFMC Plantation

Proposed estimate for JFMC plantations under Joint Forest Management working circle in Digboi division for the period of 2019-20 to 2028-29.

Item No	Details Item of Works	Qty	Number of man-days
1.	Plantation – including land preparation, pit digging, manuring , watering and maintenance @50 ha/yr x 2500/ha x 10 yrs.	1250000	96,095
2.	ContingencyL.S		961
3.	Total		97,056

8.4.1.3 JFMC NTFP/Organic formulations/ Hydrams/CAT plans related development

Proposed estimate for JFMC other activities related to NTFP/organic formulations/hydrams/CAT plans under Joint Forest Management working circle in Digboi division for the period of 2019-20 to 2028-29.

Item	Details Item of Works	Qty	Number of mandays
1.	Lump sum for each JFMC for development of NTFP processing values adding, development of inorganic formulations, manure, fabrication of hydrams, , development of CAT plans	10	3075
2.	ContingencyL.S		308
3.	Total		3,383

CAMPA Assam, Norms (Rs.) used for estimation.

S.No.	Works	25 Ha	1 Ha
1	Site Selection, Advance Work, Creation and 1st Year Maintenance	35,14,375	1,40,575
2	2nd Year Maintenance	4,91,250	19,650
3	3rd Year Maintenance	4,35,000	17,400
4	4th Year Maintenance	3,22,500	12,900
5	5th Year Maintenance	2,78,750	11,150
	TOTAL	50,41,875	2,01,675

Nursery Development–

Norms for creation and development of 1.5 hect nursery under CAMPA is attached below-

Norms for Maintenance 1.5 Ha. Nursery under CAMPA

Number of standard beds for raising naked seedlings =25

Number of standard mother beds for raising polypot seedlings = 10

Number of beds for arranging polypot seedlings = 110

Total number of polypot seedlings to be raised = 1,00,000

Total number of naked seedlings to be raised = 10,000

Total number of tall seedlings to be raised = 1,000

Total number of seedlings to be raised = 1,11,000

Sl. No.	Particulars of works	Unit	Qty	Rate (Rs.)	Amount (Rs.)
1	Maintenance of chainlink fencing including repairing of fencing	LS	-	-	10,000.00
2	Preparation of 35 standard beds (10 mother beds for polypots + 25 for naked seedlings/stumps) by soil working etc. @1.5 DLs/bed= 53 DLs	DLs	53	250	13,250.00
3	Preparation of 100 beds for arranging polypot seedlings @ 4 bed/DL	DLs	28	250	7000.00
4	Procurement of Bamboo for arranging Polypots in the raised beds including ropes for tying etc.	No	110	150	16,500.00
5	Procurement of of quality seeds	LS	-	-	12,000.00
6	Cost of procurement of fertile soil, river silt/ sand soil 225 cum @300/- per cum including loading, transporting and unloading	Cu.m	225	300	67,500.00
7	Cost of farm yard manure & Vermi-composit: 75 cu.m @ Rs. 500	Cu.m	75	500	37,500.00
8	Cost of fungicide, insecticide, pesticide etc. & their application	LS	-	-	2,500.00
9	Cost of sowing, dibbling of seeds in standard/ mother beds @ 5 beds/DL for 35 beds = 7 DLs	DL	7	250	1,750.00
10	Cost of perforated virgin HDPE black polypot including 5% VAT 15% excise duty for a) 1,00,000 polypots 5 inch x 8 inch x 300 gaige + 3.8 quintals (approx 26,500 polypots per quintal) b) 1,000 polypots 12 inch x 18 inch x 300 gauge = 0.2 quintal	Qtls	4	18500	74,000.00
11	Preparation of 1,00,000 polypots including selving of soil, mixing of soil with manure, filling of soil in polypots, arranging the polypots in beds, transplanting seedlings as per silviculture requirement of species etc. (1 DL = 200 polupot per day) = 500 DLs	DL	500	250	1,25,000.00
12	Preparation of 1000 polypot seedlings for tall planting including cost of polypot preparation and upkeepment (1 DL = 20 polypots per day) = 50 DLs	No	50	250	12,500.00
13	Shifting of polypot seedlings to avoid rooting in soil atleast twice in a year@1000 polypots/DL = 201 DLs	DL	201	250	50,250.00
14	Providing temporary shed using agronet for shade demanding species (both bareroot and polypot) including purchase of bamboo posts etc.	LS	-	-	12,500.00
15	Watering of 35 beds & 1.01 lakh polypots (110 beds) as and when necessary @ 150 beds/DL x 90 days (180 days of lean period) = Total 145 beds x 90 days	DL	90	250	22,500.00
16	Weeding of 35 beds and 1.01 lakh polypots (110 beds) @ 3 beds/DL x 5 weeding/year = 242 DLs	DL	242	250	60,500.00
17	Protection work, cattle watching, fencing repairing and upkeepment of nursery works = 365 days	DL	365	250	91,250.00
18	Cost of tools, implements, signboard, bed wise sinage (Rs.100/ sinage showing details of species, date of sowing/transplanting and number of plants) etc.	LS	-	-	25,000.00
19	Transportation of materials & seedlings for free distribution etc.	LS	-	-	10,000.00
20	Awareness, monitoring & Evaluation works	LS	-	-	5,000.00
21	Overhead, administrative expenditure & contingency	LS	-	-	8,500.00
Grand Total = Rs.					6,65,000.00

Estimate for development of nursery for the period of 2019-20 to 2028-29

Y1 (Rs.)	Y2 (Rs.)	Y3 (Rs.)	Y4 (Rs.)	Y5 (Rs.)	Y6 (Rs.)	Y7 (Rs.)	Y8 (Rs.)	Y9 (Rs.)	Y10 (Rs.)
6,65,000.00	-	6,65,000.00	-	6,65,000.00	-	6,65,000.00	-	6,65,000.00	-

Estimate for creation of Plantation for the period of 2019-20 to 2028-29

Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
area	200	200	150	150	150	-	-	-	-	-
@ 1,40,575/-	28115000	28115000	21086250	21086250	21086250	-	-	-	-	-

Estimate for maintenance of Plantation for the period of 2018-2019 to 2027-2028

Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
area	-	200	400	550	500	450	300	150		
@61100	-	12220000	24440000	33605000	30550000	27495000	18330000	9165000	-	-

JFMC Training and awareness programmes

	Y1 (Rs.)	Y2 (Rs.)	Y3 (Rs.)	Y4 (Rs.)	Y5 (Rs.)	Y6 (Rs.)	Y7 (Rs.)	Y8 (Rs.)	Y9 (Rs.)	Y10 (Rs.)
No. of Training	8	8	8	8	8	8	8	8	8	8
Amt	4000000	4000000	4000000	4000000	4000000	4000000	4000000	4000000	4000000	4000000

Promotion of ecotourism

	Y1 (Rs.)	Y2 (Rs.)	Y3 (Rs.)	Y4 (Rs.)	Y5 (Rs.)	Y6 (Rs.)	Y7 (Rs.)	Y8 (Rs.)	Y9 (Rs.)	Y10 (Rs.)
No. of Trg Program	2	2	2	2	2	2	2	2	2	2
Amt	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000	1000000

8.4.2 Estimated expenditure for Plantation Working Circle

Proposed estimate for Plantation and regeneration working circle in Digboi division for the period of 2019-20 to 2028-29

Item	Detail Item of Works	Qty	Number of mandays
1.	Block Plantation – including land preparation, pit digging, manuring, watering and maintenance @100 ha/yr x 1111/ha x	1000 ha	10,763
2.	Gap filling (150 ha/yr) and regeneration activities (50 ha /yr) @ 200 ha/yr x 10 years @20,000/ha	2000 ha	3,075
2.	Contingency L.S		953
3.	Total		14,791

Proposed estimate in mandays in for the period of 2019-20 to 2028-29

Sl.	Details of Item of Works	Mandays
1.	Plantation and regeneration - including land preparation, pit digging, manuring, watering	2,73,278
2.	Maintenance	1,20,779
3.	Total	3,94,057

CAMPA norms (Rs.) used for estimation of expenditure

S.No.	Activities	25 Ha	1 Ha
1	Site Selection, Advance Work, Creation and 1st Year Maintenance	35,14,375	1,40,575
2	2nd Year Maintenance	4,91,250	19,650
3	3rd Year Maintenance	4,35,000	17,400
4	4th Year Maintenance	3,22,500	12,900
5	5th Year Maintenance	2,78,750	11,150
	TOTAL	50,41,875	2,01,675

Estimate for creation of Plantation for the period of 2019-20 to 2028-29

Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
area	525	525	525	525	525	525	525	525	-	-
@ 1,40,575/-	73801875	73801875	73801875	73801875	73801875	73801875	73801875	73801875	73801875	73801875

Estimate for maintenance of Plantation for the period of 2019-20 to 2028-29

Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
area	-	525	1050	1575	1575	1575	1575	1575	1575	1050
@61100	-	32077500	64155000	96232500	96232500	96232500	96232500	96232500	96232500	64155000

8.4.3 Estimated expenditure for Forest Protection Working Circle

Proposed estimate in mandays in for the period of 2019-20 to 2028-29

Item	Details Item of Works	Qty	Number of Mandays
1.	Boundary pillars	200	21,525
2.	Plantation of evicted areas (10 ha/year)	1000	1,07,626
	Total		1,29,151

Total Costs for Boundary Pillars: New Construction and Maintenance (10 Year Period).

Sl No	Year of Working Plan	Item	Pillars to be established	No of Pillars expected to be existing	Pillars to be maintained	Unit Cost of establishment (Rs)	Unit Cost of Maintenance (Rs)	Total Costs (Rs)	Total Cost (Per Year) (Rs)
1	2019-2020	Main Pillar	26	0	0	15300	3825	3,97,800	9,52,800
		Sub Pillar	74	0	0	7500	1875	5,55,000	

2	2020-2021	Main Pillars	26	22	0	15300	3825	3,97,800	9,22,800
		Sub Pillar	70	64	0	7500	1875	5,25,000	
3	2021-2022	Main Pillars	26	44	0	15300	3825	3,97,800	9,22,800
		Sub Pillar	70	128	0	7500	1875	5,25,000	
4	2022-2023	Main Pillars	26	66	22	15300	3825	4,81,950	11,26,950
		Sub Pillar	70	192	64	7500	1875	6,45,000	
5	2023-2024	Main Pillars	26	88	22	15300	3825	4,81,950	11,26,950
		Sub Pillar	70	256	64	7500	1875	6,45,000	
6	2024-2025	Main Pillars	22	110	22	15300	3825	4,20,750	10,65,750
		Sub Pillar	70	320	64	7500	1875	6,45,000	
7	2025-2026	Main Pillars	22	132	22	15300	3825	4,20,750	10,65,750
		Sub Pillar	70	384	64	7500	1875	6,45,000	
8	2026-2027	Main Pillars	14	154	22	15300	3825	2,98,350	9,43,350
		Sub Pillar	70	448	64	7500	1875	6,45,000	
9	2027-2028	Main Pillars	0	168	22	7500	3825	84,150	2,04,150
		Sub Pillar	0	504	64	7500	1875	1,20,000	
10	2028-2029	Main Pillars	0	168	22	7500	3825	84,150	2,04,150
		Sub Pillar	0	504	64	7500	1875	1,20,000	
GRAND TOTAL		Main Pillars	188	-	-	-	-	34,65,450	85,35,450
		Sub Pillar	564	-	-	-	-	50,70,000	

Estimate for implementing works of Forest Protection(Preservation)Working Circle:

SNo	Items of work	Unit	Cost/Unit	Total (in Rs.)
Cost for implementing the ejection plan				
1	50 labour/day for 91 days	4550	250	1137500.00
2	1 Truck/day for labourers for 91 days	91	6000	546000.00
3	1 Truck/day for seized materials for 2 days	2	6000	12000.00
4	1 Bus/day for security personnels for 91 days	91	10000	910000.00
5	2 Small vehicle/day for Officers and staff for 91 days	182	5000	910000.00
6	1 Ambulance with medical team/day for 91 days	91	5000	455000.00
7	1 No. JCB for 2 days @Rs. 3000/- per Hour X 5 Hours per day= 10 Hours	2	3000	30000.00
8	1 Kunki elephant/day for 2 days	2	5000	10000.00
9	Tools and equipments	L/s		300000.00
10	Contingency/TA/DA, etc.	L/s		1000000.00
11	Tents, accommodations of security forces	L/s		500000.00
12	Construction of new camp	6	1000000	6000000.00
13	Construction of new security barrack	11	2000000	22000000.00
14	Mini Truck (hiring)	3	1200000	3600000.00
	Sub Total:-			3,74,10,500.00
Cost for creation Nursery and Plantation				
1	1.5 Ha Nursery	4	6,65,000	26,60,000.00
2	Plantation	1440	52528/-	7,56,40,320.00
3	Maintenance of plantation (3 maint./year) for 5 yrs	1440 x 5yr	18864/-	13,58,20,800.00

SNo	Items of work	Unit	Cost/Unit	Total (in Rs.)
Cost for implementing the ejection plan				
4	Maintenance of Nurseries for 4 years	4 Nos. x 4 yrs	320000	51,20,000.00
	Sub Total:-			21,92,41,120.00
Roads and Bridges				
1	Maintenance of existing roads	30	100000	30,00,000.00
2	Solar Lights	17		11,90,000.00
3	Erection Shine / Signboard	L/s		1,00,000.00
4	G.P.S.	12	45000	5,40,000.00
5	Wireless Set with walkie talkie 12 Nos. X 12 Camp/Beat etc.	12	10000	1,20,000.00
	Sub Total:			49,50,000.00
1	Wall/fencing in strategic places to check biotic interference		-	4,50,00,000.00
1	Intensive protection measures including patrolling, staff mobilizing etc.			20,00,00,000.00
	Total =			50,66,01,620.00

* CAMPA norms for plantations and nursery and for other items prevailing market rate is considered for calculations which is purely subjective and objective.

8.4.4 Estimated expenditure for NTFP Working Circle.

Estimate for creation of Plantation for the period of 2019-20 to 2028-29

Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
	25	25	25	25	25	25	20			
@ 1,40,575/-	3514375	3514375	3514375	3514375	3514375	3514375	2811500			

Maintenance

Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
area		25	50	75	75	75	75	70	45	
@61100		1527500	3055000	4582500	4582500	4582500	4582500	4277000	2749500	

Norms proposed for implementation of 1 ha of bamboo plantation

NORMS PROPOSED FOR IMPLEMENTATION OF 1 Ha OF BAMBOO PLANTATION (Wage rate @ Rs. 247/-)			
	Patern of Works	No.of Labour Units	Amount (Rs) per Hect
A. Advance works			
1	Site clearance & planting	30	7410.00
2	Fencing (LS)	LS	25000.00
3	Planting materials- 625 Rhizomes/Ha @ Rs. 20/Rhizome		12500.00
B. Creation (First year)			
1	Planting	49	12103.00
2	First rain weeding		
3	2nd rain weeding		
4	3rd weeding		

5	4th weeding		
Sub Total			57013.00
C. First Year			
1	First weeding	18	4446.00
2	2nd weeding		
3	3rd weeding		
4	4th weeding		
5	Fire watching etc.		
D. Second Year			
1	First weeding	18	4446.00
2	2nd weeding		
3	3rd weeding		
4	4th weeding		
5	Fire watching etc.		
D. Third Year			
1	First weeding	18	4446.00
2	2nd weeding		
3	3rd weeding		
4	4th weeding		
5	Fire watching etc.		

The rates are subject to revision based on approval from the Forest Department

Estimate for Bamboo plantations and maintenance for the period of 2019-20 to 2028-29

Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
	25	25	25	25	25	25	20	-	-	-
@ 57013/-	1425325	1425325	1425325	1425325	1425325	1425325	1425325	-	-	-

Maintenance

Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
area		25	50	75	75	75	75	70	45	
@13338	-	333450	666900	1000350	1000350	1000350	1000350	933660	600210	-

8.4.5. Expenditure for Soil & water Conservation W.C.

Proposed estimate for SWC (Overlapping) Working Circle for the period of 2019-20 to 2028-29

Item	Details Item of Works	Qty	Number of
1.	SWC activities (spring shed/CAT/WMP) for treatment of 600 ha in 7 years	600	1,10,701
2.	Riparian plantation (row plantation) both sides of rivers/streams 50 m on each side 62500 endemic trees	1000 000	3,844
3.	Contingency L.S		1,107
4.	Total		1,15,652

Proposed estimate for creation plantation for the period from 2020-21 to 2028-29

Sl. No.	Details Item of Works	Mandays
1.	Soil conservation works 500 ha @250 hectares for 2 nd , and 3 rd year	1,845
2.	Contingency L.S	185
3.	Total	2,030

Estimate of Expenditure for Creation of Plantation from 2020-21 to 2028-29

Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9
Creation Plantation = 500 hect. @ Rs. 1,40,575/-	-	35143750	35143750	-	-	-	-	-	-

Maintenance

Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9
Creation Plantation = 500 hect. @ Rs. 61100/-	-	-	1527500	3055000	3055000	1527500	-	-	-

Estimate of Expenditure for of soil and water conservation engineering measures

Year	2020-21 (Rs)	2021-22 (Rs)	2022-23 (Rs)	2023-24 (Rs)	2024-25 (Rs)	2025-26 (Rs)	2026-27 (Rs)	2027-28 (Rs)	2028-29 (Rs)
Engineering works	1 Crore	1 Crore	1 Crore	1 Crore	1 Crore	-	-	-	-

8.4.6. Estimate for Wildlife and Biodiversity Conservation Working Circle

Estimate for creation of waterbodies

Item No	Details Item of Works	Qty	Number of mandays
1.	Clearing, digging, deepening, desolation, of waterbodies LS	10	1,538
2.	Contingency L.S		77
3.	Total		1,614

Proposed estimate for enrichment plantation

Item	Details Item of Works	Qty	Number of mandays
1.	Clearing of land, fruit saplings, fodder species, plantation of fruit plants, fodder species @ 5 ha/year (625 saplings/ha, x 5ha x 10	5	24,024
2.	Wages for skilledlaborsfor clearing, pit digging =1563DLS	1563	1,754
3.	Contingency L.S		1,289
4.	Total		27,067

Estimate of Expenditure for Creation of Plantation from 2020-21 to 2028-29

Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Creation Plantation = 800 hect. @ Rs. 1,40,575/-	14057500	14057500	14057500	14057500	14057500	14057500	14057500	14057500	-	-

Maintenance

Year	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Creation Plantation = 2300 hect. @ Rs. 61100/-	-	6110000	12220000	18330000	18330000	18330000	18330000	18330000	18330000	12220000

Estimate for establishment of anti-depredation unit

Item No	Details Item of Works	Qty	Number of mandays
1.	Tranquilizer medicines	-	461
2.	Tranquilizer guns	2	154
3.	Wireless sets (radio, transmitter and receiver, battery)	10	246
4.	High beam torch lights	10	77
5.	GPS sets	2	49
6.	Purchase of crackers LS 1,00,000 per year		3075
7.	Purchase of DBBL/SBBL guns	10	923
8.	Purchase of ammunition	100/yr	154
9.	Feed, training, others of catching elephant LS	2x90x10	0
10.	Feed, etc. of four koonkies LS	4x365	5535
11.	Bolero Camper	4	4490
12.	Anti-depredation squad	4	8426
13.	Maintenance LS 10,00,000/yr from 4 th yr onwards	-	49200
14.	Wildlife first aid kits LS 20,000/yr	-	2768
15.	Human injury compensation LS	-	615
16.	Crop damage compensation LS	-	308
17.	Ex gratia for causality LS	-	308
18.	Construction of watch towers	5	1538
19.	Contingency L.S		9225
20.	Total		91,927

Estimate for digging trench as per SOR, APWD 2009

Item	Details Item of Works	Qty	Number of mandays
1.	Excavation for roadway in soil using manual means for carrying of cut earth to embankment site with a lift up to 1.50 m and lead upto 50 m as per technical specification clause-302.3. Elephant Proof Trench 3.00m x 2.35m x 1m x 5000 m = 37500m ³	37500 0	10,955
2.	Contingency L.S		548
3.	Total		11,503

Proposed estimate for improvement of elephant corridor

Item No	Details Item of Works	Qty	Number of mandays
1.	Construction of cemented camouflaged on corridor (40m x 20m) across railway lines LS	-	3,075
2.	Eviction (hiring of cranes, etc.) LS	10	769
3.	Insulation of electric lines, etc. LS	-	3,075
4.	Contingency L.S		346
5.	Total		7,265

Proposed estimate for awareness campaign etc.

Item No	Details Item of Works	Qty	Number of mandays
1.	Awareness of identified areas (8 camps x 2 x 10 years)	160	12,300
2.	Contingency L.S		615
3.	Total		12,915

Summary of the proposed estimates for prescriptions proposed under wildlife management and biodiversity conservation (overlapping) working circle for the period of 2018-2019 to 2027-2028.

Sl. No.	Summary of works	Detail Estimate Table	Mandays
1.	Maintenance of water holes	18.11 b	1,692
2.	Fruit and fodder plantation	18.11 c	28,373
3.	Wildlife depredation unit	18.11 d	91,991
4.	Trenching (Elephant trenches)	18.11 e	12,058
5.	Improvement of elephant corridor	18.11 f	7,616
6.	Awareness	18.11 g	13,538
7.	Biodiversity conservation	18.11 h	55,847
8.	Ecotourism	18.11 i	12,000
8.	Total		2,23,115

Estimate for establishment of anti-depredation unit

Sl. No.	Details Item of Works	Nos.
1.	Tranquilizer related (medicines) procurement	462
2.	Tranquilizer (guns) procurement	154
3.	Wireless sets (radio, transmitter and receiver, battery)	246
4.	High beam torch lights	77
5.	GPS sets	50
6.	Purchase of crackers LS 1,00,000 per year	3,077
7.	Purchase of DBBL/SBBL guns	924
8.	Purchase of ammunition	154
9.	Feed, training, others of catching elephant LS	5,539
10.	Feed, etc. of four koonkies LS	4,493
11.	Bolero Camper	8,431
12.	Anti depredation squad	49,231
13.	Maintenance LS 10,00,000/yr from 4th yr onwards	2,770
14.	Wildlife first aid kits LS 20,000/yr	616
15.	Human injury compensation LS	308
16.	Crop damage compensation LS	308

17.	Ex gratia for casualty LS	1,539
18.	Construction of watch towers	9,231
19.	Contingency L.S	4,381
20.	Total	91,991

Estimate for biodiversity conservation

Sl. No.	Details Item of Works	Mandays
1.	Yearly data collection, research on biodiversity, monitoring	30,770
2.	Preservation plots for Hollong-Mekai-Nahar	6,154
3.	Development of nurseries of RET species and raising its seedlings LS	1,539
4.	ANR activities LS	9,231
5.	Cleaning, maintaining, repairing, collection LS	3,076
6.	Maintenance L.S	5,077
7.	Total	55,847

Proposed estimate for Ecotourism development

Sl. No.	Details Item of Works	Mandays
1.	Ecotourism - Nature trail, boating, camps, weaving center, weavng center at Namphake Village in the periphery of Joypur RF	67,340

Estimate for Establishment of 1 anti-wildlife depredation unit.

SI No.	Item of works	Unit/specification	Amount Required (Unit Price)	First year's expenditure Total(In Rs)	Subsequent years expens
1	Purchase of crackers		Rs.3,00,000 /yr	3,00,000.00	3,00,000.00
2	Purchase of Arms & ammunition	DBBL - 10 Nos. SBBL - 10 Nos.	Rs.30000 / unit - DBBL Rs.25000 / unit- SBBL	5,50,000.00	-
3	Ammunition	500 / yr	Rs 120 / unit	60,000.00	60,000.00
4	Purchase of ropes etc.		Rs. 60,000 /yr	60,000.00	60,000.00
5	Hiring of Kunki elephant for Anti-Depredation	3 (for 180 days)	Rs. 3000/ day / elephant	16,20,000.00	16,20,000.00
6	Purchase of vehicles	5 Nos.	Rs. 6,85,000 per unit	34,25,000.00	-
7	Vehicle maintenance Rs. 100000/- year	5 Nos.	Rs. 1,00,000 per yr		5,00,000.00
8	Food for Kunki & rescued elephant calf etc.	3 (for 180 days)	Rs. 1000 /day	5,40,000.00	5,40,000.00
9	Anti Depredation Squad (Rs. 4,00,000 /Range and Account Beat/yr)	5 Estabs	Rs. 20,00,000/ yr	20,00,000.00	20,00,000.00
10	Tranquilizing Gun & Chemicals	2 Nos	Rs.1,50,000 /unit	3,00,000.00	-
11	Procurement of wireless handsets	20 Nos.	Rs.20,000 /Unit	4,00,000.00	-
12	Watch & Ward & forewarning labourers payment	10 nos	Rs. 400 /DLS/day	14,60,000.00	14,60,000.00
13	Rescue & Rehabilitation fund for wild animals during flood		Rs.2,00,000 /yr	2,00,000.00	2,00,000.00
14	Protection of elephant corridor (at entry/exit point)		Rs.3,00,000 /yr	3,00,000.00	3,00,000.00

15	Provision for Trapping cage & other wildlife emergency	4 Nos	Rs.2,00,000 / unit	8,00,000.00	-
Total = Rs.				1,20,15,000.00	70,40,000.00

8.5 Cost of the Preparation of the Working Plan: The actual expenditure incurred on the preparation of this Working Plan during 2013-2014 to 2018-2019 and expenditure likely to be incurred during 2019-2020 is given in table 8.5.

Table 8.5 Table showing the cost of preparation of the working plan

Details	Expenditure incurred during Financial year in Rs.			
	2013-2014 (Actual)	2018-2019 (Actual)	2019-2020 (Estimated)	Total
01. Pay	-	-	-	-
02. Labour	-	-	-	-
03. Dearness Allowances	-	-	-	-
04. Travelling allowance	-	-	-	-
05. T.T.A	-	-	-	-
06. Other allowance	-	-	-	-
08. Office Expenditure	-	-	-	-
11. Stationery & printing of forms.	-	-	-	-
12. Office furniture	-	-	-	-
13. Telephone	-	-	-	-
15. Vehicles maintenance and petrol	-	-	-	-
18. Publication	-	-	-	-
42. Other expenditure (Field data collection from sample points, plantation survey, boundary survey, socioeconomic survey, encroachment survey for the forest areas of 2000 ha and travel cost of forest staff)	771000	-	-	771000
47. Computer Maintenance	-	-	-	-
Total	7,71,000	-	-	7,71,000

(Note: The working plan team has been assigned to revise & prepare the working plans of the Division. Hence, 60% of total expenditure can be considered as the expenditure for making this plan)

8.6 Mandays to be generated during current plan period: Apart from estimate of probable cost in terms of Rupees for execution of works, Mandays are also estimated to be engaged for each item of works.

8.7 Possible Funding Agencies: Normally the forestry activities are funded through various schemes under District, State & Central sector. In the state, the district & state sector schemes are totally funded by State government. Presently 40 schemes are under operation. Assam being given special status by the central government; the central sector schemes are funded on a 90%:10% basis. Eight such schemes are running in the State. The details are given in chapter V of Part I of the plan. Besides these schemes, funding can also be received from other sources. The following are the main agencies from where the funds may be obtained for implementation of prescriptions of this plan.

Table 8.7 Table showing the probable funding sources

S.N.	Funding Agency	Schemes involved	Nature of works
1.	Ministry of Forest & Environment, Government of India.	National Afforestation and Eco-Development Board (NAEB), Project Elephant, Project Tiger etc.	Ecological restoration, Wildlife & forest Protection.
2	Ministry of Agriculture, GOI	River Valley Project	Increase of Forest cover Through Afforestation.
3	Ministry of Rural Development, GOI	Integrated-Watershed Development, Industrial and Pulpwood Plantation	Integrated Forest Development.
4	District Rural Development Agency (DRDA)	National Rural Employment Guarantee Act (NREGA)	Community infrastructure & Forest resource development
5	Forest Development Corporation, Uttarakhand	Forestry developmental work	Buildings, Roads, Silvicultural operations, marking, etc.
6.	French Government	APFBC	Biodiversity Conservation,

8.8 Prioritization of works: All the works prescribed in this plan are important for effective forest management. Hence, funds should be made available to carry out all the prescriptions prescribed for the sustainable management of the forest. However, scarcity of financial allocation is often felt while implementing working plan prescriptions. Therefore, priority of works has been fixed to guide DFO while preparing annual budget & sending his demand. It is also suggested that DFO should carry out top priority works with the available budget:

Table 8.8: Table showing the priority of work

Priority	Nature of works to be carried out
I	Forest Protection i.e. protection from forest fire, encroachment, illicit felling, poaching etc.
II	Joint Forest Management Activities
III	Plantation and regeneration
IV	Long distance Group patrolling & Monsoon patrolling.
V	Improvement of waterbodies
VI	Soil & Water Conservation works.
VII	Strengthening the knowledge of field staff by imparting training & exposure visits.
IX	Maintenance of buildings & other infrastructure (Nursery etc.) in the division.

CHAPTER 9

MISCELLANEOUS REGULATIONS

9.1 Deviations

Any large and unusual operation, variation from yield and target for plantation/regeneration and other activities provided in control forms of the working plan constitutes a deviation. Deviation beyond 25 percent of target is considered to constitute a major deviation. All deviations, which permanently alter the basis of management laid down in a working plan, will require prior sanction of the PCCF. All deviations, which do not permanently alter the basis of management and with the necessity of which he agrees, may be approved and sanctioned by the Working Plan Conservator on behalf of the PCCF. Where there is difference of opinion between the Working Plan Conservator and the territorial Conservator of Forests, the former will refer them to the PCCF for instructions. The PCCF/CFWP, as the case may be, will counter sign the deviation statement. Minor deviations can be sanctioned at the level of the CF Working Plan or the PCCF as the case may be, but the PCCF before sanctioning the major deviations of following nature, will necessarily take prior approval of the Regional CCF/APCCF of the Ministry of Environment and Forests:

- (i) Change in Silvicultural system
- (ii) Clear felling of natural forest
- (iii) Formation of new felling series; and
- (iv) Large scale felling due to natural calamities.

For all major deviations with respect to prescriptions where sanction of the MoEF is mandatory, an explanatory note along with the request for regularization has to be sent by PCCF (HoFF) to RAPCCF (MoEF). In case, where there is difference of opinion between the PCCF (MoFF) and RAPCCF (MoEF), the former will refer the matter to DG F&SS (MoEF), whose decision shall be final. The PCCF (HOFF) will countersign the deviation statement for reporting to the MoEF (para 132 of National Working Plan Code-2014). The following format for deviation statement should be used:

Year..... Division.....

Sl. No. of deviation	Controlbook, name, form, No. page	Reference to WorkingPlan		Nature of deviationrequiring sanction
		Paragraph	Nature ofPrescription	

The DFO territorial will forward through the Head, territorial circle, typed copies of this form in triplicate yearly with his copy of control forms. No explanatory remarks are required on this form but these should be given in the forwarding letter. The Head, Working Plan Organisation, as per situation given above, after sanction, will return one copy of the statement to the DFO territorial through the Head, territorial circle, and

the other copy will be sent to the WPO for record. All major deviations without altering the basis of management, the prior sanction of the PCCF (HoFF) should have been obtained in advance, the sanction number and date should be quoted in the last column.

9.2 Construction of Roads/Link roads

No construction of roads/link roads passing through the forests shall be allowed without the sanction of the competent authority/Government of India, as they attract the provisions of the Forest (Conservation) Act, 1980.

9.3 Buildings

The old buildings requiring repair needs to be approved by the PCCF. Those building that are not put to use needs to be used.

9.4 Maintenance of boundaries and Pillars

This has been dealt with in the Protection Working Circle. To avoid legal disputes in the future, maintenance or boundary pillars is necessary especially the state boundaries. Inspection path of 3 m wide all along the boundary should be prepared for inspection and protection. The boundary pillars must be numbered and written. The distantly located pillars may be connected to one another by digging lines, which should be regularly cleared. Boundary registers should be maintained. The records be prepared in triplicate and kept in Range, Division and Circle Offices. The Range Officer should check the boundaries once a year and record a certificate to that effect on the Boundary Register. The Block Officer should check the entire boundaries of the forest under his charge and send the necessary report to the Forest Range Officer. The Beat Guards should keep the records of boundaries of their beats in the Beat Book. The programme repair of Boundary Pillars should be followed as given in the Protection Working Circle.

9.5 Fire Protection

There are as such no significant damages from fires, however the following miscellaneous regulations are necessary to ward off forest fires:

- i) Annual maintenance of fire lines to be done in the January through vegetation clearing from fire lines.
- ii) Fire risks should be notified by the DFO to the staff for necessary preventive measures.
- iii) Entry of people inside the forests for extraction of MFP should be regulated.

The territorial staff should maintain cordial relations with the local people to garner their support in case of fires and other eventualities. The Divisional Forest Officer should visit the fire-affected areas immediately after it comes to his knowledge and should submit a report to the Conservator of Forests giving all the detail of occurrence of fire, causes of fire and damage occurred to the crop with remedial measures for the future.

9.6 Control of Grazing

The prescriptions on control of grazing made in the various working circles should be strictly observed. In this regard, strict enforcement of the penal provision of the Indian Forest Act, 1927 and the Cattle Trespass Act, 1871 should be ensured.

9.7 Preservation Plot

It is proposed to preserve 3.00 ha area of endemic species Hollong - Mekai - Nahar as the permanent preservation plot to study the increment of these species in the area and its further prospects. Artificial protection around this forest patch to be initiated. The boundary geo-coordinates should be recorded. Periodical measurement should be taken and recorded. Account of any silvicultural operation, maintenance measures and natural disasters should also be recorded. Existing preservation plot of 154 ha at Naralata UDW RF Compt II/6 and II/7 will be maintained. The preservation plot of 100 ha at Powai block UDR (E) RF, Compt. 54 also known as Mohanlal plot is to be maintained.

9.8 Nurseries

To meet the needs of plantation in the area, new nursery for raising tree species, medicinal plants, and fruit species needs to be initiated. To raise good quality seedlings, the following steps should be taken up in the nurseries:

- i) Seed from identified Plus Trees should be used. In case of other species seed from reliable seed orchards should be used.
- ii) Production through vegetative means like root, stem, shoot cuttings, tissue culture, tree improvement techniques, cloning, rhizomes to raise the planting stock.
- iii) For bamboos, cuttings, rhizome multiplication method should be used to raise qualitative seedlings.

To minimize the cost of transportation of seedlings to the field in the difficult terrain situations, seedlings should be raised in the root-trainers which give sturdy seedlings with high root-shoot ratio.

9.9 Petty Sales

Dry, dead and wind fallen trees after getting sanction from the CCF through the DFO may be disposed off as early as possible to avoid financial loss. Thatch and other grass if falling inside the JFMC areas may be handed over to the JFM committees. However, if there are problems with JFMC or they are not willing to take over, various minor forest produces should be auctioned.

9.10 Stone Mahals

All stone mahals should be geotagged, inspection carried out and quarrying in stone mahals may be in operation adhering all the formalities. It should be ensured that in no way there are any environmental and ecosystem and its services degradation / deterioration through stone quarrying activities.

9.11 Sand Mahals

All sand mahals should be geotagged, inspection carried out and sand mining in sand mahals may be in operation adhering all the formalities. It should be ensured that in no way there are any environmental and ecosystem and its services degradation / deterioration through sand mining activities.

9.12 Fishery Mahals

All fishery mahals should be geotagged, inspection carried out and fishing adhering all the formalities / norms may be in operation in the fishery mahals. It should be ensured that in no way there are any fish biodiversity losses and introduction of exotics fishes and any environmental and ecosystem and its services degradation / deterioration through fishery mahal activities.

9.13 Departmental supply of wind fallen logs

The competitive sale needs to be improved to prevent further deterioration of wind fallen, dead, dying and decay trees in the process of disposal.

9.14 Elephant Mahals

A study under PCCF should be initiated to quantify elephant depredation and loss of lives. Based on the study results and committee recommendations, a report needs to be sent to the Central Government for allowing capture of maximum 4 koonkies. The study undertaken should ensure that in no way there are impacts on the elephant gene plasm, migration and population dynamics from any activities.

9.15 Recreational spots

A study under PCCF should be initiated to understand possibilities of development of the following plots as recreational plots for generating revenue.

- i) Thongthong under UDR (W) RF Compt I (3).
- ii) Jairampur gate under Tinkopani RF Comp. 3.
- iii) Namchik Gate (Assam - Arunachal Pradesh interstate boundary) under Jagun range.
- iv) Oil drilling sites under the Division
- v) Saraipung – Kujibali Naralata – Agbandha Road.

It should be ensured that recreational spots should in no way impact any environmental and ecosystem and its services degradation / deterioration.

9.16 Celebration of Forest related festivals: Awareness campaign to educate and sensitize people with the objective to protect forest and biodiversity including flora and fauna is to be undertaken. Celebration of some specific days/festivals together with communities especially students are suggested.

Van Mahotsava is an annual pan-Indian tree planting festival, occupying a week in the month of July. During this event millions of trees are planted. It was initiated in 1950 by K. M. Munshi, the then Union Minister for Agriculture and Food to create an enthusiasm in the mind of the populace for the conservation

of forests and planting of trees. By encouraging Indians to support tree planting and tending, festival organizers hope to create more forest in the country. It would provide alternative fuels, increasing production of food resources, creating shelter-belts around fields to increase productivity, provide food for cattle, offer shade and decorative landscapes, reducing drought and helping to prevent soil erosion.

Wildlife Week is celebrated all over the country in the month of October from 2nd to 8th October every year with the view to preserve the fauna means the animal life of the India. Wild Life Week celebration was planned to arouse the general awakening of the normal people in the country towards the protection of wildlife. It was first started in the year 1952 with the great vision of saving the life of the Indian animals by taking some critical steps. It involves the planning to save animal extinction of any species of the India. The Indian Government has established an Indian Board of Wild Life which works to improve the awareness as well as the consciousness of the Indian people towards the wildlife preservation.

World Environment Day (WED) is celebrated on 5 June every year, and is the United Nations' principal vehicle for encouraging awareness and action for the protection of our environment. First held in 1974, it has been a flagship campaign for raising awareness on emerging environmental issues to marine pollution, human overpopulation, and global warming, to sustainable consumption and wildlife crime. World Environment Day has grown to become a global platform for public outreach, with participation from over 143 countries annually. Each year, WED has a new theme that major corporations, NGOs, communities, governments and all celebrities worldwide adopt to advocate environmental causes.

World Wildlife Day: On 20 December 2013, at its 68th session, the United Nations General Assembly (UNGA), in its resolution UN 68/205, decided to proclaim 3 March, the international day of the adoption of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) on the planet raise awareness and benefits fauna and flora in 1973, as **World Wildlife Day**, which was proposed by Thailand, to celebrate and raise awareness of the world's wild fauna and flora.

World Earth Day is an annual event celebrated around the world on April 22 to demonstrate support for environmental protection. First celebrated in 1970, it now includes events coordinated globally by the Earth Day Network in more than 193 countries.

International day for the preservation of the ozone layer: September 16 was designated by the United Nations General Assembly as the International Day for the Preservation of the Ozone Layer. This designation had been made on December 19, 2000, in commemoration of the date, in 1987, on which nations signed the Montreal Protocol on Substances that Deplete the Ozone Layer. In 1994, the UN General Assembly proclaimed 16 September the International Day for the Preservation of the Ozone Layer, commemorating the date of the signing, in 1987, of the Montreal Protocol on Substances that Deplete the Ozone Layer.

9.17 Training of Staffs:

The ongoing developments in the forestry sector at policy, administrative and implementation level together with paradigm shift towards sustainable forest management, participatory forestry, biodiversity conservation, forests for climate change mitigation and adaptation through the mechanism of REDD +(Reducing Emissions through Deforestation and Forest Degradation) , focus on forest based livelihoods and forests for water and increasing role of technology and social media in forestry and sustainable development etc. have necessitated fundamental re-orientation and attitudinal changes of forestry personnel. These challenges coupled with conflict resolution issues faced in protection, management and conservation of the forest resources require appropriate capacity building of frontline forestry personnel by providing them the state of art information, knowledge and skills. Staffs and officers of the division shall be deputed to various forestry training Institutes including SFTIs of the State for imparting training.

9.18 Achieving SDG:

Sustainable Development Goals

The world economies have unified in their efforts to achieve the goals of sustainable development. This is in sheer contrast to the earlier approaches where governments pursued goals for the growth and development of their respective economies. The struggle for growth and excellence has created imbalance in the economic development among countries, depleted some of the natural resources and has thus altered the ecological balance. The impact of this is being experienced in the form of global warming and climate change. Since this threatens the very existence of human life on earth, a course of action that would ensure a safe environment for future generations has become the need of the hour. Sustainable development is a term coined to ensure that development takes place in such a way that natural resources are sustained and passed on to the future generations unimpaired.

India has, over the past years, directed its development pathway to meet its priorities of employment, economic growth, food, water and energy security, disaster resilience and poverty alleviation. India has also aimed to restore its natural capital and adopt transparent and robust governance along democratic lines. However, emerging challenges of climate change impacts, increasing inequities, and lagging human development indices are well recognised by both the citizens as well as the government. The SDGs will be more ambitious than the MDGs, covering a broad range of interconnected issues, from economic growth to social issues to global public goods. To realise this vision, a just-as-ambitious plan for financing and implementation is needed. The magnitude of the SDG financing challenge far exceeds the capacity of any one organisation and demands a strong partnership among governments, the private sector, and development organisations.

Sustainable Development Goals:

Goal 1 End poverty in all its forms everywhere

Goal 2 End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Goal 3 Ensure healthy lives and promote well-being for all at all ages

Goal 4 Ensure inclusive and equitable quality education and promote lifelong learning

opportunities for all

- Goal 5 Achieve gender equality and empower all women and girls
- Goal 6 Ensure availability and sustainable management of water and sanitation for all
- Goal 7 Ensure access to affordable, reliable, sustainable and modern energy for all
- Goal 8 Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
- Goal 9 Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
- Goal 10 Reduce inequality within and among countries
- Goal 11 Make cities and human settlements inclusive, safe, resilient and sustainable
- Goal 12 Ensure sustainable consumption and production patterns
- Goal 13 Take urgent action to combat climate change and its impacts*
- Goal 14 Conserve and sustainably use the oceans, seas and marine resources for sustainable development
- Goal 15 Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
- Goal 16 Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
- Goal 17 Strengthen the means of implementation and revitalize the global partnership for sustainable development

Dibrugarh Forest Division shall contribute for achieving Sustainable Development Goals.

9.19 Forest Certification:

Forest certification, a mechanism based on third-party auditing of compliance with established standards, was quickly accepted as a means to promote sustainable forest management and directly influenced forest management practices. Through certification as a soft policy instrument, it is possible to provide credible assurance to customers about the effective compliance of forest management with sound social, environmental, and economic principles. However, as sustainable development is a continuous process and its concept is further adjusted according to new knowledge, sustainability indicators are continuously improved in order to achieve credibility and legitimacy within society through a wider form of participation involving citizens or their representatives.

The key financial benefit of forest certification is market access. In summary, the benefits of forest certification were grouped into conventional economic, social, and environmental components of sustainable development. In addition to those perceived benefits associated with forest certification, there are also direct and indirect expenses related to certification adoption. Forest certification was developed in the early 1990s to curtail tropical deforestation through verified use of sustainable forest management.

Certification systems generally are market-based, non-regulatory, and focused on forests, operations and products, and associated businesses and communities. Certified raw material is accounted for or tracked using chain-of-custody and certified products typically are labelled.

In the global quest for ways to protect the world's forests and to slow down, if not reverse, the pace of deforestation, much faith has been reposed in what is known as Forest Certification (FC) and the Criteria and Indicators (C&I) of Sustainable Forest Management (SFM). The C&I are supposed to give an objective measure of how close the forest management is to a sustainable regime. The FC framework is supposed to provide an impartial process for inspecting each forest management unit (FMU) to assess its performance periodically and bestow an internationally recognized certificate of good practices. By extension, the FC framework also provides for certifying and labeling the products that come out of such units. In principle, consumers can encourage the manufacturers to use more and more of these certified raw materials. By actively rejecting or shunning material coming out of unsustainable logging or poaching, consumers could theoretically put pressure on the primary producers themselves to clean up their act and adopt sustainable ('green') practices. Thus the undesirable practices that are resulting in deforestation the world over will be eliminated.

Measures for Forest Certification shall be taken in next Working Plan.

9.20 Convergence with other Departments:

With a view to achieving the goal of the Working Plan, socio-economic condition of communities residing in and around the forest need to be uplifted. It is important that the various development projects reach communities. Forest department may play the pivotal role to take the communities accessed to various departments so that they can avail such Government schemes/projects. Work in Convergence with other departments like Panchayat & Rural Development, Agriculture department, Animal Husbandry & Veterinary department, Fishery department etc. can facilitate the communities to avail following schemes/projects to bring about overall improvement in the quality of life of the people in forest fringe areas.

Panchayat & Rural Development:

1. Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS),
2. Deendayal Antyodaya Yojana – National Rural Livelihoods Mission (DAY-NRLM),
3. Deen Dayal Upadhyay – Gramin Kaushalya Yojana (DDU-GKY),
4. Pradhan Mantri Awaas Yojana – Gramin (PMAY-G),
5. Pradhan Mantri Gram Sadak Yojana (PMGSY),
6. Shyama Prasad Mukherjee National RuRBAN Mission
7. National Social Assistance Programme (NSAP)

Agriculture department:

1. National Mission for Sustainable Agriculture (NMSA)
2. Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)
3. The Paramparagat Krishi Vikas Yojana (PKVY)

4. Pradhan Mantri Fasal Bima Yojana (PMFBY)
5. Livestock insurance Scheme
6. Micro Irrigation Fund (MIF)
7. Assam Farmers' Credit Subsidy Scheme (AFCSS),
8. Assam Farmers' Interest Relief Scheme (AFIRS)
9. Assam Farmers' Incentive Scheme (AFIS).

Animal Husbandry & Veterinary department:

1. Chief Minister Samagra Gramya Unnayan Yojana' also referred as Assam Milk, Meat & Egg Mission society (AMMEMS-CMSGUY).
2. Livestock, Health & Disease Control Programme

Fishery department:

1. Development of Inland Fisheries and Aquaculture

9.21 Duties and responsibilities of officers and staffs: Duties and responsibilities of officers and staffs are mentioned in The Assam Forest Manual, Vol-II. All officers and staffs must adhere to the provisions of the Manual and shall be be dutiful to protect and develop the forests.

CHAPTER 10

MOINTORING, ASSESSMENT AND REPORTING

10.1 Control and Records

The control forms required for control of deviation from prescriptions for JFMC operation, plantation and regeneration, forest protection, soil and moisture conservation, FRA operations, Wildlife Management and Biodiversity Conservation is provided in this chapter. The control forms shall be prepared and submitted annually to the Conservator of Forests with a copy to the Working Plan Officer on the 1st of January for scrutiny and obtaining sanctions of deviations, if any.

The following control forms will be used for monitoring all the important operations prescribed and suggested in this working plan:

10.1.1. Bamboo Harvesting Control Form For cutting bamboo identified for felling and bamboo left out, the Control Form 1 shall be used.

10.1.2 Silvicultural Control Form For control of all silvicultural operations such as subsidiary cultural operations, cleanings, and burnings etc., Form No. 2 shall be used.

10.1.3 NTFP Control Form For controlling and maintaining a record of all NTFPs harvest so as to make the removal/harvesting of NTFP sustainable, Form No. 3 shall BE used.

10.1.4 Wildlife Management and Biodiversity Conservation Control Form For improvement of wildlife habitat and conservation and preservation of biodiversity, Form No. 4a, 4b & 4c shall be used.

10.1.5 Plantation Control Form For any plantation block, gap, regeneration natural and assisted Form No. Pa, 4a, 4b & 4c shall be used.

The DFO territorial will annually make entries in his copy of the control forms and send them, together with the deviation statement in triplicate to the Head, territorial circle. After the entries have been checked and approved, the Head, territorial circle will first get his copies completed and then send it in two copies to the concerned WPO. The latter will then complete his copy and finally return the DFO's set for deposit in the latter's office till next year. The WPO will send the deviation statement with appropriate justification in four copies to the CCF/APCCF (RE&WP) for recommendation to PCCF (HoFF) for sanction. After the sanction, one copy each will be sent to the WPO, Head, territorial circle and the DFO territorial for their record and the CCF/APCCF (WP) as the case may be, will retain the fourth copy for his set of control forms. The control forms should be submitted by the DFO territorial to the Head, territorial circle by October and the latter should send them to the WPO concerned by December each year (para 129 of the National Working Plan Code-2014).

10.2 Compartment History

Compartment history will be furnished and any deviation for aligning compartments for the current context of sustainable management of forests adhering to watershed approach will be recorded. The DFO will direct the marking Officer to write the compartment description and maintained in the registrar. The

compartment history along with a thematic map will include the operations, silvicultural operations, and any other operations in the compartment as prescribed in the working circles.

10.3 Maintenance of Records

A detailed record of each forestry activity shall be maintained in order to have a solid database for scientific monitoring, evaluation and future planning. In order to avoid any complicity at any level, the controlling officers should inspect the following documents during inspection and enter signed observations.

- i. Annual Plan of Operations (APO)
- ii. Plantations Journals
- iii. Nursery Registers
- iv. Measurement Books
- v. Divisional Note Book
- vi. Fire Control Forms
- vii. Beat Book

10.3.1 Annual Plan of Operations: An annual plan of operations should be prepared by the Divisional Forest Officer based on the prescriptions and operations to be carried out as per the provisions of the Working Plan. It should be approved by the Conservator of Forests.

10.3.2 Plantation Forms and Journals: The existing system of filling plantation forms and compartment history will be furnished and any deviation for aligning compartments for the current context of sustainable management of forests adhering to watershed approach will be recorded. The DFO will direct the marking Officer to write the compartment description and maintained in the registrar. The compartment history along with a thematic map will include the operations, silvicultural operations, and any other operations in the compartment as prescribed in the working circles.

For each plantation, a separate journal shall be maintained in the prescribed form wherein a complete record of plantation viz. year and month of plantation, area planted, Number of plants planted, species. All activities such as advance work, plantation, regeneration, maintenances, felling and enumeration, maintenance cost, weed cutting, constructing of fire-lines etc. should be recorded for a year. For each year, there will be one entry that should be signed by the Forest Range Officer. The inspection notes by the officers should be recorded in the journals. The Divisional Forest Officer should inspect the entries at the time of annual office inspection.

Details of expenditure incurred month-wise, compartment wise and operation wise including maintenance cost for subsequent three years. At the end of each year observation regarding success of plantation, survival percentage and the reports on monitoring and evaluation should be given. Specific instructions given during the inspection by senior forest officers to be recorded. Instructions of the PCCF/APCCF on checking of plantations issued from time to time should also be followed.

10.3.3 Nursery Register: The existing system of filling plantation forms and compartment history will be furnished and any deviation for aligning compartments for the current context of sustainable management of forests adhering to watershed approach will be recorded. The DFO will direct the marking Officer to write the compartment description and maintained in the registrar. The compartment history along with a thematic map will include the operations, silvicultural operations, and any other operations in the compartment as prescribed in the working circles.

For each nursery, separate registers need to be maintained. It shall have monthly detail of operations and expenditure incurred, plants raised, plants used departmentally, plants supplied to the public during the month etc. Detail of plants supplied free of cost to other Government Departments, public institutions, NGOs etc. shall also be recorded in the register. Plants destroyed as a result of natural calamities or otherwise destroyed shall be got written off from the competent authority. A copy of the nursery statements showing details of species wise nursery stock should be sent to the Divisional office monthly.

10.3.4 Divisional Note-Book: The Divisional Forest Officer should maintain a note-book in which the following information shall be recorded.

- a) Flowering of important tree species.
- b) Seeding of important tree species including geo-coordinates of mother trees
- b) Gregarious flowering of bamboos.
- c) Climate-rainfall and temperature experienced during this year and its effect of the forest crop.
- d) Pests and diseases noticed in the crop, treatment and result thereof.
- e) Growth date of trees collected during the year.
- f) Labor related problems faced during the year.
- g) Market trend of forest produce.
- h) Working of JFM committees.
- i) Any other major important issue from the forest management point of view.

10.3.5 Fire Control Form: The record of forest fires should be maintained without any bias. The details of area burnt with sketch, cause of fire, date of fire, time of fire, date and time of control, damage and financial loss will be recorded. The copy of the fire report should be sent to the Conservator of Forests.

10.3.6 Deviation statement: To exercise control over progress of various operations at the end of each financial year, the prescriptions of the working plan will be compared with the actual operation done in the field on felling, silvicultural operations and miscellaneous works and any excess or short fall shall be recorded giving reasons for deviation and sanction of the competent authority shall be obtained as per the details given in the Miscellaneous Regulations.

10.3.7 Beat Books: Each beat guard will maintain a Beat-Book to be prepared and issued by the Divisional Office. The Beat-Book shall contain the following information:

- a) Beat map
- b) Detail of forests in the beat

- c) Copy of boundary register of forests
- d) Duties of Forest Guard
- e) Legal status of the forest area with notifications
- f) Abstract copy of the relevant sections of the Indian Forest Act, 1927; Wildlife (Protection) Act, 1972; Forest (Conservation) Act, 1980 and vernacular translation thereof.
- g) List of buildings, roads, paths, fire-lines in the beat
- h) List of plantations raised during the past 10 years
- i) Record of water table at various places in the area

10.3.8 Registers And Records: The following updated (till last financial year) register and records will be maintained by the Division:

- i) Compartment histories
- ii) Fire records and registers
- iii) Register of Boundary Pillars
- iv) Register of Rights and Concessions
- v) Record of forest produce harvested
- vi) Free grants
- vii) Register of land transferred to other departments under FC Act.
- viii) Register of soil and water conservation works
- ix) Register of rotational grazing
- x) Register of invasive species e.g. Lantana eradication
- xi) Register of wildlife management may include detailed record of human wildlife conflicts that includes data on human casualties and injuries, loss of domestic animals and crop damage and compensation paid etc.
- xii) Register of Government buildings that includes log of the repairs and addition (if any) undertaken in the building.
- xiii) Register of registered saw-mills in the Division.

10.3.9 Annual Inspection Annual: inspection of DFO territorial office by CF/CCF and Range office by DFO territorial is mandatory within three months of completion of financial year to have checks on annual statements in control forms and deviation statements and maintenance of registers and records.

CHAPTER 11

SUMMARY OF THE PRESCRIPTIONS

The brief summary of prescription against each Working Circle are narrated in table 11.

Table 11: Summary of prescriptions for each Working Circle.

Sl. No.	Chap No.	Name of the Working Circle	Para No / Sub para	Prescription	Remarks
1.	Chap 14	Joint Forest Management Working Circle	14.10.2.1	The prescriptions of micro plans needs to be aligned with the working plan and objectives of the JFMC working circle. The staff shall follow the procedure laid down and prepare site specific plans involving all the stakeholders before implementing the project adhering Government orders any amendments to be strictly followed.	Stakeholder's engagement in achieving the objectives of JFMC working circle.
			14.10.2.2	There should be monthly meeting of the JFMCs under the Chairmanship of JFMC president. Range Forest Officer should attend meeting at least quarterly.	Ensure functionality of the JFMC.
			14.10.2.3	NTFPs to be collected and sustainably harvested from areas from JFPC area and shall be sold by the concerned JFMC.	Sustainable NTFP harvesting.
			14.10.2.4	Collection, processing, value adding and sale of NTFP should be as per the guidelines issued by Divisional Officer.	Value addition of NTFP.
			14.10.2.5	Continuous efforts should be made to create and sustain the JFPM movement by creating required awareness among the people and the staff through training programmes.	Capacity building of JFMC members.
			14.10.2.6	After eviction of encroached areas massive plantations should be carried out through the JFMC members. JFMC will maintain nursery of endemic species and saplings of endemic trees species from the JFMC members maintained nurseries and will be planted in the evicted areas.	Ensure enhancement of forest cover through people's participation.
			14.10.2.7	JFMC areas to practice minimum tillage, organic formulations.	Maintenance of ecology of the area
			14.10.2.8	System of crop intensification to be promoted in JFMC cultivated paddy	Enhanced crop yield to meet people's

Sl. No.	Chap No.	Name of the Working Circle	Para No / Sub para	Prescription	Remarks
				fields to increase productivity.	requirement.
			14.10.2.9	JFMC plantation assistance will be released as 1 st year 40%, 2 nd year 40% and 3 rd year 20% based on the survival of the plants.	Ensure maximum plantation survival.
			14.10.2.10	Ecotourism should be promoted, fringe village population should be made aware, nature trail should be set identified and set up.	Improvement of livelihoods of local population.
2.	Chap 15	Plantation and Regeneration Working Circle	15.11.3.1	Identification of good seed bearers and collect information on seed year.	Database and geotagged location of good seed bearing trees.
			15.11.3.2	Select mother trees and marking those.	Ensure adequate number of mother trees of endemic species.
			15.11.3.3	Before a heavy seed fall, cleanings can be made beneath fruiting trees to form natural nurseries, which can be used later to plant forests with low natural regeneration or in secondary vegetation.	To ensure minimum seed losses and enhance maximum seed germination.
			15.11.3.4	Transplantation of naturally regenerated seedlings which are 45 cm to 55 cm and six to eight months old.	Ensure survival of naturally regenerated seedlings.
			15.11.3.5	For seeds raised in nurseries, it is advisable to sow seeds quickly since it loses its viability quickly, to be raised in biodegradable poly bags.	Ensure maximum germination of seeds.
			15.11.3.6	Block plantations in scrub areas i.e. areas with less than 10% canopy density cover with endemic species mainly Hollong – Mejkai - Nahor and its associates.	1000 ha of scrub will be brought under forest through block plantation over 10 year's period.
			15.11.3.7	Gap filling in open forest areas i.e. areas with canopy density cover from 10% to 40% with endemic and native tree species.	Increase of forest cover by gap filling of 1500 ha area under open forest over 10 years period.
			15.11.3.8	Assisted regeneration in moderately dense forest area i.e. areas with canopy density cover of 40% to 70% with endemic and native tree species.	Increase 500 ha of land from moderately dense to very density canopy cover over a period of 10 years.
			15.11.3.9	No introduction of non - division native species.	Stopping introduction of invasive exotics.
3.	Chap 16	Forest	16.10.1.1	Eviction of encroachments and	Release areas from

Sl. No.	Chap No.	Name of the Working Circle	Para No / Sub para	Prescription	Remarks
		Protection Working Circle		consolidating the forest boundary are to be made mandatory.	encroachment.
			16.10.1.2	Creating massive awareness and involvement of people in all round protection and development of forests should form a part of conservation programme.	Engaging the local people in protection of forest.
			16.10.1.3	To completely shift grazing, lopping, shifting cultivation and other forms of forest degrading activities to the fringe forests or JFMC working circle areas.	Minimising forest degradation drivers and improve forest health.
			16.10.1.4	Boundary survey and erection of RCC boundary pillars of atleast 1.2m height and colored to locate it from a distance.	Securing the forest boundaries.
4.	Chap 17	Non Timber Forest produce & Bamboo (Overlapping) Working Circle	17.11.1	In consultation with the officials JFMCs are allowed to collect NTFP from the area under JFMCs without damaging any part of the tree or trunk.	Preservation of threatened NTFPs.
			17.11.2	Collection of bark of any tree is strictly prohibited.	Ensure survival of threatened species.
			17.11.3	Only flowers, leaves, fruit and nuts are permitted to collect.	Enhance survival of NTFP species.
			17.11.4	A list of endangered species has to be prepared by the department time to time and collection of NTFP from such trees has to be banned.	Ensure conservation and preservation of threatened NTFP species.
			17.11.5	While collecting NTFP some trees in the area may be identified and left as mother tree/ tree for seed resources.	Ensure maintenance of adequate male: female ratio of dioecious species and enhance natural regeneration.
			17.11.6	Only authorised member of the VFC with their Identity card are permitted to enter into the forest and collect the NTFP.	Reduce pressure from on dioecious species and enhance natural regeneration.
			17.11.7	JFMCs are permitted to collect the NTFP only through the members of the JFMC. From the permitted micro plan areas.	Ensure benefit to only the needy JFMC members
			17.11.8	The collected NTFPs in the JFMCs areas should be stored in a declared godown properly after processing and disposed by tender-cum-auction sale in the presence of the forest staff.	Value addition of NTFP and maintain transparency.
			17.11.9	JFMCs are to raise NTFP plantation	500 ha NTFP

Sl. No.	Chap No.	Name of the Working Circle	Para No / Sub para	Prescription	Remarks
				and bamboo species in their land.	plantation and 1000 ha bamboo plantation to be raised over a period of ten years.
			17.12.2	Bamboo cutting regulations.	Ensure sustained yield of bamboo and maintenance of bamboo habitat for wildlife.
5.	Chap 18	Community and Forest Rights Working Circle	18.2	Constituent of the working circle.	Application of FRA, 2006.
			18.10	Measures of protection.	Monitor the process of registration of all claims and final settlement of the genuine claims.
6.	Chap 19	Soil and Water Conservation Working Circle	19.11.1	Identification of SWC related issues during microplanning.	Ensure people participation.
			19.11.2	Technical and social feasibility of soil and water conservation works.	Minimise conflicts of water conservation activities.
			19.11.3	Development of detailed project report.	Ensure flowing of adequate resources for implementation.
			19.11.4	Gully plugging works to check further extension of the gullies.	Ensure reduction of soil loss.
			19.11.5	Minor engineering works in eroded areas and in slips prone areas to check the soil erosion and reduce runoff.	Check soil erosion.
			19.11.6	Crate works on the sides of diversion drains to checking further cutting of the drains/channels.	Ensure soil conservation.
			19.11.7	Planting of cuttings of soil binding species in vegetative spurs but avoid exotic species.	Reduction of surface water loss and maintain geohydrology.
			19.11.8	DRSM works in the areas are also recommended to check the soil and water erosion.	Conservation of soil and water.
			19.11.9	Creation of continuous trenches across the slope and planting of soil binding species in the pit. 19.11.10 The dugout soil will be placed towards the flow of water to check the soil erosion and reduce run-off.	Ensure water conservation and preservation.
			19.11.10	Delineation of spring sheds and initiating springtide treatments.	Enhance potentiality of springs.

Sl. No.	Chap No.	Name of the Working Circle	Para No / Sub para	Prescription	Remarks
			19.11.11	Plantation keeping a buffer of 50 meters on both sides of streams/rivers.	Riparian plantation in row covering 10,00,000 sq. meter area Ensure preservation of riparian ecosystem.
			19.11.12	Identification of SWC related issues during microplanning.	Addressing issues through stakeholder's participation.
7.	Chap 20	Wildlife Management and Biodiversity Conservation (Overlapping) Working Circle	20.10.1.1 and 20.10.1.2	Stop hunting Stop Poaching	Five watch towers proposed
			20.10.1.3 and 20.10.1.4	The forest staff shall keep vigil all the time through patrolling, information sharing, information on felling equipment through network develop with the help of local people, shopkeepers selling felling equipment.	Stop illegal felling of trees and collection of NTFPs
			20.10.1.5	Encroachment identified and the standard procedure eviction of any such encroachment is to be done at priority. No new villages or new dwellers should be permitted to come out in future in close proximity of the wildlife habitats	Prevent encroachment and illegal activities
			20.10.1.7	Creation of water holes Fruit and fodder plantation Development of nesting sites	Improve degraded wildlife habitats
			20.10.1.8.1	Improvement of three major elephant corridor	Minimize human animal conflict
			20.10.1.8.2	Establishment of wildlife anti-depredation unit. Keeping 4 koonkies to chase away makhanas and catching 2 elephants every year	Reduce human elephant conflicts
			20.10.1.8.3	1 km trenching around habitations	Keeping away straying of wild animals and makhanas.
			20.10.1.8.4	Removal of electric fencing from tea gardens, etc.	Reducing wild elephants death
			20.10.1.8.5	Wildlife First aid kit	First aid to wounded wild animals
			20.10.1.8.6	Awareness should be conducted to sensitize the people from not creating chaotic situation when wildlife stray into habitations, agricultural fields etc.	Awareness on wildlife to reduce human wildlife conflicts
			20.10.2.1	Tree species whose IVI is less than	Conserve and

Sl. No.	Chap No.	Name of the Working Circle	Para No / Sub para	Prescription	Remarks
				5.00 will be promoted by planting and preservation.	preserve endemic floral biodiversity
			20.10.2.2	Fruit trees such as Outenga, Mango, Amla, Bel, Jamun, Arjuna, Bahera, Bot, Aahat, Bamboo, etc. will not be felled during any operation	Enhance wildlife habitats and reduce conflicts and
			20.10.2.3	Areas infested with dense Mikenia micrantha, Lantana spp., Parthenium spp. (found on the areas nearby the villages) be replaced by useful economical species. Compartments or parts of compartments which have population of fruit trees, or trees of lesser known species shall be preserved against any exploitation activity	Promote endemism
			20.10.2.4	Application of pesticides/ insecticides around a 5 km periphery of the forest in this division is to be completely banned. The forest houses diverse insects, birds and application of insecticides/pesticides by the surrounding tea estates affects the insect population of the forest division. It hampers pollination of important tree species and indirectly affects the birds and fish population.	Prevent degradation of ecosystem services
			20.10.2.5	Fire protection measures, though fires incidences are not reported to be done as a precautionary measure to protect the endemic biodiversity	Precaution from fire
			20.10.2.6	During plantation or departmental removal for any wind fallen trees care should be taken not to sacrifice the rarely found species or their regeneration	Precaution to decrease mortality of endemic shrubs and natural regeneration
			20.10.2.7	An effective naturalization plan needs to be devised based on principles for maintaining natural diversity.	Promote natural regeneration of endemic species
			20.10.2.8	Involvement of local communities especially women in forest and wildlife protection through awareness, participatory planning and equitable sharing of responsibility and benefits needs to be promoted.	Participation of local communities for biodiversity conservation
			20.10.2.9	Further efforts should be made to preserve as many patches of natural communities as possible.	To preserve regional biodiversity preservation
			20.10.2.10	Regular monitoring and updation of	Monitor status of

Sl. No.	Chap No.	Name of the Working Circle	Para No / Sub para	Prescription	Remarks
				species data through R & D activities needs to be taken up taking the present data as the base.	biodiversity and develop a biodiversity database of the division
			20.10.2.11	To preserve the natural floristics of the forest, it is proposed to establish a permanent preservation plots of Hollong, Nahar and Mekai in the selected compartments.	Biodiversity conservation a preservation of Hollong, Mekai and Nahar

CONTROL FORM NO. 1 BAMBOO HARVESTING

Provision of working plan											
Year	Locality to be exploited				Results of operation					Comparison balance + No - No.	Remarks
	Forest	Compt.	Area (ha)	No of culms to be removed	Year of working	Balance brought forward No of culms	Forest	Compt.	No. of culms felled		

CONTROL FORM NO. 2 SILVICULTURAL OPERATIONS

Provision of Working Plan									
Year	Para of W.P.	Locality		Nature of Operation	Results of Operation			Cost Amount spent (Rs.)	Remarks
		Forest	Comptt.		Year of operation	Locality of operation			
						Forest	Comptt.	Area (ha)	

CONTROL FORM 3 NON TIMBER FOREST PRODUCE

Year	Para of W.P.	Locality		Area (ha)	NTFP to be harvested	Results of Operation					Comparison		Remarks
		Forest	Comptt.			Year of harvesting	Locality		Area (ha)	NTFP harvested	Excess (+)	Short (-)	
							Forest	Comptt.					

CONTROL FORM NO 4A
WILDLIFE MANAGEMENT & BIODIVERSITY CONSERVATION

Ref: Para Area to be taken up for habitat improvement
 Annually and improvement planting of fruit trees and fodder species

Control Year	Plantation center	Prescribed		Marked		Remark
		RF & comptt.	Area	RF & comptt.	Area	

Total running excess/ deficit in area at the end of the year of commencement of the plan
 (±) Hectares.

CONTROL FORM NO. 4b
WILDLIFE MANAGEMENT & BIODIVERSITY CONSERVATION

Ref: Para Map of the area planted

Control year	RF & Comptt.	Plantation center	Area of under planting	Blank area Planted
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Scale 1: 16,000

N.B:

1. Map of the Compartment to be traced from stock map and the area over which under planting is done and other blank area where fresh plantation is created should be plotted in this center form.
2. Area treated in past year under same prescription if falls in same comptt should also be shown.
3. One form to be used annually for each compartment.

CONTROL FORM NO. 4C
WILDLIFE MANAGEMENT & BIODIVERSITY CONSERVATION

Ref: Para Weeding, maintenance, ANR to be continued in subsequent years till plantation is established.

Control year	RF & comptt. No.	Plantation center	Year of creation	Area of plot	Item of Subsidiary operation			Remarks
					Prescribed	Executed	Month	

N.B: One form to be used for all plots (other than plot of year) in a Compartment each year.

CONTROL FORM NO. PI
PLANTATION AND REGENERATION RECORDS
PLANTATION FORM

General instruction one set forms to be maintained for each plantation center and these should be loose bound between two hard-covers so that additional sheets can be added from time to time. Some of the forms relate to the whole center and some for individual plots as detailed below:

Form no. P I a one form for the whole center

Form No. P I b To the scale map for whole center. Individual plots need not be shown here.

Form No. P I C To the Scale map showing individual plots in the center. New plots to be added and plotted as soon as plantations are created. One form for whole center.

Form No. P II a One form for the whole center.

Form no. P II b One form for the whole center

Form no. P III a To be maintained for each individual plot.

Form No. P III b To be maintained for each individual plot.

Form No. P III C To be maintained for each individual plot.

FORM NO. P I A

Name of plantation center

Division.....

Reserve

Range

Block

Beat

Compartment No.

Situation

Aspect and slop

Soil

Brief description of

Forest type

Top Story

Mid Story

Under growth

Ground Cover

Sources of labor

Supply – Villages

Approximate number

Of daily labors

Available in different

Periods

General Remarks

FORM NO. P.I B

Name of plantation center

Division.....

Reserve

Range

Block

Beat

Compartment No.

SITUATION MAP

Scale 1: 16,000

N.B: The position of the center should be shown in this map with reference to the nearest Beat office, Range Office, inspections Bungalow. Location of roads, river, compartment / Block/ Reserve Boundaries should also be indicated in the Map.

FORM NO. P.I C

Name of plantation center

Division.....

Reserve

Range

Block

Beat

Compartment No.

PLANTATION CENTRE MAP

Scale 1 cm – 50 meters

N.B: The map will be shown the individual plots with plot No. and year of creation recorded on the body of each plot. Nearest Compartment boundaries are also to be shown in the map. Now creations are to be plotted and added each year.

FORM NO. P.II A

Name of plantation center

Year in which plantation

Reserve

Commenced in the center

Block

Division.....

Compartment No.

Range

Beat

AREA STATEMENT

Year of Creation	Plot No.	Area attempted in hectares	Species	Area failure/Successful			Remarks
				Year of assessment	Failure in ha.	Successful in ha.	
1	2	3	4	5	6	7	8

N.B:

1. In column 1 the calendar year in which planting / sowing etc. of a plot were done is to be filled in.
2. Column 1 to 4 should be filled in during the first year of a plantation plot. As soon as new plots are taken in hand in the center. These columns should be filled in.
3. Column 5 to 7 are to be filled at the end of 5th year of each plot.
4. In remarks column reason for failure and sanction no. writing off failures should be entered.

FORM NO. P.II B

Name of plantation center

Year in which plantation

Reserve

Commenced in the center

Block

Division.....

Compartment No.

Range

Beat

SUMMARY OF EXPENDITURE AND REVENUE

Year	Expenditure (₹) of the year from Commencement						Revenue (₹) of the year			Progressive total of revenue (₹)
	Creation	Upkeep	Total	Creation	Upkeep	Total	From seeds	From seedlings	Total	

N.B:

1. Col. 1 should preferably be the calendar year.
2. In Col. 2 cost of creation of the plot of that calendar year inclusive of seed cost nursery cost and first year's tending should be entered.
3. Col. 3 will show the cost of tending, thinning etc. of previous year's plots incurred during the particular calendar year of column 1.
4. Col. 5, 6, 7 will reflect the progressive total of column 2, 3, 4 respectively from year to year.

FORM NO. P.III. A

Name of plantation center

Division.....

Reserve

Range

.....

Block

Beat

.....

Compartment No.

Year of creation.....

Area (Hecate/res)

Brief description of:

Type of plantation

Method of Formation

Species

Quantity of seeds / number of stumps

Number of transplant used

Spacing

Category of labor

Inter-culture of field crops (if any)

Fencing

Financial year	Date of work	Brief summary of works	Extent of area covered by the item of work	Cost in ₹		Cost in terms of unit of daily labors ₹		Remarks
				Free labor converted to ₹.	Cash paid labor in terms of ₹	No. of free labors	No. of paid labors	
1	2	3	4	5	6	7	8	9

N.B:

1. This form is to be maintained plot by plot. Additional sheets to be added as soon as new area taken in hand.
2. All items of work including cost of seed collection, nurseries etc. for the particular plot should be entered in this form and hence entries are to start prior to the year of creation of the plot.
3. Form to be filled up immediately on completion of a particular item of works.

FORM NO. P.III. C

Plantation center Plot No. Year of Creation

.....

Reserve Blockcompartment no.

.....

Division RangeBeat

.....

PROGRESS OF HEIGHT AND DIAMETER / GIRTH GROWTH

Species	Age at which measurement recorded	Height (in meter)		Diameter/girth (in centimeters)		Remarks
		Maximum	Average	Maximum	Average	

N.B:

1. For the purpose of measurements old trees growing along the edges of the plot in the open. Measure a few groups of stems selected at random of property at fixed intervals along the rows of plots. The maximum would be the topmost dimension found during such measurements of groups and the average is to be worked out in the usual way.
2. From end of the 1st to 4th year of the plot only height measurement are to be recorded annually from the end of 5th year onwards record height / diameter of Girth measurements at periods intervals (say 5 years)
3. One form to be maintained for each plot, end to be opened as soon as plot is created.

FORM NO. P.III. C

Plantation center Plot No. Year of Creation

.....

Reserve Block compartment no.

.....

Division Range Beat of the plot Area (in ha.).....

Analysis of cost per hectare upto the end of 10th year

Sl. No.	Item of work	Total cost (₹) for the entire plot		Total Cost (₹)	Remarks
		Cost of materials (₹)	Total No. of daily labor		

1. Seed collection
2. Nurseries
3. Clearance of site
4. Burning
5. Staking / Lining
6. Hoeing / site preparation
7. Sowing/ Dibbling/planting
8. Fencing
9. 1st year's fire –protection measure
10. Repeat item 9 and 10 for 2nd to 10 year add
Clearing in the 6th year and thinning in the appropriate year.

N.B:

1. One form to be maintained for each plot and posting carried out at the end of each financial year.
2. In remarks column enter quantity and type of materials used.

PLANTATION JOURNAL**General Instruction:-**

One bond Register with serially numbered pages to be maintained for each center. First page to provide an index showing plot No. year of creation and reference to page nos. in which the plot appears. A Map showing the location with GPS Co-ordinates in KML,GPX Format to be attached including Google Spread sheet and a Trace Map not in scale.

Entries to be effected for each plot in the form of abstract of information furnished in the plantation Forms.

Sufficient blank pages to be left out between two plots for the purpose of future entries.

Proforma could be as follows.

LEFT- HAND PAGE OF THE REGISTER

Name of plantation center Division Plot No.

ReserveRange Year of Creation

Block Beat Compartment No. Area (in Ha.)

Species

Type of Plantation Method of Formation

Quantity of seeds/number of Spacing

Stumps or transplant used field –crops raised (if any)

Fencing

Brief summary of work done Month 7 year in which done Cost.

- | | |
|---|---|
| 1. Seed collection /Nurseries | ₹ |
| 2. Cost of the creation of the
Plot including first year's tending
And fire-protection..... | ₹ |
| 3. 2 nd year's tending and fire protection etc. | ₹ |

(Removal due to disease/wind fallen/decay (if any) to be entered in red ink and photographs to be attached)

RIGHT HAND PAGE OF THE REGISTER

Remarks by the Inspecting Officer.

Noting