



**THE WORKING PLAN
of
DOOMDOOMA FOREST DIVISION**

For the period from 2023-2024 to 2032-2033

VOLUME 1



Compiled by

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&

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**Assam Forest Department
Government of Assam**



सत्यमेव जयते

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No. 12-2/36/2014/RONE/AS/Doom Dooma/WP/ 280-81

May 04, 2023

To

✓ The Principal Chief Conservator of Forests & HoFF
Department of Environment & Forest
Govt. of Assam
Dispur

Sub: Approval of Draft Working Plan of Doom Dooma Forest Division- reg.

Ref: (i) State Govt.'s letter No. FG.62/REWP/WP/Final Approval dated 22.03.2023.
(ii) Ministry's order No. 9-7/2012-ROHQ dt. 23.02.2018.

Sir,

With reference to the subject and State Govt.'s letter cited above, I am directed to inform that the matter has been examined and discussed in the Regional Empowered Committee (REC) meeting held on 28th March, 2023 in pursuant of Ministry's order as cited under reference no. (ii).

In this regard, I am directed to convey that on the basis of the recommendation of the REC, the Central Govt. hereby conveys the approval under Section 2 of the Forest(Conservation) Act, 1980 the approved Working Plan of Doom Dooma Forest Division subject to the following conditions:-

A. General conditions:-

1. The approval shall be effective from the date of issuance of this letter and is for a period of 10 years i.e. 2023-24 to 2032-33.
2. All the prescriptions of the Working Plan regarding regeneration, protection and management of the forest will be strictly complied with and any change in the prescriptions of Working Plan will be treated as deviation for which prior approval of competent authority as per National Working Plan Code 2014 (Chapter V) shall be obtained in advance.
3. Any alteration in the plan leading to deviations or involving important technical points shall be made available with necessary draft amendments to the Deputy Director General of Forests (Central) through the PCCF and shall be implemented only after amendments are duly approved by the Deputy Director General of Forests (Central).
4. Sufficient budgetary allocations must be ensured for implementation of various prescriptions regarding protection, regeneration and development of the forests and all the prescriptions mentioned in the Working Plan must be carried out as per schedule. All the felling must be commensurate with regeneration and in case the regeneration works in the areas worked in a year are not taken up in the subsequent year, then felling of trees in forest area shall not be undertaken unless facts are appraised to Central Government and concurrence is obtained for taking up felling operations as per working plan prescriptions. The Hon'ble Supreme Court of India's orders in this regard will be strictly complied with.
5. The standing instructions issued by the Hon'ble Supreme Court from time to time in W.P. (C) No. 202/95 as well as in similar petitions shall be meticulously followed.
6. The domestic requirement of fuel wood from the branches etc and the construction timber should be the first priority of the local people and the balance timber may be utilized for the Forest Based Industries.

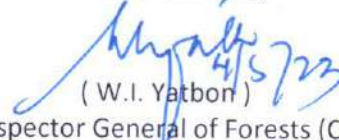
7. The approved saw/veneer mills will have to submit the monthly returns as per the Hon'ble Supreme Court order dated 05/12/2005 in WP (C) 202/95 dated 12.05.2001 to the State Government with a copy to this office. The monthly returns are to be duly verified and checked by the Forest Officer authorized by the State Government.
8. Rights and concessions, if any, should be given to the rights holders on the principle of sustainability of the forests.
9. Thinning of plantation, if any, should be done after proper assessment of the Plantation taking into consideration the spp., site quality, the expected stand number and basal area for the given age from relevant yield tables and stand tables.
10. No thinning shall be carried out on the slopes over 30° (steep slopes), areas having blanks or under stocked or in the areas of 20m strip on both sides along the streams and nullahs and 50m strip on both sides along the rivers.
11. The monitoring of the thinning, if any, will be done by territorial DFO and CCF (30 % and 10%) respectively. A certificate regarding this to be submitted regularly to this office.
12. No new construction of roads in the forest area shall be taken up for the purpose of extraction of timber.
13. The material obtained from thinning, if any, is to be transported to the notified depots and no timber should remain in the felled compartments.
14. Every year after any thinning as per prescription, a report regarding the yield removed shall be communicated to the Regional Office of MoEF&CC with an annual plan of operation to commensurate regeneration in the working plan area before commencement of new forestry operation year (in the month of September).
15. Adequate fire protection measures shall be taken up and adequate funds for this purpose shall be made available by the State Government.
16. Intensive protection measures against biotic interference and encroachment in forest shall be taken up. The case of forest settlement and encroachment shall be expedited and all the Acts, Rules, Orders of Hon'ble Supreme Court of India shall be followed in letter and spirit. Action should be taken for demarcation of forest areas and budgetary provision should be made for the same.
17. It shall be ensured that no activity is permitted/taken up in forest area in violation of the provisions of Forest (Conservation) Act, 1980.
18. No exotic spp. is to be introduced in the Plantation Working Circle and in any of the compartment for regeneration.
19. Shifting cultivation shall be discouraged and practice shall be devised to contain such cultivation within already affected area with right land use practices and through social forestry/energy plantations etc.
20. Annual updating of compartment history & control forms with the proposed major deviations if any shall be intimated to the Regional Office of MoEF&CC in the month of September every year.
21. The Working Plan Officer is to revise this Working Plan 2 (two) years before the expiry so that there will be a continuity on the Management of the Reserved Forest.
22. A Mid-term review of the progress of implementation of prescriptions as well as efficacy of the Working Plan shall be carried out in the year 2027-28 so that deviations if any causing short falls in achievements of target can be adjusted by the Standing Consultative Working Plan Committee in consultation with the Deputy Director General of Forests (Central).
23. A copy each of the approved final Working Plan is to be sent to the Regional Office, MoEF&CC, Shillong, ICFRE, IGnFA and FSI, Dehradun.

24. The Central Government reserves the right to review/modify or withdraw this approval at any point of time depending upon the management needs and orders of the Central Government /Court.

B. Specific conditions:-

1. The Working Plan should have special provision for conservation of elephant corridors, water conservation, conservation of wetlands and archaeological sites.
2. The Working Plan should have provision for skill development for extraction, development and proper marketing of NTFPs, Bamboo including effort on composting through JFMCs. The Division may prescribe for the collaboration with RFRI, Jorhat for the same.
3. The Working Plan should prescribe for creation of preservation plots of important and threatened species and seek to involve school, college and other like organization in biodiversity conservation.
4. The Working Plan should prescribe for exploration of funds for JFMCs from other sources like MNREGA, CSR etc. The agency providing fund for the implementation of Working Plan to be specified.
5. Though compartment is a smallest unit of management and State is advised to allot compartments into particular Working Circles that best fits the condition of the compartment, but the same was not followed by the State. Hence, in order to facilitate working for the field officers and staff, State Govt. shall allot beforehand each compartment into different Working Circles through a compartment-wise map dividing the area into Working Circles eg. Compartment 1 of Lokhipathar consisting of 155 ha. divided into 35 ha., 15 ha., 75 ha. & 30 ha. under different Working Circles may be shown on a compartment map as to which part of the area would fall under each Working Circle so as to avoid confusion in future.
6. Special attention to be given to climate change and development of climate-resilient models for plantation and conservation.
7. Provisions to be made for strengthening the protection mechanism and provision of wireless set, GPS sets, drone facility etc.
8. The Working Plan should have prescription for proper demarcation of the forest area and if there is any encroachment, timely and decisive action to be taken.
9. The Working Plan may also calculate the indirect benefits derived from the forest as part of the budget projection.
10. All Appendices as mentioned in para 97 & 98 of the National Working Plan Code, 2014 should be provided in the Plan.

Yours faithfully,


(W.I. Yatbon)

Dy. Inspector General of Forests (C)

Copy to:-

1. The Additional Chief Secretary (Environment & Forests), Govt. of Assam, Dispur.



Dy. Inspector General of Forests (C)

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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 Doomdooma forest division, Assam for the period 2021-2022 to 2030-2031 is prepared as per the National Working Plan Code, 2014 (NWPC, 2014). The working plan is prepared for sustainably managing 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 coordinatities for the sample plots were worked out by the North Eastern Space Applications Centre, Shillong (NESAC); with support from the O/O. 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.

The Doomdooma Division division was created by transferring some of the reserved forests from Digboi and Doomdooma Divisions vide Govt. of Assam's Notification No. FOR.287/66/110, dt. 9.11.1973 and the boundaries consolidated vide Notification No.FOR.287/66/118, dt. 18.4.1974. The Doomdooma Division has it's origin from erstwhile Lakhimpur Division which owing to its increasing revenue and pressure of works was divided gradually into several territorial divisions for administrative convenience. The first to come out were Digboi and Doomdooma divisions and then the reorganization into Digboi, Doomdooma and Doomdooma Divisions. The main emphasis after

creation of these divisions was on plywood timber and development of plywood industries. The Doomdooma Division was mainly earmarked for raising Hollong as well as other Miscellaneous plywood plantations.

The Doomdooma Division comprises of 20 Reserved Forests situated within the geographical limits of North Latitudes 27^o 20' and 28^o 00' and East Longitudes 95^o 15' and 96^o 00' and lying within the Civil district of Tinsukia. The various reserved forests are Hahkhathi, Kumsung, Mesaki, Doomdooma, Dangori, Kakojan, Phillobari, Nalani, Tokowani, Torani, Duarmara, Buridehing, Kukuramara, Hollogaon, Sadiya Station (North Block), Sadiya Station (West Block), Kundil Kalia, Deopani, Hollonghabi, Lokaipathar.

The forest type occurring in this Division is Hollong-Nahor forests and this type corresponds to type IB/CI- 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. With a view to achieving the goal, following four Working Circles are constituted-

- Hollong Regeneration Working Circle
- Miscellaneous Plantation Working Circle,
- Joint Forest Management (overlapping) Working Circle,
- NTFP and Bamboo (overlapping) Working Circle, and
- Wildlife Management and Protection (overlapping) Working circle.

a) Hollong Regeneration Working Circle: Hollong-Nahor Forests, also commonly known as Upper Assam Dipterocarpus Mesua forests, fall under type 1B/C1 - the Assam Valley tropical wet evergreen forest, as per the Champion and Seth's revised classification of forest types. These forests extend from Doomdooma and Dangori reserves of the Doomdooma Division in the east to the Jaipur reserve of Dibrugarh Division in the west. It is represented well in Tarani, Kakojan, Buridehing, Duarmara & Dangori reserves. The forest is composed of several canopy layers. The top canopy is dominated almost entirely by Hollong trees which grow upto the height of 50 mts. The other species that are found to occur sporadically in the top canopy are Amari, Hollock, Sam, Jutuli, Titasopa, Sopa, Simul etc. Hollong dominates in term of the total number of stems in the top canopy. Hollong appears to prefer well drained soil and so its occurrence gets rarer in the crop growing on the flat land. The under growth is composed of woody shrubs like Cochbhedeli, Kasidoria, Osbeckia species, Sorat, etc. Scitaminous (means remarkably stable group of flowering plants) shrubs like Kaupat, Tora, Bogitora etc. Palms such as Gerega tamul, Tokoupat etc. and canes such as Jengu, Raidang, Haukabet, Lajaibet etc. Bamboos occupy the areas where the density of tree stocking is poor. The common species of the bamboos found are Kako, Bojal and Dolou. Regeneration of Hollong is found in many parts of the forest floor and the seedlings, under ideal conditions, can survive under a closed canopy but requires tending with opening to get established. Regeneration of Nahar and other species is found to be promising.

Over the period of time Hoolng is depleting in the forest. With a view to restock, Hollong Regeneration Working Circle is constituted.

b) Miscellaneous Plantation Working Circle: This plantation working circle will cover existing plantations done by the department, blanks and under stocked areas cleared by encroachers and lands under compensatory afforestation etc. which are suitable for plantations, identified and allocated to different years of plan period along with prescription of sustainable management. Every effort shall be made to restore the ecology of such areas to their previous status. All the plantation areas focus on enhancement of the carbon stocks. Effort made to register such plantations under REDD+. Periodic monitoring of carbon stocks in such areas require support from the state government in the form of instruments and subject matter experts. Efforts made not only to enumerate the present area of trees outside forests but also to increase it. People interested in taking up plantations that are commercially viable in their private lands would be given technical guidance as well as seedling support to raise such plantations. People shall be made aware about the benefits of conserving and improving the quality of their plantations against the backdrop of climate change negotiations, particularly, REDD+.

c) Joint Forest Management Working Circle: This working circle is 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. The management of the jointly managed forests is done through the provisions of a micro-plan prepared by the community on participatory rural appraisal (PRA) basis with the technical help of the officials of the forest department. The concept of this Working Circle will be participatory approach, participatory planning, participatory implementation and participatory sharing of the outturn as per "*The Assam Joint (peoples' participation) Forestry Management Rules 1998*". This Working Circle shall include the entire existing plantation in this division raised with the help of JFMCs under different schemes.

d) NTFP and Bamboo (overlapping) Working Circle: The NTFP working circle comprise the 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. The Main NTFP products that are being extracted are bamboo, Canes, Fruits, Medicinal plants etc. The collection of the materials from forest areas is proposed to be undertaken as per rules in vogue. The Bamboo Working Circle aims at the production of bamboo in the RF areas other than wildlife habitat and plantation and harvesting of high quality bamboo in JFM area 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 areas includes parts of prescribed felling series.

e) Wild life Management and Protection (overlapping) Working Circle: This will be on overlapping circle to cover all the areas of the Division. The plan prescribes measures for wildlife habitat conservation, their management and identification of corridors for movement of elephants, protection and mitigation of man-animal conflict. Further, this Division comprises a part of Dehing Patkai

Elephant Reserve where a sizeable population of Asiatic elephants forages. The ever increasing man-elephant conflict is a serious 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 Doomdooma to reduce the ever increasing problem. Rising increasing 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.

Two new chapters such as Prospects of Ecotourism and Landscape Management (Chapter 6) and Ejection of Encroachers (Chapter 11) have been freshly introduced.

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 Doomdooma 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 Doomdooma Forest Division. A case no WP(C)4671/2005 in the Hon'ble High Court was won by Doomdooma division during Sep 2014 against erroneous settlement of 138 hectares of forest area of Nalani Reserve Forest in favour of M/S Mothola Tea Estate. The Officers and staff of Doomdooma division deserve appreciation for this stupendous feat.

Place: Doomdooma
Dated: 1st June 2021

R.K.Das, IFS
Yunush Salim, AFS

Acknowledgement

The success of any project depends largely on the encouragement, guidance and support of many other people. Apart from the efforts of us, number of senior officials, colleagues, staffs contributed in preparation of this Working Plan. We have taken efforts in this project. However, it would not have been possible without the kind support and help of many individuals and organizations. We take privilege to express my gratitude to the people who have been instrumental in the successful completion of this Forest Management Plan.

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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 office of the CCF (RE&WP), Assam. We offer our sincere acknowledgement to NESAC and staffs of GIS Cell of o/o CCF (RE&WP), Assam for their valuable contributions.

Place: Domdooma

Dated: 28th March 2023

R.K. Das, IFS
Yunush Salim, AFS

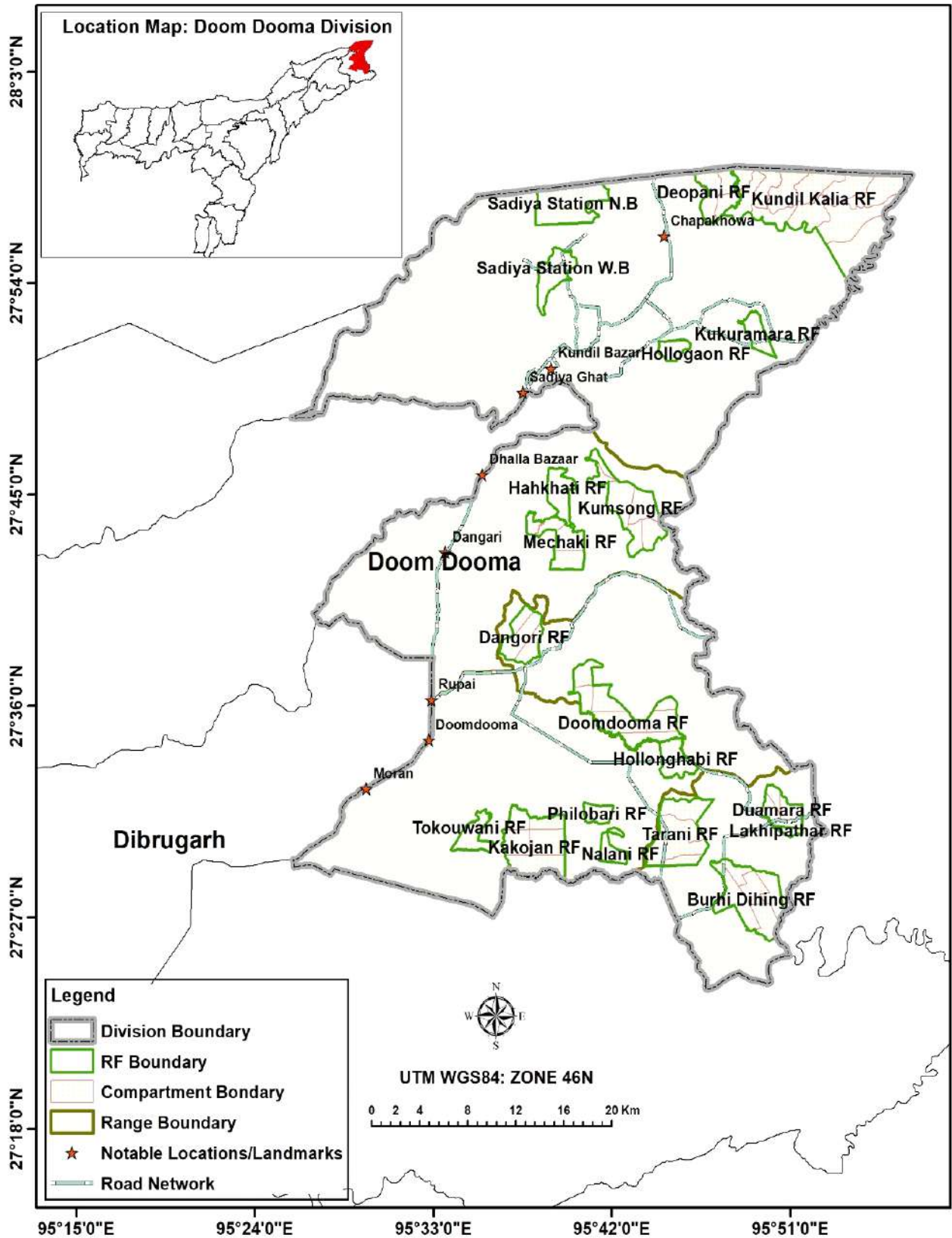


Figure 1: Location map of Doomdooma Forest Division, Assam.

EXECUTIVE SUMMARY

1. Introduction:

The Working Plan for the Doomdooma forest Division, Assam for the period 2023-24 to 2032-2033 is prepared as per the National Working Plan Code 2014. The current initiative is undertaken to efficiently plan and sustainably manage, conserve and utilize the state forests, its biodiversity, and improve flow of ecosystem goods and services. Further the Working Plan aims to steer processes to guide increase the percentage of forest area and trees outside forest. The Doomdooma Division comprises of 20 Reserve Forests and 4 Proposed Reserve Forests situated within the geographical limits of North Latitudes $27^{\circ} 20'$ and $28^{\circ} 00'$ and East Longitudes $95^{\circ} 15'$ and $96^{\circ} 00'$ and lying within the Civil district of Tinsukia.

The Doomdooma Division was created by transferring some of the Reserve Forests from Digboi and Doomdooma Division has its origin from erstwhile Lakhimpur Division which owing to its increasing revenue and pressure of works was divided gradually into several territorial divisions for administrative convenience. The first to come out were Digboi and Doomdooma divisions and then the reorganization into Digboi, Doomdooma and Doomdooma Divisions. The total area covered by all the Reserve Forests is about 30,904.35 Hactares. Sixteen out of twenty Reserve Forests are situated on the southern side of the division i.e. towards south of the Lohit and Brahmaputra rivers. Sadiya Station (North Block), Kundil Kalia, and Deopani RF's form the interstate boundary between Assam and Arunachal Pradesh. The division is surrounded by Arunachal Pradesh towards North and Eastern sides, Digboi Division towards southern side and Doomdooma Divisions towards western side.

The terrain is more or less flat over the most part of the division, particularly towards the south of Brahmaputra River. The reserve boundary line consists of either demarcated artificial lines or roads or village paths or natural features like banks of stream and rivers or swamps. The tract formed of sand in the alluvial region is drained by several rivers, the more important among them are Brahmaputra, Dibru and Na-Dehing in the south and Debang, Deopani and Kundil Rivers in the north. The river Dirok falling into the river Dibru and Buridehing river- a tributary of the Brahmaputra, also contribute significantly to the drainage. The Brahmaputra, Dibang and Buridehing rivers are navigable throughout the year.

Encroachment inside the notified Reserve Forests, particularly in the Northern limits of the division whose boundaries of Reserve Forests coincide with the interstate boundary of Arunachal Pradesh occurring during the sixties is presently an almost accepted affair. While occurrence of further such encroachment cannot be ruled out altogether encroachment inside some other Reserve Forests by civilians also exist, most notable being inside Hollonghabi, Kumsong and Mesaki R.Fs. All four PRFs with 4252 Ha area are fully encroached.

It is estimated that there are more than 200 edible insect species with therapeutic values in the NE India. Edible insects are good source of supplement food item that could meet the people's present and future need. Doomdooma division houses significant number of edible insects. Edible insects are natural renewable resource that provides food and economical safety to many ethnic groups. A

research study on this aspect, first of its kind in the entire country will be initiated soon in the division with Assam Agriculture University, Jorhat.

a) Vision statement:

The vision statement of the Working Plan of Doomdooma 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 Doomdooma Forest Division is that after implementation of this Working Plan prescriptions, one can see -

- A forest as it was 50 years ago with multy 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 Dependants 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:

Goals:

- Protection of forests from degradation and reclamation of encroached areas.
- Improvement of quality of Hollong, Mekai, Nahor forests along with their associates.
- Conservation of the rich biodiversity of the area including elephant corridors.
- Enhancement of carbon sequestration.
- Involvement of the fringe villagers in forestry activities on payment for the flow of ecosystem goods and services, to device mechanism for their livelihood support.
- Development of infrastructure for promotion of eco-tourism with an aim for landscape management, to highlight potential areas for protection of wildlife particularly for Bengal Florican, White Winged Wood Duck, Gangetic dolphin, Hoolock gibbon, Vultures, Elephants, Tigers, and other big cats.

Objectives:

- To ensure large scale plantation and improvement of growing stock of Hollong-Mekai-Nahor forests.

- To reclaim forest areas from the hands of encroachers.
- To conserve wildlife particularly the rare and endangered species.
- To increase carbon sequestration and contribute development of carbon sinks.
- To ensure participation of JFMC members in regeneration and protection of forests, promotion of eco-tourism
- To generate livelihood opportunities for JFMC and EDC members .
- To carry out Research and monitoring activities for conservation of species.

c) SWOT Analysis:

The Division has unique biodiversity and very diverse forest types which are enriched with fertile soil and good water resources. Soil erosion is under control and interstate connectivity through river may be used as river navigation. International boundary being near, forest conservation will be up on the priorities list, and the outlook on ecotourism will be highly optimistic.

Customary practise of hunting and accessibility to the RFs are the concerns that result in constant rate of wildlife diminution. Lack of infrastructural facilities and unskilled manpower weakens the moral of the Department. Part of the encroached areas (Total 39%) is in dispute with neighbouring State and are under immense pressure of resource extraction resulting in higher rate of degradation. The Working Plan formulates the strengths and opportunities of the Division so that the threats can be minimised and development of the forest reserves can be facilitated.

The detailed SWOT analysis carried out for prescriptions and strategies for achieving the Plan's goals and objectives is shown in Box 1.

SWOT analysis of the Doomdooma Forest Division, Assam.

STRENGTHS	WEAKNESS
<ul style="list-style-type: none"> • Rich biodiversity • Unique forest types • Good water resources • Fertile soil condition • Good interstate connectivity • Picturesque landscape • Rich and diverse cultures 	<ul style="list-style-type: none"> • Inadequate infrastructural facilities • Inadequate skilled and trained man power • Lack of awareness
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> • Opportunities for ecotourism • Good opportunity for NTFP marketing • Opportunities river navigation • Near to the state of Arunachal Pradesh 	<ul style="list-style-type: none"> • Encroachments • Upcoming hydro electric dams in upper stretches of Dibang and Luit river of Arunachal Pradesh • Increased human disturbances • Increased cattle population and pressure on forests

d) Expected Outcome:

- Forest development will not only enhance the green cover but will also increase carbon sequestration.

- Increase in Hollong-Mekai-Nahor forest type area will help maintain and conserve the endemic biodiversity and also species such as white winged wood duck, two species of hoolock gibbon, gangetic dolphin, elephants, bengal florican, butterflies, orchids etc.
- Increase forest cover will help develop reduce green house effect (GHG) and ameliorate the overall environment in areas under Doomdooma Division.
- Ejection followed by rehabilitation of encroachers from the RF/PRFs by offering economic package.
- Due to proximity to the interstate boundary, ecotourism in the Division will benefit the members of the JFMCs/EDCs.
- Need based NTFP plantations and its value addition will benefit the fringe villagers in livelihood generation.
- For the Forest Department, greater prospects of advanced conservation strategies, and higher revenue generation opportunities are expected.

e) Abstract of plan prescriptions: The abstract of plan prescriptions in the Working Plan of Doomdooma Forest Division, Assam, for the plan period 2021-2022 to 2030-2031 is summarized in Table 1 as per the format laid out under National Working Plan Code 2014.

Abstract of prescriptions for each Working Circle.

Chapter No.	Name of the Working Circle	Prescribed activity	Physical target over a period of ten years/ Remarks
Part 2 Chapter 2	Hollong Regeneration Working Circle	Working Circle restricted to South of the Brahmaputra River,	5635 Hect of Forest area shall be
		Reclamation of Hollong in the division	5635 Hect of Forest area shall be reclaimed with Hollong species.
		No felling of trees is prescribed during the Plan period except thinning	No felling prescription.
Part 2 Chapter 3	.Miscellaneous Plantation Working Circle	8790 Ha area to be planted in the Plan period	8790 Ha area to be planted in the Plan period
		Identification of good seed bearers and collect information on seed year.	Database and geo tagged location of good seed bearing trees.
		Select mother trees and marking those.	Ensure adequate number of mother trees of endemic species. Geo tagging required
		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.
		Transplantation of naturally regenerated seedlings which are 45 cm to 55 cm and six to eight months old.	Ensure survival of naturally regenerated seedlings.
		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.
		All areas that are having gaps is to be planted with native tree species.	The planting schedule as prescribed should be followed
		Planting schedule to be followed	Adherence to the strategies and prescription
		No felling of trees is prescribed during the Plan period.	Emphasize mainly on the replenishment of the area

		Reclamation and plantation of evacuated areas	Rehabilitation of the encroached RF areas and planting locally suitable quick growing species
		Assisted natural regeneration as per the prevailing norms may be adopted in the regenerated areas (100 seedlings per hectare).	Ensure survival of naturally regenerated seedlings.
Part 2 Chapter 4	A. Joint Forest Management (overlapping) Working Circle	10630 hect area shall be protected by 29 JFMCs	10630 hect area shall be protected by 29 JFMCs
		JFMC Plantation with various species = 2900 hect.	JFMC Plantation with various species = 2900 hect.
		Forest department staffs with active participation of JFMC conduct PRA exercises and develop microplans for the socioeconomic upliftment and livelihoods development of the local people. These microplans need to be submitted to DFO for assessing their technical feasibility for final approval as per the available government schemes and any other funders norms. Before implementing the project, Government orders and any relevant amendments are to be strictly followed.	Government orders and any relevant amendments are to be strictly followed before implementing the project,
		There should be monthly review meeting of the JFMCs under the Chairmanship of JFMC president. Range Forest Officer should attend meeting at least quarterly.	Ensure functionality of the JFMC.
		NTFPs to be collected and sustainably harvested from areas from JFMC area and shall be sold by the concerned JFMC.	Sustainable NTFP harvesting.
		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.
		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.	Enhanced crop yield to meet people's requirement.
		JFMC areas to practice minimum tillage, organic formulations	Maintenance of ecology of the area
		Formation of Forest/ Protection Regeneration Committee, Entry point activities, infrastructural development, welfare programmes with special reference to woman folk and girl child, JFM plantation and nurseries etc. are proposed in the Budget and mostof them will be maintained during and beyond the Plan period.	Ensure enhancement of forest cover through people's participation. Improvement of livelihoods of local population.
Part 2 Chapter 5	Non timber forest produce and bamboo (overlapping) Working Circle	2565 hect area is earmarked for NTFP plantation	2565 hect area is earmarked for NTFP plantation
		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.
		Collection of bark of any tree is strictly prohibited.	Ensure survival of threatened species.

		Only flowers, leaves, fruit and nuts are permitted to collect.	Enhance survival of NTFP species.
		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.
		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.
		20% of the JFMC plantation will comprise of NTFP	To meet the demands of local people
		Harvesting regime has been prepared	Ensure harvesttion and sustained yield
		Small scale industries and necessary steps have been proposed for grinding, packaging, certification and marketing of the products	Value addition of NTFP and maintain transparency and Ensure benefit to the needy JFMC members
		Bamboo plantation @10 Ha to be carried out by every JFMC. Harvesting allowed on sustainable manner from 104 Ha (Out of 520 Ha) created by JFMC	No harvesting allowed in Secondary Bamboo Forests.
Part 2 Chapter 6	Wildlife protection (Overlapping) Working Circle	Creation of water holes Fruit and fodder plantation Development of nesting sites	Improve degraded wildlife habitats
		No new villages or new dwellers should be permitted to come out in future in close proximity of such important wildlife habitats.	Protect forest land and biodiversity
		Protection of Fauna	Protect wildlife biodiversity

f) Abstract of Works prescribed During the Plan Period Along with Annual Target: The abstract of works prescribed in the Working Plan of Doomdooma Forest Division, Assam, for the plan period showing its year-wise target, is summarized below.

Table 2. Abstract of annual targets of Doomdooma division.

Chapter No	Working Circle	Prescribed Activity	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Part II Chapter 2	Hollong regeneration Working Circle	To convert all blank areas/poorly stocked areas into regular Hollong Forest through plantation & maintenance	580	610	590	635	650	565	525	530	495	455
Part II Chapter 3	Miscellaneous Plantation Working Circle (Energy plantation)	To cover 8790 Ha of RF area, reclaimed from encroachers by plantation	905	870	905	885	910	895	890	875	850	815
Part II Chapter 4	Joint Forest Manage-ment (Overlapping) Working Circle	To allot peripherial areas of RFs for natural regeneration and integrated planting(artificial regeneration) @ 100 ha per JFMC for existing 29 JFMCs	1085	1085	1060	1130	1090	1085	1060	1055	1010	970
Part II Chapter	NTFP plantation	NTFP plantation(Firewo	270	300	300	300	300	300	300	300	300	300

5	under NTFP (Overlapping) and Bamboo Working Circle	od, medicinal plants, fruits)											
Part II Chapter 6	Wildlife management WC	Food and Fodder Plantation	50	50	50	50	50	50	50	50	50	50	50

II. Glossary of terms

S.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 a 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 Sequestration	The uptake and storage of carbon. Trees and plants, for example, 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 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, subregional, 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 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 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 (Ntfps)	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.
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 fibre contained in a tree, stand, or forest, or parts of these measured in cubic units (e.g., cubic metres 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. Abbreviations

S.No.	Abbreviation	Full form
1	ACF	Assistant Conservator of Forests
2	AFR	Assam Forest Regulation
3	APCCF	Additional Principal Chief Conservator of Forests
4	APFBC	Assam Project on Forest and Bio-Diversity Conservation
5	AR / ANR	Artificial Regeneration/Aided Natural Regeneration
6	BFO	Beat Forest Officer
7	BMC	Biodiversity Management Committee
8	CAI	Current Annual Increment
9	CAMPA	Compensatory Afforestation fund Management and Planning Authority
10	CCF	Chief Conservator of Forests
11	CF	Conservator of Forests
12	DBH	Diameter at Breast Height
13	DCF	Deputy Conservator of Forests
14	DFO	Divisional Forest Officer
15	FAO	Food and Agriculture Organization
16	FC	Forest Clearance
17	FCA	Forest Conservation Act
18	FDA	Forest Development Agency
19	FRA	Forest Rights Act
20	FRH	Forest Rest House
21	FSI	Forest Survey of India
22	FSR	Forest Schedule of Rates
23	GHGs	Green House Gases
24	GIM	Green India Mission
25	GIS	Geographic Information System
26	GPS	Global Positioning System
27	Ha.	Hectare
28	HoFF	Head of Forest Force
29	ICFRE	Indian Council of Forestry Research and Education
30	IGNFA	Indira Gandhi National Forest Academy
31	IIFM	Indian Institute of Forest Management
32	IUCN	International Union for Conservation of Nature
33	IVI	Importance Value Index
34	JFM	Joint Forest Management

35	JFMC	Joint Forest Management Committee
36	LULUCF	Land Use and Land Use Change and Forestry
37	MAI	Mean Annual Increment
38	MAR	Monitoring Assessment and Reporting
39	MEoF	Minister of Environment and Forests
40	MSL	Mean Sea Level
41	NAP	National Afforestation Project
42	NBM	National Bamboo Mission
43	NaRMIL	National Resource Management and Intrigated Livelyhood
44	NFI	National Forest Inventory of India
45	NRSC	National Remote Sensing Centre
46	NTCA	National Tiger Conservation Authority
47	NTFP	Non-Timber Forest Produce
48	NWAP	National Wildlife Action Plan
49	OSMs	Open Series Maps
50	PA	Protected Area
51	PBRs	Peoples Biodiversity Registers
52	PCCF	Principal Chief Conservator of Forests
53	PF	Protected Forests
54	PRF	Proposed Reserved Forest
55	PWPR	Preliminary Working Plan Report
56	RAPCCF	Regional Additional Principal Chief Conservator of Forests
57	REDD	Reducing Emissions from Deforestation and Forest Degradation
58	REWP	Research Education and Working Plan
59	RET	Rare, Endangered, and Threatened
60	RF	Reserve Forests
61	RoFR	Recognition of Forests Rights
62	RFO	Range Forest Officer
63	SFM	Sustainable Forest Management
64	SOI	Survey of India
65	TOF	Trees Outside Forests
66	WP	Working Plan
67	WPO	Working Plan Officer
68	WPU	Working Plan Unit

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 Doomdooma forest 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 pimmata</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 nudiflora</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>Elaeocarpus 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 oliocephala</i>	Endangered
44.	Haludsaki	<i>Endosperum chinensis</i>	Endangered
45.	Hatipolia	<i>Pterospermum acerifolium</i>	Endangered
46.	Hengunia	<i>Meliosma pimmata</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>Altingla excalsa</i>	Abundant
59.	Kadam, Raghu	<i>Anthocephalus indicas</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>Albizzia procera</i>	Abundant
69.	Kuhir	<i>Bridelia retusa</i>	Abundant
70.	Kurial, Kanchan	<i>Bauhinia purpurea</i>	Abundant
71.	Leluk	<i>Beilschmiedia bramdisii</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>Albizzia 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 favanica</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	<i>Schizostachyum pergracile</i>	Abundant
12	Behti banh	<i>Schizostachyum griffithii</i>	Abundant
13	Dalu banh	<i>Schizostachyum dullooa</i>	Abundant
14	Bajal banh, bajah banh.	<i>Schizostachyum polymorphum</i>	Abundant
15	Tarai banh, Nah banh, Muli banh.	<i>Melocanna baccifera=M.bambusoides</i>	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 barringtomiaefolia</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 thyriflorius</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>Erythralum 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.	Asclepiadiaceae	Abundant
15	<i>H. parasitica</i> Wall.	Asclepiadiaceae	Abundant
16	<i>H. vaccinioides</i> Hook.f.	Asclepiadiaceae	Abundant
17	<i>Jesminum anastomosans</i> Wall	Oleaceae	Abundant
18	<i>J. attenuatum</i> Roxb	Oleaceae	Abundant
19	<i>J. dispernum</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	Asclepiadaceae	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>Smilex 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 coccnea</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 lituiflorum</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
	Mycaranthes		
65	<i>Mycaranthes floribunda</i>	Dec – March	Epiphyte in dense humid evergreen forest
66	<i>Mycaranthes pannea</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 deliciosa</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 Doomdooma 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 Indain 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>Amblyonyx cinereus</i>	Rare
38	Gaur (dung and tracks).	<i>Bos gaurus</i>	Threatened
39	Serow	<i>Capricornis Sumatraenis</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>Tamiops 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	Rhfous tailed hare	<i>Lepus nigricollis</i> <i>Syn.ruficaudatus</i>	Threatened
51	Chinese Pangolin	<i>Manis pentadactyla</i>	Threatened
52	White-tailed Mole	<i>Parascaptor</i> sp.	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>	Treatened
58	Dobson's Horseshoe Bat	<i>Rhinolophus yunanensis</i>	Common
59	Greater False Vampire Bat	<i>Megaderma lyra</i>	Common

v) List of avifauna in Doomdooma Division

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>Heirococyx sparverioides</i>	
72	Common Hawk Cuckoo	<i>Heirococyx 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>Eudynamis scolopacea</i>	R, C
78	Green-billed Malkoha	<i>Phaenicophaeus tristis</i>	R, C
79	Lesser Coucal	<i>Centropus bengalensis</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 capansis</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 Yelloenape Woodpecker	<i>Picus chlorolophus</i>	R, C
117	Rufous Woodpecker	<i>Cealeus 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 longirostris</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 auroreus</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 (SV)</i>	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 mccllellandii</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

Butterfly

Sl. No.	Scientific name	Common name	Status as per Evans 1932	Species restricted to northeastern
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				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> Möscher, 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>	Common Banded	Common	-

	Fruhstorfer, 1911	Demon		
34	<i>Notocrypta curvifascia curviascia</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 cephalo</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>Caltoris aurociliata</i> (Elwes & Edwards, 1897)	Yellow Fringed Swift	Rare	Endemic
49	<i>Baoris chapmani</i> Evans, 1937	Small Paintbrush Swift	-	Endemic
50	<i>Pyronera 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 lycida 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)	Bisport 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>Anthene emolus emolus</i> (Godart, [1824])	Common Ciliate Blue	Common	-
119	<i>Anthene 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,	Glistening Cerluean	Not Rare	Endemic

	1879)			
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])	Bhulia 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 dilectaus</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 sotis</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 kahruha</i> (Moore, [1895])	Variiegated 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: Limenitidinae			
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 zeroca 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>Hypolimnna 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, 1798)	Small Branded Swift	Common	-
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> (Fabricius, 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 emolphus eumolphus</i> (Cramer, [1780])	Green Oakblue	Not Rare	-
300	<i>Arhopala atrax</i> (Hewitson, 1862)	Indian Oakblue	Common	-
301	<i>Arhopala athada apha</i> deNicéville, 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 Sch I)	Chocolate Bushblue	Very Rare	Endemic
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>Sinthusia nasaka amba</i> (Kirby, 1878) (IWPA1972 Sch II)	Narrow Spark	Rare	Endemic
313	<i>Sinthusia 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: Polyommatae				
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 iynteanana</i> (de Nicéville, [1884])	Jynteana 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	Jungleglory	Not Rare	Endemic
352	<i>Cupha erymanthis</i> (Drury, [1773])	Rustic	Common	-
353	<i>Discophora sondaica zal</i> 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</i> de Nicéville, 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 pruinosum</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 Doomdooma division, Assam

Table 6: List of lichen found in Doomdooma 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>Coccocarpiceae</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) Sprigyra
Ulvophyceaea	a) Ulothrix
Chlorophyceae	a) Chlamydomonas,
	b) Chlorella,
	c) Haematococcus
	d) Oedogonium
	e) Gonium
Bacillariophyceae	a) Pinnularia,
	b) Navicula
Euglenoidea	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>	<i>Agaricaceae</i>	Saprophyte	Edible
2	<i>Lycoperdon pyriforme</i>	<i>Agaricaceae</i>	Mycorrhizal	Edible
3	<i>Coprinus disseminates</i>	<i>Agaricaceae</i>	Saprophyte	Non edible
4	<i>Amanita pantherina</i>	<i>Amanitaceae</i>	Mycorrhizal	Non edible
5	<i>Auricularia auricula-judae</i>	<i>Auriculaceae</i>	Dead wood	Edible, Medicinal
6	<i>Boletus badius</i>	<i>Boletaceae</i>	Mycorrhizal	Non edible
7	<i>Cantharellus lateritius</i>	<i>Cantharellaceae</i>	Saprophyte	Edible

8	Craterellus sp.	Cantharellaceae	Saprophyte, dead wood	Edible
9	Clavaria sp.	Clavariaceae	Saprophyte, dead & decaying wood	Non edible
10	Ganoderma lucidum	Ganodermataceae	Parasitic	Medicinal
11	Ganoderma applanatum	Ganodermataceae	Parasitic	Medicinal
12	Ramaria sp.	Gomphaceae	Saprophyte, dead wood	Edible
13	Laccaria bicolor	Hydnangiaceae	Mycorrhizal	Non edible
14	Phellinus gilvus	Hymenochaetaceae	Parasitic	Non edible
15	Marasmius androsaceus	Marasmiaceae	Saprophyte, plant debris	Non edible
16	Pleurotus 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. delica	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 - I

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 twenty RFs and four PRFs of Doomdooma Division. The Division is situated between 27° 5' and 27°42' N latitude and 94°41' and 95°30' E longitude covering an area of 35,154.75 Ha. as per the records register.

The Doomdooma Division was created by transferring some of the RFs from Digboi and Doomdooma Divisions vide Government of Assam's notification no. for. 287/66/110, dated 9.11.1973. This area was a part of erstwhile Lakhimpur Forest Division with head quarter at Doomdooma till its re-organization in the year 1973. The boundaries of Doomdooma Division were consolidated vide notification no. for. 287/66/118, dated 18.4.1974. The Doomdooma Division was further reorganized in order to declare Dibru RF as a Wildlife Sanctuary in 1986 and, subsequently transferred the RF to the newly created Tinsukia Wildlife Division in the year 1989. In the year 2001 two more RFs - namely Padumoni and Bherjan RFs - were transferred to Tinsukia Wildlife Division. Consequent upon reorganization being effected during last four decades, the present territorial jurisdiction of this Division covers a major part of the Tinsukia District. The main emphasis after creation of these Divisions was on plywood timber and development of plywood industries. The Doomdooma Division was mainly earmarked for raising Hollong as well as other miscellaneous plywood plantations.

Sixteen out of twenty Reserve Forests are situated on the southern side of the Division i.e. towards south of the Lohit and Brahmaputra river. Sadiya Station (North Block), Kundil Kalia and Deopani RFs form the interstate boundary between Assam and Arunachal Pradesh. These forests are covered Survey of India Toposheet No. 83 (M9, M13, M6, M10, M14, M7, M11, M15) on 1:50,000 scale The maps prepared with geographical coordinates recorded at the site is maintained by the GIS Cell (REWP) Guwahati for reference purposes. Table 1.1 shows the administrative set up of Doomdooma Division forests.

Table 1.1: Administrative setup of the RFs in Doomdooma Division

Name of Range	Name of the RFs	Compartment	Area (Ha.)
Khatangpani Range	Burhi Dihing RF	1,2,3,4,5	2295.83
	Duarmara RF	1,2,3,4	653.03
	Lokaipathar RF	1	105
	Tarani RF	1,2,3,4,5	2040.08
Kakopathar Range	Dangori RF	1,2,3	919.83
	Dumduma RF	1,2,3,4,5,6,7	2881.78
Sadiya Range	Deopani RF	1,2,3	2333
	Hollogaon RF	1	371.25
	Kukuramara RF	1	365.18
	Kundil Kalia RF	1,2,3,4,5,6,7,8,9,10,11	7287.44
	Sadiya Station R F (N.B.) RF	1	2331.89
	Sadiya Station R F (W.B.) RF	1	965.18
Saikhowa Range	Hahkhathi RF	1	671.25
	Kumsong RF	1,2,3,4,5,6	2252.63
	Mechaki RF	1,2,3,4	1366.8
Doomdooma Range	Nalani R F	1	374.68
	Philobari R F	1	317.81
	Tokouwani RF	1	502.83
	Hollonghabi RF	1	520

	Kakojan RF	1,2,3,4,5	2347.26
Total area RFs			30,902.75
Name of Range	Name of PRF		Area (Ha)
Khatangpani Range	Mohongpathar		466
Khatangpani Range	1 st Addition to Duarmarah PRF		113
Kakopathar Range	Talpathar PRF		170
Sadiya Range	Dibang Valley PRF		3605
Total area PRFs			4252
Total Area(RFs & PRFs)			35,154.75

According to the 2011 census, Doomdooma Town Committee has a population of 21, 572 of which 11,476 are males while 10,096 are females. Average literacy rate is 85.52 %, higher than State average which 72.19 %.

1.2 Configuration of the ground:

The area under Doomdooma Division is almost level and most of the RFs get inundated during high flood. The terrain is therefore cut by numerous streams dotted with swamps full of earthen mounds and hence a major portion of the land in these RFs is stiff heavy soil which dries out completely.

The terrain of the Reserve Forest comprises of low hills. The altitudes range from 100 mtr to 180 mtr above mean sea level (msl). The Division is surrounded by Arunachal Pradesh towards North and Eastern sides, Digboi Division towards southern side and Doomdooma Divisions towards the western side.

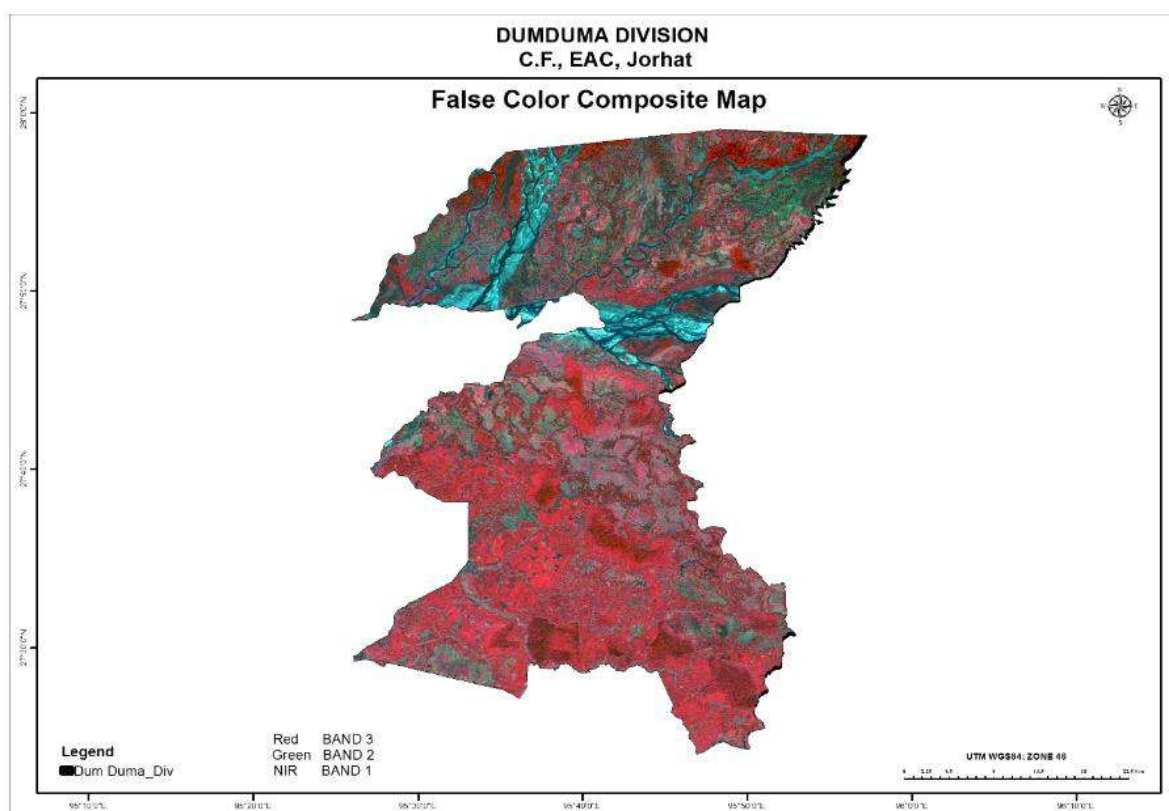


Figure 1.2: False Colour Composite (FCC) map of Doom dooma division, Assam.

1.3 Geology, rock, and soil:

A fairly thick group of sedimentary rocks occurs in this Division ranging in origin between Eocene and Pleistocene, exposed mainly along the foot hills bordering Southern boundary of the Division. The Eastern part of the Division and of Brahmaputra River valley are covered by thick alluvial deposits belonging to Recent and Sub-Recent periods. The Brahmaputra valley in this area is of a “ramp valley” nature developed during the simultaneous upheavals of the Himalayas in the North and Northeast.

The soil formation, for the most part, is of alluvium which is of relatively recent geological times. Main changes in the land masses seem to have begun to appear in the Cretaceous period, assuming the characteristics that are prevalent today. The Eocene period witnessed the raising of the Tibetan Plateau and the upheaval of the Himalayas. Along with this the Patkai range which was probably then a low lying tract of land was raised and during subsequent earth movements this tract must have subsided and been covered with subsequently deposited strata. With the rise of Himalayas and the uplift of the Patkai Range, the detritus from the streams began to be laid down in the newly formed Assam Valley, the older alluvium, which was first deposited, being covered by layers of fresh deposits giving rise to the new alluvium.

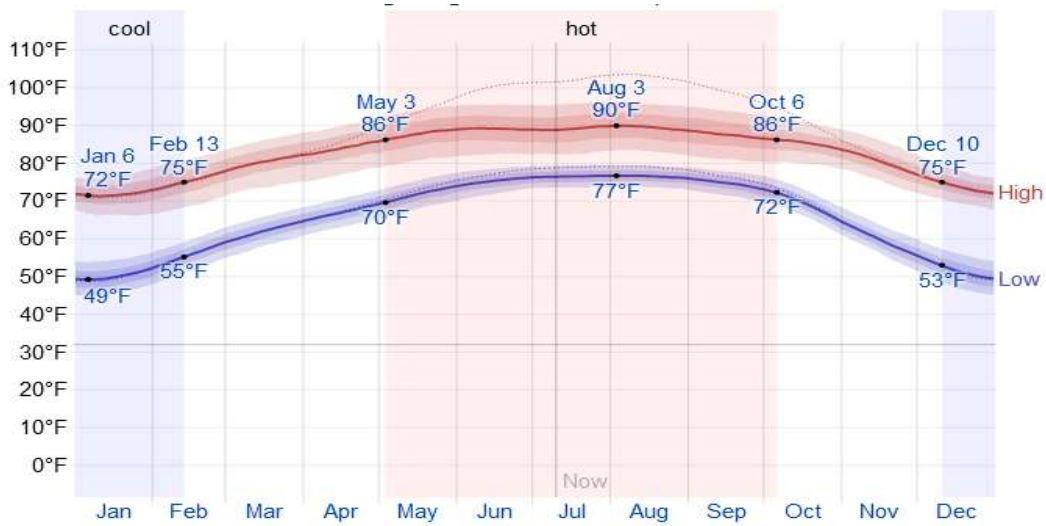
The alluvial deposit of the Brahmaputra River is characterized by the shallow surface layer of silty loam not exceeding 3 ft in depth and of gray colour, with subsoil of coarse sand often mixed with pebbles and boulders. The alluvial deposit of the Dehing river is characterized by its coarse nature, reddish colour, sandy clay and considerable depth. The soil of the Brahmaputra alluvial is acidic, the pH value being 5.5. Soil map of the entire Tinsukia district is provided in Volume 2, Figure 4.

1.4 Climate:

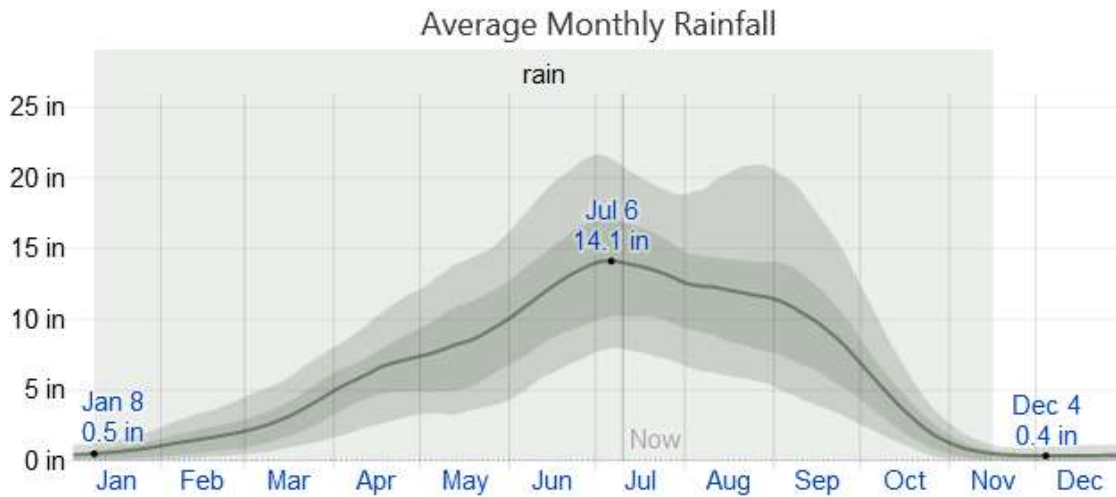
The division experiences sub-tropical humid climate and falls under high humid zone. High humidity and high rainfall are the characteristic feature of the forests in this division. The meteorological data for Doomdooma Division was collected from the station at Bisakopi.

Figure 1.4.a shows the month-wise temperatures recorded from the year 2007 to 2016 by IMD. The minimum temperature recorded was 5°C during the month of January 2010 whereas the maximum temperature recorded was 42°C during May 2007. The hottest months are May, June, July and August while December and January are the coldest.

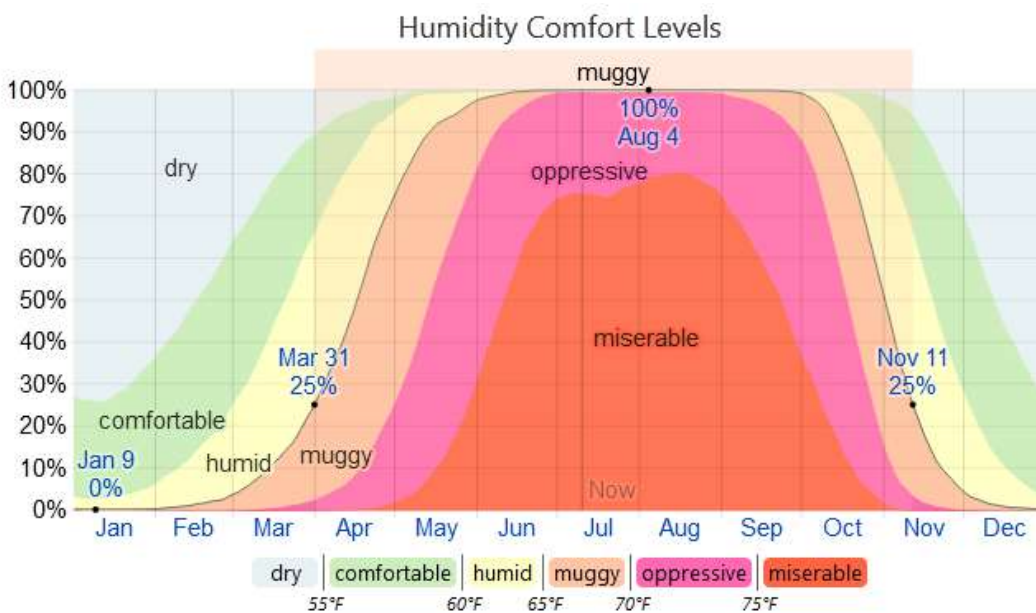
The division is endowed with high rainfall during all the months in a year. The rainfall is distributed more or less throughout the year. Figure 1.4.b. shows that bulk of precipitation takes place during the period of May to September. However, the rainfall is distributed more or less throughout the year. The average annual rainfall ranged from 2122.70 mm in the year 2014 and to a maximum of 3893.17 mm in the year 2010.



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 TREE COVER

2.1 Area of forest under different legal classes: The area of forest under different legal classes is shown in detail in table 1. The Reserve Forests have been constituted under the relevant provisions of the Assam Forest Regulation, 1891 and the Indian Forest Act. A statement showing the details of the notification numbers and dates of various areas of forest under different legal classes is shown in table 2.1. Geocoordinates of compartment is provide in Annexure 2 Compartment map of the division is shown in Volume 2.

Table 2.1: Notification numbers and dates of area of forest under different legal classes

S.No.	Name of R.F. / PRF	Notification No.	Date	Area (Ha.)
1	Mesaki R.F.	4242 R	18-11-1921	1366.8
2	Kumsong R.F.	1243 R	26-05-1924	2252.63
3	Hakhati R.F.	1241 R	26-05-1924	671.25
4	Dangori R.F.	3240 R	10-09-1921	919.83
5	Doomdooma R.F.	3021 R	22-11-1922	2881.78
6	Kakojan R.F.	4946 R	08-10-1917	2347.26
7	Tokawani R.F.	4947 R	08-10-1917	502.83
8	Phillobari R.F.	For/Sett/273/56/52	02-03-1960	317.81
9	Hollonghabi R.F.	FRS.241/80/6	30-10-1980	520
10	Nalani R.F.	For/Sett/790/68/10	20-11-1968	374.68
11	Tarani R.F.	AFR/43/52	21-04-1954	2040.08
12	Buridehing R.F. (North & South Block)	2422 R	27-05-1930	2295.83
13	Lokaipather R.F.	FRS.393/81/19	06-09-1982	105
14	Duwarmora R.F.	1080 R	19-04-1933	653.03
15	Kundil Kalia R.F.	For/Sett/87/64/11	14-12-1966	7287.44
16	Kukuramara R.F.	1246 R	26-05-1924	365.18
17	Hollogaon R.F.	1248 R	26-05-1924	371.25
18	Sadiya Station (N.B.) R.F.	For/Sett/197/68/5	19-03-1968	2331.89
19	Sadiya Station (W.B.) R.F.	1245 R	26-05-1924	965.18
20	Deopani R.F. (Forest area of Deopani RF decreased from 62,300 Acre to 5766 Acre vide Notification No. AFR.222/52/60 dt. 21.06.1956)	4168 R	14-12-1936	2333
	TOTAL OF RFs			30,902.75
1	Mohongpathar PRF	FRS.261/76/2	21.09.1977	466
2	1st Addition to Duarmarah PRF	FOR/SETT/442/66/6	02.08.1966	11.3
3	Talpathar PRF	FRS.300/74/2	27.08.1974	170
4	Dibang valley PRF	FRS.109/89/17	01.07.1981	3605
	TOTAL OF PRFs			4252

Total forest area (RF+PRF) is 35,154.75 Ha. There are 20 (Twenty) Reserve Forests and 4 Proposed Reserve Forests in Doomdooma Division as mentioned in table 2.1. The proceeding of declaration of the Reserve Forests is not complete though the DFO concerned took up the pending issue with the Forest Settlement Officers/Collectors concerned a number of times.

It may be noted that a Supreme Court case in O.S no. 1/1989 is going on against Arunachal Pradesh and the boundary of following Reserve Forests falling at the Inter State border is not yet settled:

1. Sadiya Station RF (North Block) declared during 1968,
2. Kundil Kalia RF declared during 1966,
3. Deopani RF declared during 1936,
4. Buridehing RF declared during 1930.

On the other hand, the NEFA was declared as Union Territory area during 1972 and granted Statehood during 1987. The above Reserve Forests were constituted much before creation of NEFA. The matter of boundary dispute is still sub-judice in the Hon'ble Supreme Court. Once the said case is over and boundary dispute is settled, the areas will be accessible and ground truthing has to be done for all the 20 Reserve Forests to rectify the difference of 2,643 Ha arising out of digitization of the notified boundaries. In many cases, the digitized areas of the Reserve Forests are found to be more than the Notified data published in Gazette Notification. Hence, the digitized data given by NESAC can not be considered as 'Final'. The ground truthing and possible boundary correction has to be done within two years before the ejection/ self rehabilitation of the encroachers. The period to be covered during this Working Plan is intended to be for 10 years starting from 2021-2022 to 2030-2031.

2.2 Forest area under different Working Circle: 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 circle chapters in Volume 1 Part II of the working plan. Figure 2.2 shows the map of the working circle.

Table 2.2 Statement showing allocation of forest areas (Ha.) under the RFs into different working circles

Range_Name	Name	Compnt	Area (Ha)	Hollong Reg WC	Plantn WC	JFMC WC	NTFP WC
Sadiya	Deopani	1	571.61	155	85	330	60
	Deopani	2	270.56	245	0	150	70
	Deopani	3	246.58	105	65	100	-
	Hollogaon	1	318.08	30	200	80	15
	Sadiya Station	1	807.34	315	200	250	50
	Sadiya Station	2	1525.94	75	70	670	80
	Kundil Kalia	1	231.43	40	35	180	120
	Kundil Kalia	2	481.11	80	135	90	40
	Kundil Kalia	3	428.24	70	170	200	140
	Kundil Kalia	4	672.37	95	160	400	130
	Kundil Kalia	5	389.24	50	115	-	-
	Kundil Kalia	6	641.44	140	110	400	140
	Kundil Kalia	7	613.03	60	95	250	90
	Kundil Kalia	8	617.23	230	195	120	50
	Kundil Kalia	9	805.79	180	285	200	30
	Kundil Kalia	10	1166.47	155	135	800	40
	Kundil Kalia	11	1247.12	40	60	800	100
	Kukuramara	1	465.10	25	215	150	20
	Saikhowa	Kumsong	1	148.95	-	-	100
Kumsong		2	147.49	-	-	140	10
Kumsong		3	570.72	20	10	480	50
Kumsong		4	498.04	30	-	450	60
Kumsong		5	265.38	90	140	30	-

	Kumsong	6	355.33	110	60	150	40
	Mechaki	1	148.25	100	0	20	10
	Mechaki	2	193.53	100	80	-	-
	Mechaki	3	408.37	180	200	20	-
	Mechaki	4	392.03	120	160	100	20
	Hahkhati	1	673.54	340	230	110	50
Doomdooma	Hollonghabi	1	647.83	-	-	645	10
	Philobari	1	310.47	100	160	85	60
	Tokouwani	1	541.66	210	280	75	50
	Nalani	1	361.71	90	225	70	50
	Kakojan	1	280.03	20	240	30	20
	Kakojan	2	289.89	10	75	150	80
	Kakojan	3	434.61	30	380	-	10
	Kakojan	4	583.14	40	210	-	60
	Kakojan	5	725.83	100	365	200	120
Khatangpani	Burhi Dihing	1	763.76	265	450	30	20
	Burhi Dihing	2	232.96	55	150	40	30
	Burhi Dihing	3	392.39	20	350	20	-
	Burhi Dihing	4	435.52	70	205	150	40
	Burhi Dihing	5	450.19	75	160	220	90
	Duarmara	1	147.86	10	15	110	-
	Duarmara	2	215.97	35	100	75	40
	Duarmara	3	247.64	55	140	70	50
	Duarmara	4	144.25	45	90	-	-
	Tarani	1	568.78	30	0	445	50
	Tarani	2	401.66	75	35	200	50
	Tarani	3	345.25	55	260	30	-
	Tarani	4	564.72	90	290	170	30
	Tarani	5	216.77	80	120	15	10
	Lokhipathar	1	110.25	35	15	75	30
Kakopathar	Dangori	1	187.82	15	0	155	30
	Dangori	2	536.74	190	70	200	40
	Dangori	3	329.21	110	100	120	10
	Dumduma	1	306.04	220	65	50	30
	Dumduma	2	246.45	25	50	50	-
	Dumduma	3	387.09	55	255	40	20
	Dumduma	4	615.12	10	490	50	-
	Dumduma	5	145.26	55	30	40	20
	Dumduma	6	417.47	90	130	150	40
	Dumduma	7	374.96	90	75	100	40
				5635	8790	10630	2565

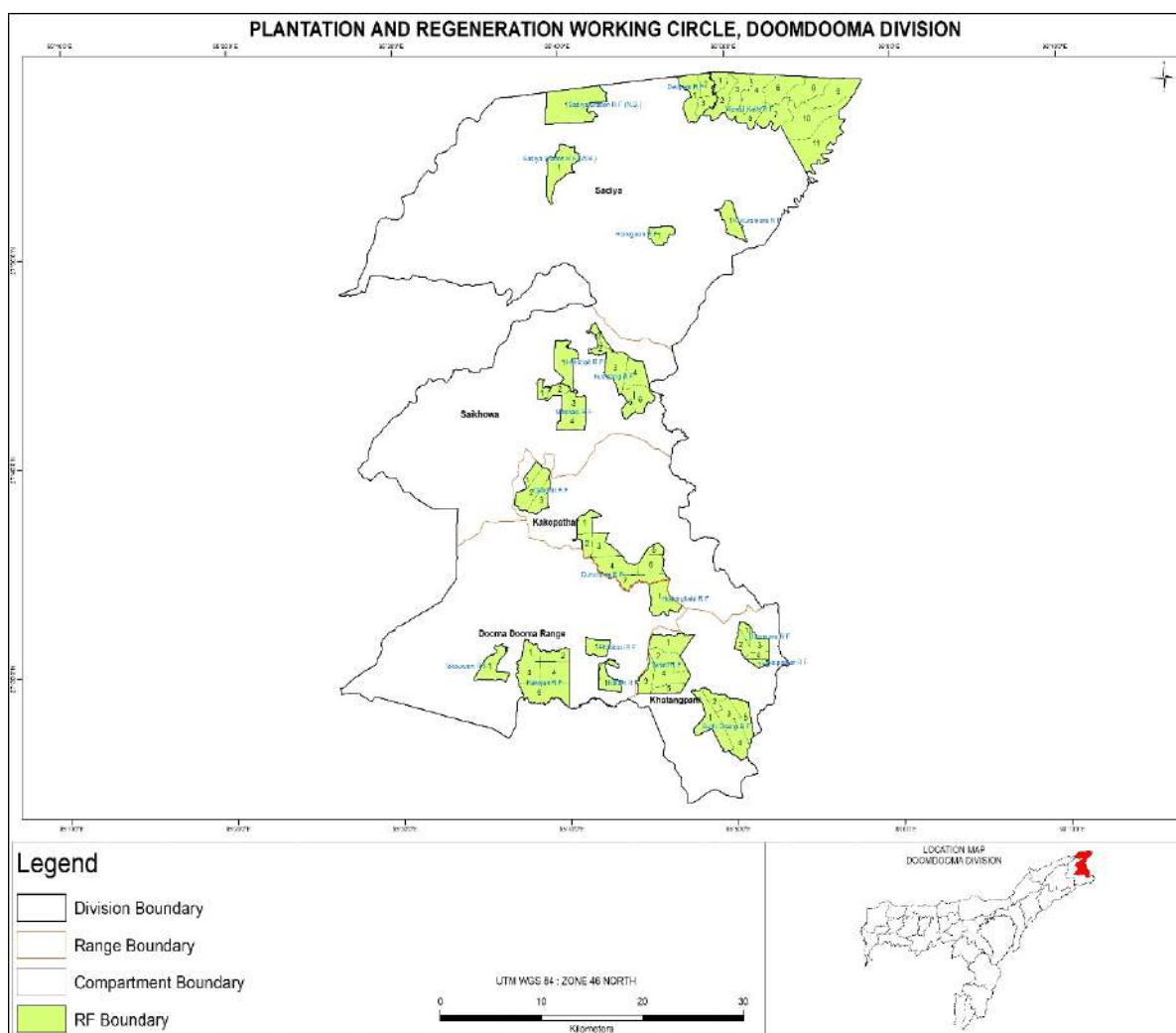


Figure 2.2: Working Circle map with compartments of Doomdooma division.

2.3 Percentage of forest: The boundary of the Doomdooma Division is disputed with Arunachal Pradesh and the matter is 'Sub Judice' in the Hon'ble Supreme Court. Four RFs such as Sadiya Station(NB), Deopani, Kundil Kolia and Buri Dehing share the inter-state boundary with the neighbouring state. Records reveal that some of the inter-State border areas occupied by Arunachalis during 1964-65 and later on by Assamese people before 1980. As such, the boundary could not be finalized and remained disputed leading to further encroachment. Apart from these four RFs , other fifteen RFs are partially and the Hollonghabi RF is wholly encroached . All the four PRFs are also fully encroached . The consolidation of the boundary with permanent RCC pillars was proposed under CAMPA scheme but the present boundary of the RFs and PRFs is not fully secured though there is natural and artificial boundaries of 447.11 km. which is shown in table no. 2.3. The percentage of forest with secured boundaries is 50% as many areas have recently been brought under afforestation with fencing. The entire artificial boundaries of the Reserve Forests are regularly inspected, except in the northern limits of the Sadiya Station RF (North Block), Deopani RF and Kundil Kalia RF, where the boundaries of the RFs coincide with the interstate boundaries with Arunachal Pradesh.

Table 2.3: The length of natural and artificial boundaries of the RFs of Doomdooma Division.

Internal		External		Total (km)
Natural (Km)	Artificial (Km)	Natural (Km)	Artificial (Km)	447.11
Not maintained	Not maintained	112.45	334.66	

2.4 Land use, land use change and forestry (LULUCF): The land use and land use change in forests was assessed and compared among two assessment base years of 2005-2006 and 2015-2016. The analysis of the data reveals that the maximum area under Wetlands and natural inlands also show massive reduction in their total land area, when assessed with respect to their base year i.e. 2005-2006 (Please refer Figure 2.4a). Due to increase in grazing activities, the area under grasslands and grazing lands has also reduced significantly. There has been an overall improvement in forest cover in Doomdooma Division. Forest in all three categories has improved over the past decade. Evergreen/Semi evergreen forest cover has improved from 17,259.3 ha in 2005-06 to 18,558.9 ha in 2015-16. Scrub forest and tree clad area have increased by 1239.63 ha and 464.676 ha, respectively.

Owing to increase in population, urbanization and industrialization, there is an ever increasing demand of land to cater the requirements. As a result, significant area under forest has been transformed to build up areas for both rural and urban settlements. Due to increase in agricultural practices, the area along the forest fringe has also witnessed major shift. Due to anthropogenic pressure, the areas under forests have also significantly deteriorated. LULCF in the division is shown in Table 2.4.1a and Land Use Land Cover Change Matrix of Doomdooma Division is shown in Table 2.4.1b. LULC area details are provided in Annexure 3.

Table 2.4.1a: Land use and land use change in forests of Doomdooma division in 2005-2006 and 2015-2016 assessment.

Land use, land use change and forestry (LULUCF)	2005-2006	2015-2016	Change in landuse (Ha.)
Agriculture Cropland	54305.94	34506.38	-19,799.56
Agriculture Palntation (Tea garden)	27758.23	29029.01	1,270.78
Built-Up	318.96	1219.46	900.51
Forest-Evergreen/Semi evergreen	17259.31	18558.89	1,299.58
Forest-Scrub Forest	1209.28	2448.91	1,239.63
Forest-Tree Clad Area	40928.14	45574.81	4,646.67
Grassland & Grazing land	11258.47	14941.53	3,683.06
Wasteland	0	3348.53	3,348.53
Waterbodies	13744.32	13376.56	-367.75
Wetlands	8459.78	12238.34	3,778.55
Grand Total	1,75,242.4	1,75,242.4	

Table 2.4.1b: Land Use Land Cover Change Matrix of Doomdooma Division.

2005-06											2015-16
Land Use Land Cover Class	Agriculture Cropland	Agriculture Palntation (Tea garden)	Built-Up	Forest-Evergreen/Semi evergreen	Forest-Scrub Forest	Forest-Tree Clad Area	Grassland & Grazing land-Temperate/Sub tropical	Waste land	Water bodies	Wetlands	Grand Total
Agriculture Cropland	32766.1	1499.1	277.9	239.2	1561.3	4486.8	2105.0	1854.2	589.4	8927.0	54305.9
Agriculture Plantation (Tea garden)	139.5	24616.9	327.0	14.2	0.7	2620.0	1.8	14.9	6.0	17.1	27758.2
Built-Up	0.3	3.4	315.1			0.0			0.2		319.0
Forest-Evergreen/Semi evergreen	58.3	311.3	1.4	15789.4	294.1	177.9	202.3	2.9	372.2	49.4	17259.3
Forest-Scrub Forest	11.9			1018.4	54.3	0.3	62.4	25.6	36.4		1209.3
Forest-Tree Clad Area	710.2	2298.8	49.8	344.4	116.6	36890.3	81.4	118.4	112.5	205.7	40928.1
Grassland & Grazing land	274.4	128.9	138.6	993.3	39.3	697.1	7289.0	275.9	1259.1	162.8	11258.5
Waterbodies	194.6	40.2	6.6	126.0	17.1	184.7	2540.1	44.6	10544.1	46.3	13744.3
Wetlands	351.1	130.3	102.9	33.9	365.6	517.7	2659.5	1012.1	456.6	2830.1	8459.8
Grand Total	34506.4	29029.0	1219.5	18558.9	2448.9	45574.8	14941.5	3348.5	13376.6	12238.3	175242.4

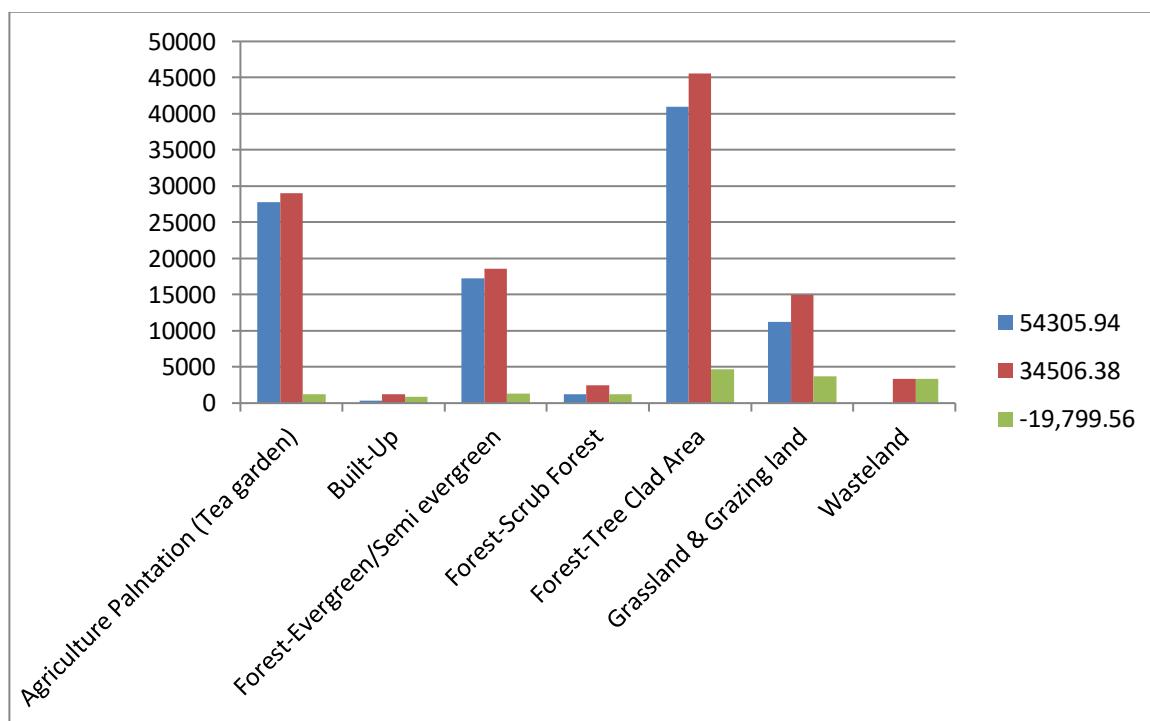
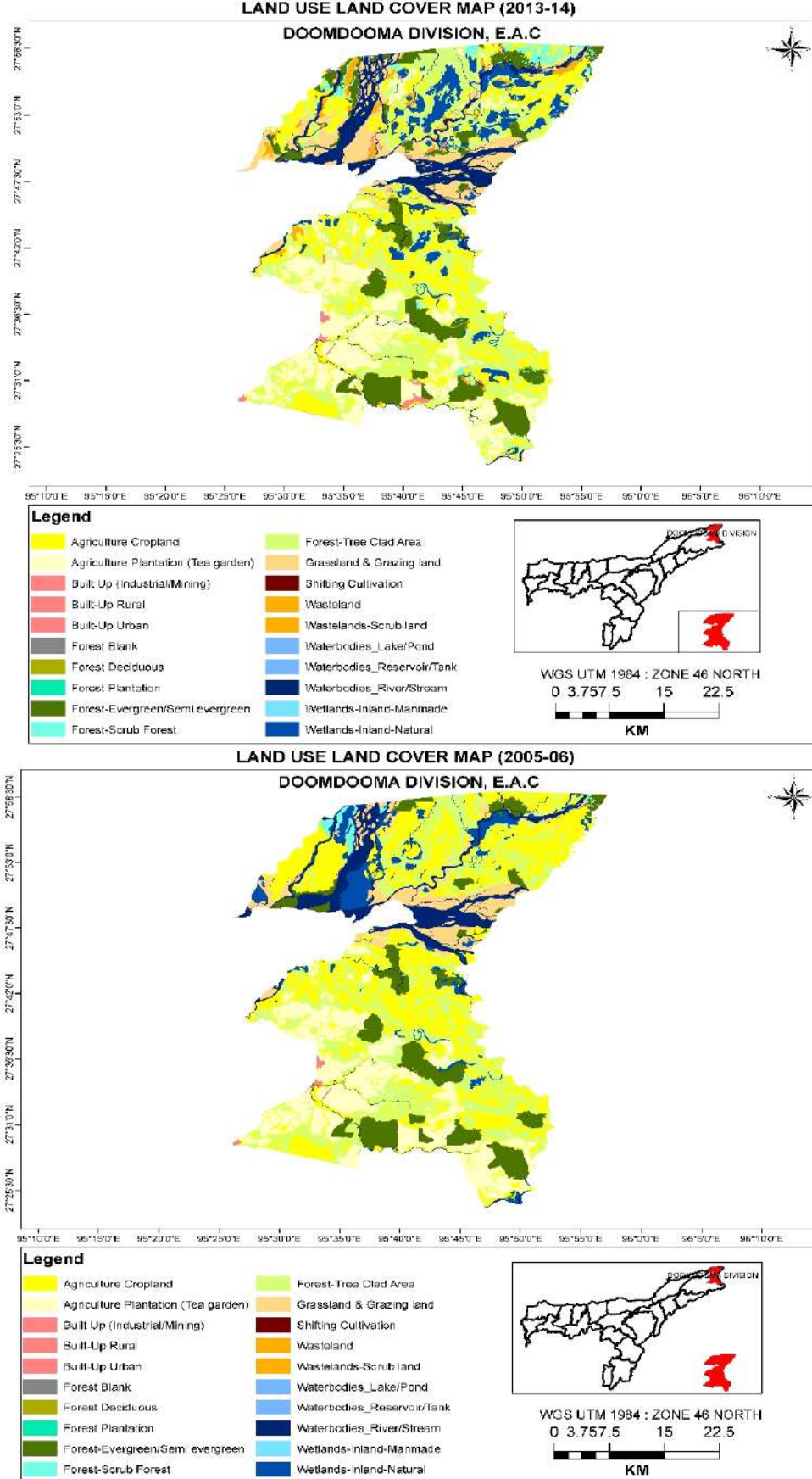


Figure 2.4.1a: Graph showing extent of changes (Hectares) in LULUC detected between 2005-2006 and 2015-2016 at Doomdooma Division.

Figure 2.4b: Land Use Land Use Cover Map of Doomdooma Divisio in 2005-2006 and 2015-2016.



2.4.1 Status of encroachment: Reserve Forest lands are susceptible to both stray and organized encroachments. A detailed study of the encroachment problem, immediate follow up action and consolidation of the notified boundaries of all Reserve Forests in the Division, is the call of the hour.

Areas inside the notified Reserve Forests, particularly in the Northern limits of the Division whose boundaries of Reserve Forests coincide with the interstate boundary of Arunachal Pradesh, are under encroachment by local people and those from Arunachal Pradesh since early sixties. While occurrence of further such encroachment cannot be ruled out altogether, most notable of these being inside Hollonghabi, Kumsong and Mesaki R.Fs.

The total forest area of the Division under encroachment is 13,709.99 Ha (RF + PRF) which is 39.00% of the total RF and PRF area which were notified in Assam Gazette. None of the RF is encroachment free ; the Hollonghabi RF and all PRFs are fully encroached which is a serious issue.

The R.F. wise encroached area statement is shown in the table 2.4.1.a. with details of encroachment.

Table 2.4.1a: Status of encroached area Doomdooma Division, Assam

Sl. No.	RF Name	RF Area (Ha)	Agricultural Area (Ha)	Built Up Area (Ha)	Tea Gardens (Ha)	Total Encroached Area (Ha)
1	Kundil Kalia R F	7,287.44	3,156.84	186.13	0.00	3,342.97
2	Deopani R F	2333	519.22	42.46	0.00	561.67
3	Kukuramara R F	365.18	113.88	0.00	0.00	113.88
4	Hollogaon R F	371.25	19.78	0.00	0.00	19.78
5	Hahkhati R F	671.25	76.47	4.85	0.00	81.32
6	Mechaki RF	1366.8	94.96	10.09	0.00	114.05
7	Kumsong R F	2,252.63	1,262.34	164.43	0.00	1,426.77
8	Hollonghabi R F	520	466.21	160.76	0.00	626.97
9	Philobari R F	317.81	40.86	0.00	0.00	40.86
10	Dangori R F	919.83	42.79	0.86	0.00	43.65
11	Kakojan RF	2,347.26	143.59	17.21	0.00	160.80
12	Tokouwani R F	502.83	30.37	6.33	0.00	36.69
13	Nalani R F	374.68	38.11	0.90	4.68	43.69
14	Tarani RF	2,040.08	650.03	217.17	0.00	867.20
15	Burhi Dihing R F	2,295.83	94.68	5.21	153.02	252.91
16	Duarmara R F	653.03	201.35	10.83	0.00	212.18
17	Sadiya Station R F (W.B.)	965.18	578.09	105.83	0.00	683.92
18	Dumduma R F	2,881.78	228.97	18.72	1.07	248.75
19	Lokaipathar RF	105	47.89	12.21	0.00	60.10
20	Sadiya Station R F (N.B.)	2,331.89	511.45	8.37	0.00	519.82
	Total	30,902.75	8,317.87	981.35	158.77	9,457.99
	Percentage encroachment of RFs					30.60%

Table 2.4.1b: Encroachment status of PRFs of Doomdooma division.

S.No.	Name of the Proposed Reserve Forests (PRF)	Area proposed in Sq.km.	Area encroached in Sq.km.	Name of the Range
1	Mohongpathar PRF	466	466	Khatangpani
2	1 st Addition to Duarmarah PRF	113	113	-do-
3	Talpathar PRF	170	170	Kakopathar
4	Dibang valley PRF	3605	3605	Sadiya
	TOTAL 4252		4252	
	Percent encroachment of PRFs			100%

2.4.2 Diversion of Forests: The status of Forest land diverted to non-forest purpose is given in following table. The area in the Kakojan Reserve Forest has been diverted for the purpose of “Exploration of natural gas and oil” by the Oil India Ltd, Duliajan.

Table 2.4.2: Status of diverted forest land to non-forest purpose

Sl. No.	Name of RF	Total Area (Ha.)	Area Diverted (Ha.)	Year	Coordinates	GOI Letter No.	User Agency
1	Kakojan R.F.	2347.36	2.944	2006	95°37'42.94" E 27°28'54.59" N	No-3 AS.B.017/2005-SHI/5291-98 dtd. 14-03-2006	Oil India Limited. Not under operation.
2	Mesaki (MKD) PROPOSED	1366.80	3.545	-	95°38'50.90" E 27°43'23.62" N	Diversion proposal pending	Oil India Limited, already submitted to the higher authority.
3	Mesaki (MKE) PROPOSED	1366.80	2.253	-	95°41'19.67" E 27°42'43.94" N	Diversion proposal pending	Oil India Limited, already submitted to the higher authority.

2.5 Threats to the Forest

The threats to the forest of Doomdooma 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 *Eicchornia* 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: Based on the floristic composition, the Division can broadly be classified into two types (Figure 2.6). The term used in Working Plans for the first type is Hollong-Nahor forests and this type corresponds to type IB/CI- Assam Valley tropical wet Evergreen

Forest of Champion and Seth's revised classification of forest types. The second type is termed as Miscellaneous Forests. 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. The miscellaneous forests consisting mainly of deciduous types with evergreen patches occur on the lower flat lands of the Brahmaputra alluvium as well as on the Dehing alluvium.

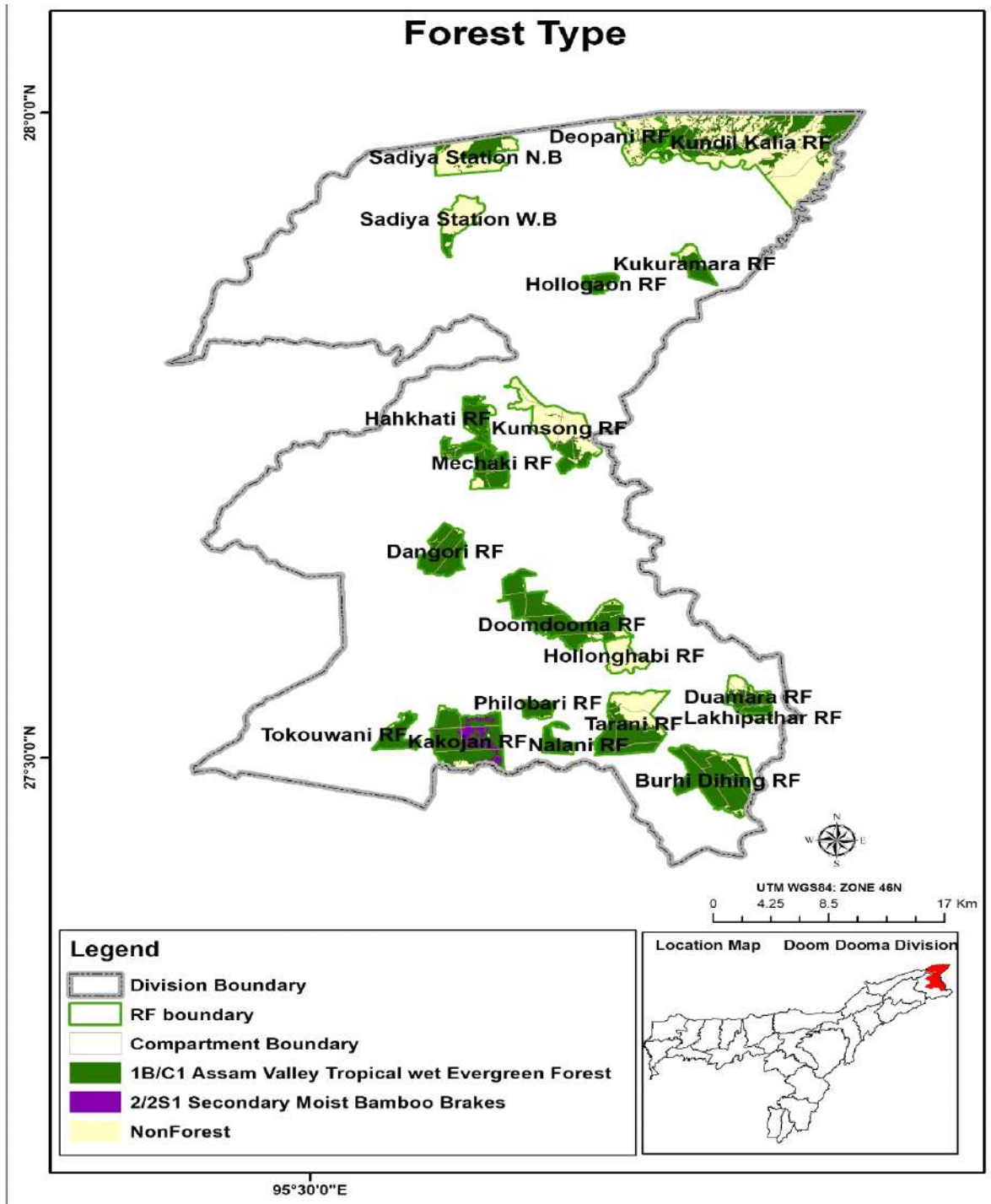
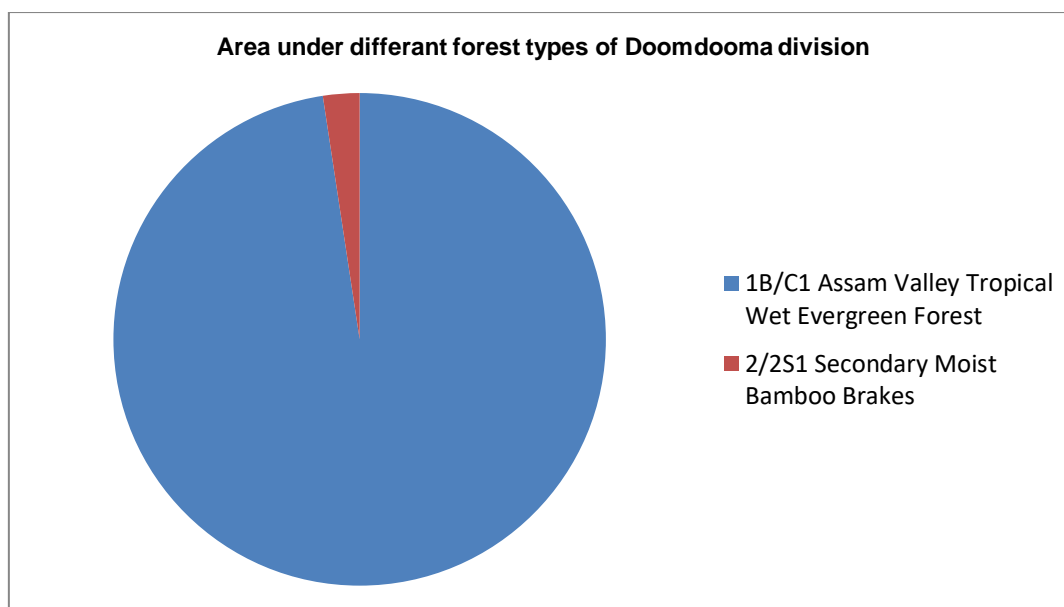


Figure 2.6: Forest types map of Doomdooma division.

2.6.1 General description of the growing stock: Table 2.6.1 shows area under the different forest types. Forest canopy density cover of the division is shown in Figure 2.6.1.

Table 2.6.1: Area under different forest types of Doomdooma division.

Forest Type	Area (Ha)
1B/C1 Assam Valley Tropical wet Evergreen Forest (Dipterocarpus)	16454.18
2/2S1 Secondary Moist Bamboo Brakes	403.64



2.6.1.1 1B/C1 Assam Valley Tropical Wet Evergreen Forest (Dipterocarpus): It is also commonly known as Hollong-Nahor Forests or Upper Assam Dipterocarpus Mesua forest, which falls under the type 1B/C1 of the Assam Valley tropical wet evergreen forest as per the Champion and Seth's revised classification of forest types. These forests extend from Hahkati, Doomdooma and Dangori Reserves of the Doomdooma Division in the east towards the Jaipur Reserve of Doomdooma Division in the South. It is represented well in Tarani, Kakojan, Buridehing, Nalani, Philobari, Duarmara & Dangori reserves.

The forest is composed of several canopy layers. The top canopy is dominated almost entirely by Hollong trees which grow upto the height of 50 mts. During field survey (sample point survey), Mekai Trees were found to be non-existent. Mekai prefers slightly higher elevations. The other species that are found to occur sporadically in the top canopy are Amari, Hollock, Sam, Jutuli, Titasopa, Sopa, Simul etc. Hollong dominates in term of the total number of stems in the top canopy.

Hollong appears to prefer well drained soil and so its occurrence gets rarer in the crop growing on flat land. Hollong tends to predominate in areas with well drained soils. The under growth is composed of woody shrubs like Cochbhedeli, Kasidoria, Osbeckia species, Sorat, etc., Sciteminous shrubs like Kaupat, Tora, Bogitora etc., Palms such as Geruga tamul, Tokoupat etc., and canes such as Jengu, Raidang, Haukabet, Lejaibet etc. Bamboos occupy the areas where the density of tree stocking is poor. The common species of bamboos found are Kako, Bojal and Dolou.

Regeneration of Hollong is found in many parts of the forest floor and the seedlings, under ideal conditions, can survive under a closed canopy. They however require thinning/tending with opening to get establishment, while regeneration of Nahor and other species is found to be promising.

2.6.1.2 Miscellaneous forests: The Miscellaneous forests can be divided into two sub-types, namely (1) Mixed deciduous forests, and (2) Mixed deciduous forests with evergreen patches. The forests are best represented in the reserves situated on the northern portion of the Division i.e. towards north to the Dangori reserve. These types fall under 3/IS2 and 4D/SSI as per Champion and Seth's revised classification, The Reserve Forest represented by the second type are Kumsang, Mesaki, Kundil Kalia, Deopani, Sadiya Station, Kukuramara, Hollogaon, Lokaipathar, Torani, Kakojan etc.

According to the topography of the area, the crop varies in composition. In higher lands not subjected to flooding, Nahor becomes predominant in the top canopy. The other species that are found in association with this are Jutuli, Sopa, Outenga, Jabahingori, Hilikha, Urium etc. In such areas Nahor regeneration is also found in considerable proportions.

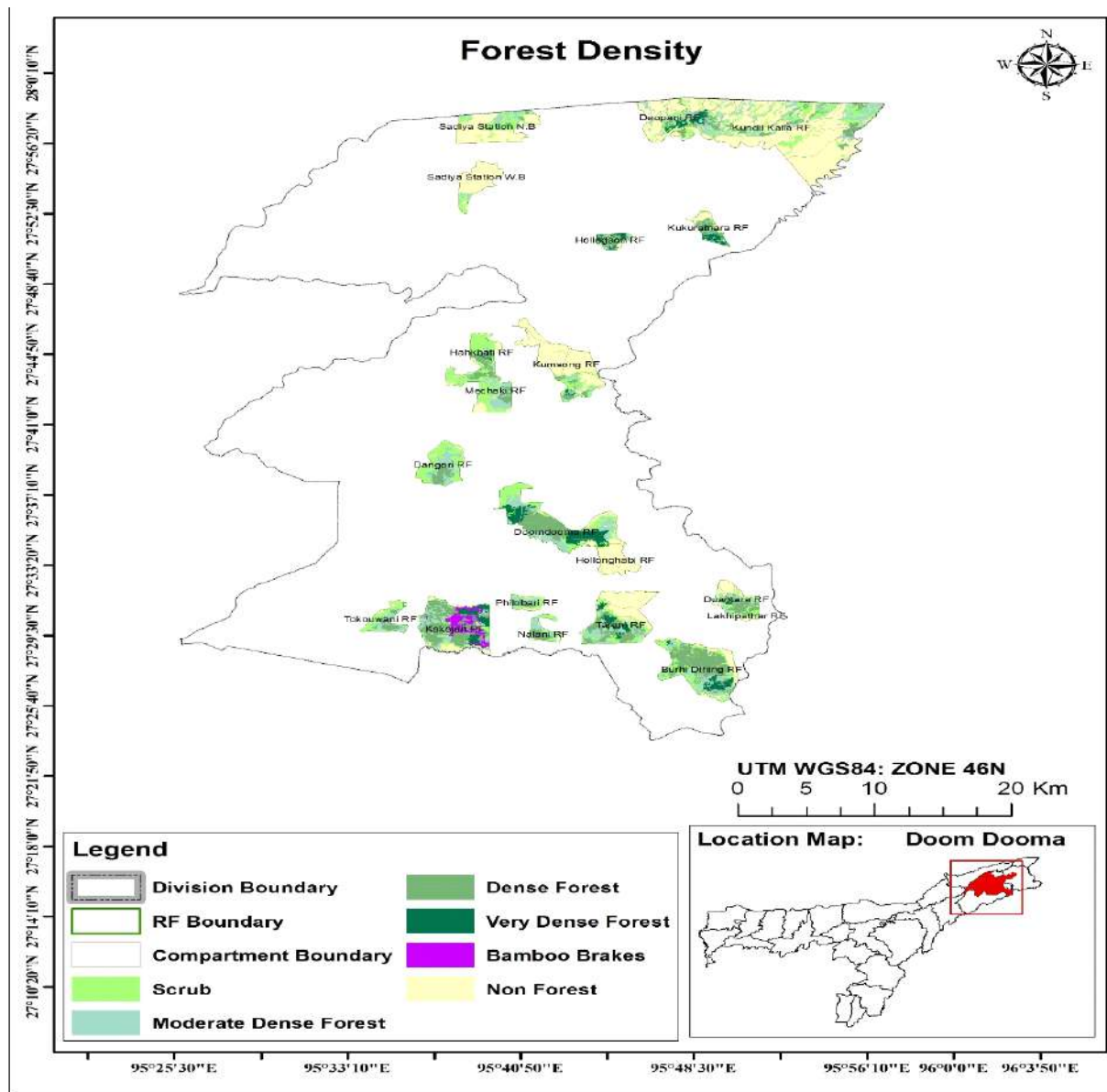


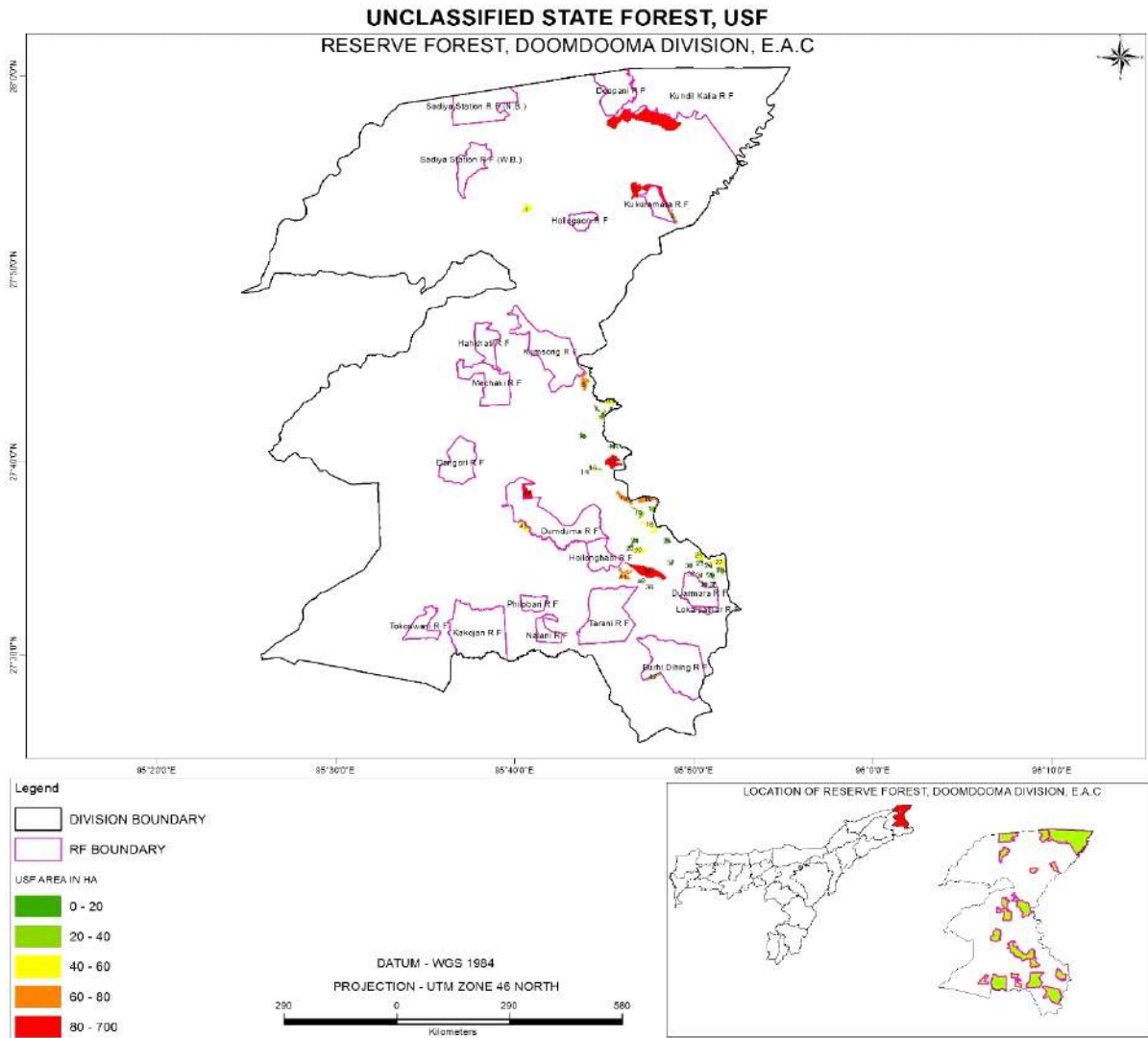
Figure 2.6.1: Forest canopy density map of Doomdooma division.

The lowlying areas of the reserves carry a poor type of forest with predominant species like Urium and Outenga. The other species found to occur are Ajhar, Nahor, Jamuk, Hingori, Morhal, Bhumura etc. The density of stocking is also very poor in these reserves. Swamps and grasslands occupy a large area in these forests. Along the edges of the swamp's Jatibet occurs and grasses such as Nal and Khagori grow along the riverbanks. The undergrowth in these forests are composed of Dhopattita, Dighloti, Cochbhedeli, Bonposola, Sorat, Patidoi, Koupat, Lajaibet, Jatibet etc. Patidoi is the most common undergrowth under Outenga forests. The incidence of climbers is also heavy, commonly affected are the species of Acacia, Ficus, Vitis etc. Regeneration of important species like Nahor and Hollong is prominent, brought about by strict protection and reduction of biotic interference.

2.7 Tree cover outside forest area: The methodology adopted by Forest Survey of India (FSI) is adopted for mapping ToF areas. The multispectral data of Sentinel 2 with spatial resolution of 10m and swath of 290 km has been used for classification of the selected grids. The sentinel satellite data is downloaded and geo-rectified with the help of Survey of India (SOI) open series map topo-sheets on 1:50,000 scale. The image is then classified into settlement, waterbodies, tree patches, agriculture and other land cover cases. This classification enables the interpreter to distinguish between tree patches and other classes. The classified image is visually analysed for editing and refinement. Since the minimum mapable area is 0.1 Ha, pixels are clumped and cluster of pixels having area less than 0.1 Ha are eliminated. After editing the classified image, the final classified map is generated having all ToF areas.

2.7.1. Tree cover outside forest area: There are homegrown species found in the revenue areas outside the reserve forest in this division. Major part of the demand of the people in terms of small timber, fuelwood, and NTFP is being met from trees growing outside forest areas. Trees are grown by people in rural areas as habitual socio-cultural practices. Though, most of the forest area is concentrated inside the notified areas of Doomdooma Division, a sizable number of trees are observed outside these forest areas. There are large number of home grown species found in the revenue areas of these districts. These are grown by people in rural areas over their land as habitual socio-cultural practices by planting fruit bearing trees like Mango (*Mangifera indica*), Jamun (*Syzygium cumini*), Jackfruit (*Artocarpus* spp), Jalpai (*Elaeocarpus serratus*), Amlakhi (*Phyllanthus emblica*), Silikha (*Terminalia chebula*) etc. along with patches of Bamboos mainly Jati, Bholuka, Bijuli and Ura or Sepa. Geocoordinates of ToF is provided in Annexure 5.

Unclassified State Forest (USF): USF areas are those patches under jurisdiction of the forest divisions, outside the reserve forests, that are above 10 hectares in area. These were delineated and mapped (see Figure 2.7.2). A total of 43 USF patches were delineated covering 2,483.81 Ha. in the division. The delineation is carried out with an attempt for a better management of USF. Delineation will help in initiating primary focus on maintenance of the flow of ecosystem goods and services for the city. Detailed areas of each USF patch and geocoordinates are shown in Annexure 6.



2.7.2 Figure 2.7.2: Map showing the unclassified state forest

2.7.3 Management of the TOF: The Division has a fair stock of forests and carbon, calculated from the ToF areas i.e. 24,762.70 Ha. The major contributing organization are the Tea Gardens. The density of the forests is highest in the G2 girth class. Very less number of trees have attained the exploitable dia. It is suggested that exploitable dia based on the earlier working plan is to be kept at 2.4 m.

2.7.4 Control of TOF: Under the Section 36 (A) and (B) of the Wildlife (Protection) Act, 1972, Conservation Reserve and Management Committees may be constituted over the Tea Gardens or in a part of them as most of the Tea Gardens were created on lease of Government owned land for a prolonged period. The Manager of the Tea Garden may be appointed as the Hony' Wildlife Warden by the State Government. Similarly, Community Reserve may be constituted covering community owned land U/S 36 (C) and (D) of the WL(P) Act. As per the Conservation Act, 1980, and the Guidelines and Rules, 2003, only 200 trees can be felled by a private individual from one hectare of such area with due permission from the authority concerned. On the other hand, the Assam (Control and Felling and Removal of Trees from Non Forest Lands) Rules, 2002, is being amended to liberalise felling restriction to grow more trees on private lands.

Slash and burn cultivation: Maps showing fire incidences due to 'Slash and burn cultivation' in the Doomdooma Division is shown in Figure 2.8.

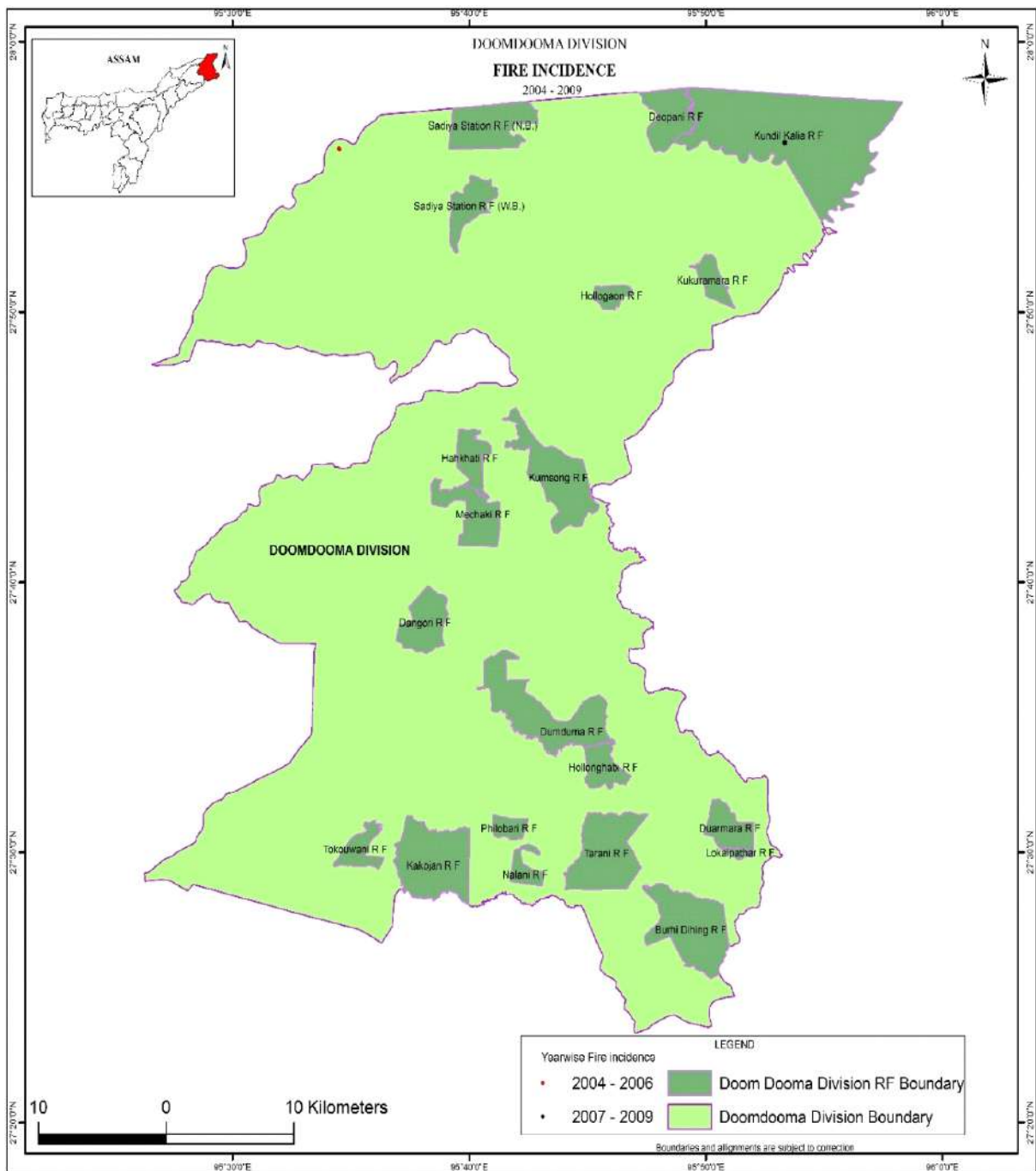


Figure 2.8: Map showing the fire incidences due to Slash and burn cultivation

CHAPTER 3

MAINTENANCE, CONSERVATION AND ENHANCEMENT OF BIODIVERSITY

3.1 Forest composition and distribution: Doomdooma Division is situated towards the eastern end of Assam. As per Champion & Seth's classification the predominant forest types are:

- a) 1B/C1 Assam Valley Tropical Wet Evergreen Forest
- b) 2/2S1 Secondary Moist Bamboo Brakes

3.1.1 Assam Valley Tropical Wet Evergreen Forest: The forest type is characterized by annual rainfall of 2,300 mm to 3,800 mm and temperatures not exceeding 32°C. Ferns are commonly present in the forest. Height of trees is generally in the range of 50-80m. The major associate species are *Dipterocarpus retusus*, *Terminalia myriocarpa*, *Shorea assamica*, *Dillenia indica* and *Artocarpus chaplasi*.

3.1.2 Secondary Moist Bamboo Brakes: This type of forest is found throughout the Semi-Evergreen and Moist deciduous forests of Tinsukia, Sibsagar, Jorhat, Doomdooma, etc. The most important is *Dendrocalamus* spp which occurs as a pure stand or as an understorey in open tree forest. While *Melocanna* grows best on hill slopes and well drained sites.

3.2 Plant species diversity: Based on the vegetation survey and forest inventory and compartment description, a summary of important trees and other species found in the area with their floristic composition and condition (age class, health, and quality of the trees) is worked out. The climatic condition and wide variety of physical features have resulted in the diversity of ecological habitats such as forests, grasslands, wetlands which harbor and sustain wide ranging floral and faunal species. Doomdooma forest division is rich in biodiversity. A total of 107 plant species were recorded in the sample plots. *Dipterocarpus retusus* is the dominant species. The species also recorded highest Importance Value Index (IVI: 50.2), followed by *Bombax ceiba* (IVI: 17.8) and *Bischofia javanica* (IVI: 14.8) as co-dominant species. IVI of major species is shown in Figure 3.2. Other associate species in this division were *Vatica lanceifolia* (IVI:11.05), *Terminalia myriocarpa* (IVI:10.80), *Dillenia indica* (IVI 10.48), *Castanopsis indica* (IVI:8.88), *Balakata baccata* (IVI:8.52), *Albizia lucidor* (IVI:8.44) and *Lagerstroemia speciosa*(IVI:8.00). All other species reported IVI values less than 8.00. Species wise details is provided in Annexure 7.

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

Name of Species	Total Basal area	Relative Density	Relative Frequency	Relative Dominance	IVI
<i>Aglaia spectabilis</i> (Miq.)	22.10	1.33	2.36	2.06	5.75
<i>Ailanthus integrifolia</i>	14.79	1.66	2.94	1.38	5.98
<i>Alangium chinense</i> (Lour.) Harms	0.35	0.10	0.14	0.03	0.27
<i>Albizia lebeck</i> (L.) Benth.	0.33	0.07	0.14	0.03	0.24
<i>Albizia lucidior</i> (Steud.) J.C. Nielsen	3.35	0.32	0.61	0.31	1.24
<i>Albizia procera</i> (Roxb.) Benth.	0.54	0.21	0.30	0.05	0.57
<i>Alstonia scholaris</i> (L.) R. Br.	4.67	0.28	0.61	0.43	1.33
<i>Altingia excelsa</i> Noronha	3.73	0.20	0.41	0.35	0.95
<i>Aphanarubra</i>	0.00	0.01	0.03	0.00	0.05
<i>Artocarpus chaplasha</i> Roxb.	38.18	1.44	2.36	3.55	7.36
<i>Artocarpus lacucha</i> Buchanan-	15.62	0.48	0.54	1.45	2.47
<i>Azadirachta indica</i> A. Juss.	0.81	0.10	0.17	0.08	0.34
<i>Baccaurea ramiflora</i> Lour.	3.38	1.35	2.20	0.31	3.86
<i>Balakata baccata</i> (Roxb.) Esser	40.11	2.48	3.28	3.73	9.49
<i>Bischofia javanica</i> Blume	16.47	1.40	2.13	1.53	5.06
<i>Bombax ceiba</i> L.	0.71	0.13	0.24	0.07	0.43
<i>Callicarpus macrophylla</i> Vahl	0.49	0.07	0.14	0.05	0.25
<i>Camelia caudata</i> Wall.	3.42	1.35	1.32	0.32	2.99
<i>Canarium bengalense</i> Roxb.	16.20	2.12	2.94	1.51	6.56
<i>Carallia brachiata</i> (Lour.) Merr.	0.70	0.03	0.07	0.06	0.16
<i>Casearia vareca</i> Roxb.	0.02	0.01	0.03	0.00	0.05
<i>Castanopsis indica</i> (Roxb. ex Lindl.)	31.91	4.98	4.26	2.97	12.21
<i>Celtis tetrandra</i> Roxb.	0.39	0.01	0.03	0.04	0.08
<i>Chisocheton cumingianus</i> .	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>	0.12	0.04	0.03	0.01	0.09
<i>Cinnamomum glaucescens</i> (Nees)	1.47	0.07	0.10	0.14	0.31
<i>Cinnamomum tamala</i>	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.)	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>Evodia meliaefolia</i> (Hance ex Walp.)	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

Name of Species	Total Basal area	Relative Density	Relative Frequency	Relative Dominance	IVI
<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.	0.30	0.04	0.10	0.03	0.17
<i>Garcinia xanthochymus</i> Hook.f.	0.02	0.01	0.03	0.00	0.05
<i>Gmelinaarborea</i> Roxb.	11.48	0.95	1.18	1.07	3.20
<i>Gmelina</i> sp.	1.88	0.13	0.24	0.18	0.54
<i>Gynocardiaodorata</i> R. Br.	10.77	0.82	1.11	1.00	2.94
<i>Heteropanaxfragrans</i> (Roxb.) Seem.	0.19	0.04	0.10	0.02	0.16
<i>Horsfieldiaamygdalina</i> (Wall.)Warb.	2.69	0.28	0.57	0.25	1.11
<i>Hydnocarpuskurzii</i> (King) Warb.	2.62	0.35	0.41	0.24	1.00
<i>Khasiacluneaoligocephala</i>	0.11	0.06	0.10	0.01	0.17
<i>Kydiacalcina</i> Roxb.	4.70	0.66	1.08	0.44	2.18
<i>Lagerstroemia speciosa</i> (L.) Pers.	6.90	1.03	0.61	0.64	2.28
<i>Lanneacoromandolica</i> (Houtt.) Merr.	0.90	0.04	0.10	0.08	0.23
<i>Leeaindica</i> (Burm. f.) Merr.	2.08	1.09	0.91	0.19	2.19
<i>Litsealaeta</i> (Nees) Hook. f.	0.34	0.07	0.14	0.03	0.24
<i>Litseamonopetala</i> (Roxb.) Pers.	0.04	0.01	0.03	0.00	0.05
<i>Machilusgamblei</i> King ex Hook. f.	0.59	0.03	0.07	0.06	0.15
<i>Magnolia baillonii</i> Pierre	0.29	0.01	0.03	0.03	0.07
<i>Magnolia champaca</i> (L.) Baill.	42.10	3.56	3.51	3.92	10.99
<i>Magnolia griffithii</i> Hook.f. & Thomson	5.62	0.51	0.81	0.52	1.84
<i>Magnolia insignis</i> Wall.	0.54	0.03	0.07	0.05	0.15
<i>Magnolia kingii</i> (Dandy) Figlar	0.13	0.06	0.03	0.01	0.10
<i>Magnolia pterocarpa</i> Roxb.	27.15	3.29	2.77	2.53	8.58
<i>Mallotusnudiflorus</i> (L.) Kulju&Welzen	1.29	0.35	0.37	0.12	0.84
<i>Mallotustetracoccus</i> (Roxb.) Kurz	3.70	0.76	1.18	0.34	2.29
<i>Mangiferasylvatica</i> Roxb.	2.24	0.30	0.64	0.21	1.15
<i>Mansoniadipikae</i> Purkayastha	0.52	0.08	0.17	0.05	0.30
<i>Meliosmapinnata</i> (Roxb.) Maxim.	3.50	1.23	1.25	0.33	2.80
<i>Meliosmasimplicifolia</i> (Roxb.) Walp.	1.02	0.13	0.27	0.10	0.49
<i>Mesua ferrea</i> L.	48.77	5.18	4.83	4.54	14.55
<i>Meynaspinosa</i> Roxb. ex Link	0.05	0.03	0.07	0.00	0.10
<i>Micheliaoblonga</i> Wall. ex Hook.f.	1.36	0.16	0.34	0.13	0.62
Misc	4.71	0.99	0.74	0.44	2.17
<i>Morusmacroura</i> Miq.	1.37	0.14	0.24	0.13	0.51
<i>Myristicaaugustifolia</i>	0.11	0.01	0.03	0.01	0.06
<i>Neolamarckiacadamba</i> (Roxb.)	4.86	0.45	0.64	0.45	1.55
<i>Oleadioica</i> Roxb.	2.15	0.07	0.10	0.20	0.37
<i>Oroxylumindicum</i> (L.) Kurz	0.47	0.20	0.37	0.04	0.61
<i>Phoebe cathia</i> (D. Don) Kostermans	1.29	0.27	0.37	0.12	0.76
<i>Phoebe goalparensis</i> Hutch	2.09	0.52	0.51	0.19	1.22
<i>Polygonumplebejum</i> R. Br.	0.16	0.01	0.03	0.02	0.06
<i>Premnabengalensis</i> C.B. Clarke	1.14	0.25	0.44	0.11	0.80
<i>Premnamilleflora</i> C.B. Clarke	0.11	0.01	0.03	0.01	0.06
<i>Psidiumguajava</i> L.	0.08	0.01	0.03	0.01	0.06
<i>Pterospermumacerifolium</i> (L.) Willd.	5.04	0.40	0.64	0.47	1.51
<i>Pterospermumjavanicum</i> Jungh.	0.80	0.04	0.10	0.07	0.22
<i>Pterospermumlanceifolium</i> Roxb.	0.08	0.01	0.03	0.01	0.06
<i>Pyruscommunis</i> L.	0.06	0.03	0.07	0.01	0.10
<i>Santalum album</i> L.	0.84	0.04	0.07	0.08	0.19
<i>Sapindussaponaria</i> L.	0.25	0.08	0.17	0.02	0.28
<i>Saurauiaroxburghii</i> Wall.	0.05	0.01	0.03	0.00	0.05

Name of Species	Total Basal area	Relative Density	Relative Frequency	Relative Dominance	IVI
<i>Schima wallichii</i> Choisy	28.83	8.13	1.99	2.68	12.80
<i>Shorea assamica</i> Dyer	17.26	1.17	1.32	1.61	4.09
<i>Spondias pinnata</i> (L. f.) Kurz	0.58	0.14	0.20	0.05	0.40
<i>Sterculia villosa</i> Roxb.	3.56	0.69	1.22	0.33	2.24
<i>Stereospermum chelonoides</i> (L. f.) DC	17.40	0.86	1.32	1.62	3.80
<i>Syzygium cumini</i> (L.) Skeels	3.21	0.93	1.28	0.30	2.51
<i>Syzygium jambos</i> (L.) Alston	0.49	0.06	0.14	0.05	0.24
<i>Tectona grandis</i> L. f.	1.52	0.21	0.07	0.14	0.42
<i>Terminalia bellirica</i> (Gaertn.) Roxb.	12.84	1.52	2.20	1.19	4.91
<i>Terminalia catappa</i> L.	0.11	0.03	0.07	0.01	0.11
<i>Terminalia chebula</i> Retz.	18.80	1.35	2.30	1.75	5.40
<i>Terminalia myriocarpa</i>	18.18	0.96	1.25	1.69	3.90
<i>Tetrameles nudiflora</i> R. Br.	1.79	0.07	0.10	0.17	0.34
<i>Toonaciliata</i> M. Roem.	8.72	0.76	1.45	0.81	3.03
<i>Trema orientalis</i> (L.) Blume	0.16	0.06	0.07	0.02	0.14
<i>Vatica lanceifolia</i> (Roxb.) Blume	21.37	4.66	4.09	1.99	10.73
<i>Ziziphus funiculosa</i> Buch	0.80	0.07	0.17	0.07	0.31
	1074.73	100.00	100	100	300

The forests are also rich in NTFP species such as *Tamarindus indica*, *Acacia catechu*, *Litsea glutinosa*, *Terminalia chebula*, *Terminalia bellirica*, *Syzygium cumini*, *Sterculia urens*, *Pterospermum acerifolium*, *Sapindus pinnata*, *S. saponaria*.

3.3 Status of biodiversity conservation in forests: The biodiversity of forests is declining rapidly due to land use change, climate change, invasive species, overexploitation, and pollution. These are due to the adverse affects 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 conservation of biodiversity. The strategies include –

- protection and making efforts to restore original ecosystem and halt habitat fragmentation, degradation, loss, and shrinking of genetic diversity,
- promotion of indigenous tree species in degraded areas,
- 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, and
- involvement of local communities and their livelihood development.

The Division is affected by encroachment and illicit felling, which also affects the natural habitat of the flora and fauna present in the Division. The Eastern hoolock gibbon in Hollougaon, Kukuramara and Kundil Kolia RFs are worst affected by unabated encroachment and conversion of forests and wetlands in to agriculture and human habitation. If forest conversions are not stopped, the endemic gibbons will disappear permanently and will lead to extinction of the Eastern Hollock from

Assam. The list of RET species and species under Schedule List of WPA, 1972 is provided in table 3.3.

Table 3.3: List of RET species and those under Schedule list of WPA, 1972.

S.No.	Common Name	Scientific Name	RET Category
1	Morhal	<i>Vatica lanceaefolia</i>	Critically Endangered
2	Tezpat	<i>Cinnamomum tamala</i> (Buch-Ham.) T. Nees & Eberm	Near Threatened
3	Holong	<i>Dipterocarpus retusus</i> Blume	Vulnerable
4	Doolee Champa	<i>Magnolia pterocarpa</i> Roxb.	DD (Data deficient)
5	Orchid	<i>Gastrochilus calceolaris</i>	Critically endangered
MAMMALS			
1	Pangolin	<i>Manis crassicaudata</i>	Schedule I
2	Fishing Cat	<i>Felis viverrina</i>	Schedule I
3	Gangetic Dolphin	<i>Platanista gangetica</i>	Schedule I
4	Hoolock Gibbon (Eastern)	<i>Dinopithecus leuconedys</i>	Schedule I
5	Hoolock Gibbon (Western)	<i>Dinopithecus hoolock hoolock</i>	Schedule I
6	Indian Elephant	<i>Elephas maximus</i>	Schedule I
7	Leopard	<i>Panthera pardus</i>	Schedule I
8	Leopard Cat	<i>Felis bengalensis</i>	Schedule I
9	Slow Loris	<i>Nycticebus caucang</i>	Schedule I
10	Sloth Bear	<i>Melursus ursinus</i>	Schedule I
11	Spotted Linsang	<i>Prionodon pardicolor</i>	Schedule I
12	Tiger	<i>Panthera tigris</i>	Schedule I
13	Wild Buffalo	<i>Bubalus bubalis</i>	Schedule I
14	Capped Langur	<i>Presbytis pileatus</i>	Schedule I
15	Clouded Leopard	<i>Neofelis nebulosa</i>	Schedule I
16	Assamese Macaque	<i>Macaca assamensis</i>	Schedule II
17	Rhesus Macaque	<i>Macaca mulatta</i>	Schedule II
18	Bengal Porcupine	<i>Atherurus mecrourus assamensis</i>	Schedule II
19	Large Indian civet	<i>Viverra zibetha</i>	Schedule II
20	Small India civet	<i>Viverricula indica</i>	Schedule II
21	Jackal	<i>Canis aureus</i>	Schedule II
22	Flying Squirrel	<i>Petaurista phillippensis</i>	Schedule II
23	Giant Squirrel	<i>Ratufa indica</i>	Schedule II
24	Jungle Cat	<i>Felis chaus</i>	Schedule II
25	Otter	<i>Lutra lutra</i>	Schedule II
26	Barking Deer	<i>Muntiacus muntjak</i>	Schedule III
27	Sambar	<i>Cervus unicolor</i>	Schedule III
28	Wild Pig	<i>Sus scrofa</i>	Schedule III
29	Hare	<i>Lepus timidus</i>	Schedule III
30	Fruit Bat	<i>Pteropus mariannus</i>	Schedule V
31	Mice	<i>Mus musculus</i>	Schedule V
32	Rat	<i>Rattus rattus</i>	Schedule V
REPTILES AND AMPHIBIANS			
1	Pit Viper,	<i>Trimeresurus medoensis</i>	Schedule-II (Part-II)
2	Indian Python	<i>Python molurus</i>	Schedule-I (Part-II)
3	King Cobra	<i>Ophiophagus hannah</i>	Schedule-II (Part-II)
4	Indian Cobra	<i>Naja naja</i>	Schedule-II (Part-II)
5	Asian Leaf Turtle	<i>Cyclemys oldhamii</i>	Schedule-I (Part-II)
6	Water Monitor Lizard	<i>Varanus salvator</i>	Schedule-I (Part-II)
7	Rat Snake	<i>Zamenis longissimus</i>	Schedule-I (Part-II)
8	Banded Krait	<i>Bungarus fasciatus</i>	Schedule IV
9	Black Krait	<i>Bungarus niger</i>	Schedule IV
10	Mountain Pit Viper	<i>Ovophis monticola</i>	Schedule IV
11	Fresh Water Frog	<i>Rana temporaria</i>	Schedule IV

ENDANGERED BIRDS			
1	Bengal Florican	<i>Eupodotis bengalensis</i>	Schedule I
2	Forest Spotted Owlet	<i>Athene blewitti</i>	Schedule I
3	Great Indian Hornbill	<i>Buceros bicornis</i>	Schedule I
4	Greater Adjutant Stork	<i>Leptoptilos dubious</i>	Schedule I
5	Lesser Pied Hornbill	<i>Anthracoceros albirostris</i>	Schedule I
6	Fish Eating Eagle	<i>Pandion haliaetus</i>	Schedule I
7	White Winged Wood Duck	<i>Cairina scutulata</i>	Schedule I
8	Hill Myna	<i>Gracula religiosa</i>	Schedule I
9	Long Billed Vulture	<i>Gyps indicus</i>	Schedule I
BUTTERFLIES			
1	Common gem	<i>Poritia hewitsoni</i>	Schedule II
2	Yam fly	<i>Loxura atymnus</i>	Schedule II
3	Sullied sailor	<i>Neptis soma soma</i>	Schedule I
4	Peablu	<i>Lampides boeticus</i>	Schedule 1

3.4 Status of species prone to over exploitation: Un-sustainable harvesting of forest produce/ NTFPs is strictly banned in Doomdooma Division. Villagers collect Jengu leaf, Tokoupat, Canes and bamboos including rhizomes, ferns, bhatghila etc., though such collection is illegal. These are the species prone to over exploitation. If steps for regeneration of these species are not taken in future, it could lead to serious decline of the biodiversity.

SI.No.	CommonName	Scientificname	Use
1	Bhatghila	<i>Oroxylum indicum</i>	NTFP
2	Bet, Cane	<i>Caluamus spp.</i>	NTFP
3	Bamboo		NTFP
4	Fern	<i>Diplazium esculentum</i>	NTFP
5	Jengu leaf	<i>Licuala peltata</i>	NTFP

3.5 Conservation of genetic resources: There are no preservation plots, sample plots, medicinal plants conservation areas, or community conservation areas, etc., in Doomdooma Division; genetic diversity has not been documented or monitored through research studies.

3.6 Fauna and their habitats: The Doomdooma town is famous as *Cha Nagar*- meaning 'Abode of Tea Gardens', as sprawl of such gardens surround the Division. 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 Mahseer, Rohu, Bahu etc. The Brahmaputra River is an excellent habitat of Gangetic Dolphin (Hihu), a critically endangered mammalian species whose world population is only 2200. There is a great potential to constitute a Sanctuary from the eastern boundary of the Dibru Saikhowa National Park to the Tengapani River (Border of Assam-Arunachal) to secure the survival of this critically endangered mammal. The distance from the Dibru Saikhowa NP to the inter-state border is about 30 kms and considering 10 km width of the Brahmaputra River, this 250-300 sq. km. stretch of riverine habitat is waiting for such recognition. Navigation on the Brahmaputra River can be regulated once this stretch is declared as a Protected Area. Further, sporadic incidences like poisoning, blasting,

electrocution, netting, etc. to catch fish can be legally dealt with. The existing Fish Mahals can be gradually withdrawn considering the immense value of the River Eco System. The Bhupen Hazarika Setu (Dhola-Sadiya bridge) was opened for public use on 26th May, 2017. The pollution caused by 250 number of wooden boats were withdrawn which gave a respite to the Dolphin population and a chance to increase their population. Simultaneously, employment to several hundred people will be generated alongwith promotion of ecotourism. Motivating the fishing community and otherwise providing engagement to the boatmen and their families will be of great help in nature conservation. Navigation (Regulated) itself is a means of surveillance and an item like “Dolphin show” can be introduced which will be the first/one of its kind in the State. Recently due to the Outburst of Mining well at Baghjan near the Dibru Saikhowa National Park, the dolphins have moved upstream of Brahmaputra River up to Alubari of Arunachal Pradesh.

Across the River Brahmaputra lies the Hollogaon Reserve Forests. As the name indicates, this is an abode of the Hollou-the Hoolock Gibbon. The area of the Reserve Forests is only 3.71 sq. km and its adjoining areas (now villages) were an excellent habitat of Hoolock Gibbon once from which the name “Hollogaon” was possibly derived (The Assamese name of Hoolock Gibbon is Hollou). But unfortunately only a few (seven) number of this endangered species of primate is surviving in this Reserve Forests. This species is a different one called Eastern Hoolock (*Binopithecus leuconedes*) while the southern population is the Western Hoolock (*Binopithecus hoolock hoolock*). Similarly, the Eastern Hoolock is available in Kukuramora RF (3.65 sq.km) but with 25 Gibbons and in Kundilkalia RF (72.87 sq. km) with 100 gibbons. These habitats are extremely fragmented, hence vulnerable and possibly these small populations will become locally extinct due to heavy biotic pressure such as non-availability of food bearing species, encroachment, felling of trees, cultivation, grazing, poaching, fishing etc. This could further lead to the extinction of the species (Eastern Hoolock) from Assam. Thus it becomes our primary duty to bring these RFs under the Wildlife Protection Working Circle, declare them as Conservation Reserve and link Hollogaon RF and Kukuramora RF constituting a Community Reserve through the villages and Revenue land lying in between so that transfer of genetic materials can take place by pairing. The NOC has already been received from the Revenue authority as well as villagers. It may also be necessary to translocate 8-10 gibbons (Eastern population) from Kundil Kalia RF to these areas to built up a healthy population. A full fledged Research hence is absolutely necessary by inviting Research Scholars from Universities or from Research Institutes. India is a signatory to the SDG 2030-an UN Convention which was adopted during 2015 and the Goal no.17 envisages protection of terrrtrial ecosystems, wetlands, biodiversity and constitution of National Parks, Sanctuary, Conservtion/Community Reserve will ensure in achieving this goal.

3.6.1 Dehing Patkai Elephant Reserve: The Dehing Patkai Elephant Reserve (hence forth ER) was notified on 17.04.2003 with an area of 937 sq. km covering Doomdooma, Sivasagar and Tinsukia District of Assam. The Forest Divisions involved are Doomdooma, Digboi, Doomdooma, Sivasagar and Jorhat. The ER extends up to Aruanchal Pradesh border. The Reserve Forests of Doomdooma Division that fall under the ER are Kakojan, Tokawani, Nalani, Torani, Philobari, Duarmora and Buridehing. The elephant habitat over these areas is highly fragmented. The isolated Reserve Forests surrounded by tea gardens and paddy fields facilitate movement of the pachyderms. The Kakojan

Reserve Forests has excellent forests and uninterrupted movement of elephants has been taking place through Upper Dehing RF (East Block) from centuries. Illegal felling and cultivation has cropped up gradually in these RFs except Kakojan. The RFs need to be reclaimed immediately and adequate protection measures must be provided to the elephants and their habitat. There is a small water body inside the Kakojan RF developed due to excavation of earth for establishing a mining well by Oil India Limited. The elephants are observed enjoying their bath for a considerable period in this water body which is to be enlarged by artificial means for giving a natural look. The mining well is not under operation.

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. Varieties of migratory birds visit the water bodies located along the river Brahmaputra during winter season. The Dangori & Doomdooma Reserve Forests are known world wide as the habitat for Deoanh "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. Thus another Sanctuary in the name and style as "Doomdooma -Dangori Wood Duck Sanctuary" is proposed. 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 particularly in Kakojan and Buridehing R.F.s throughout the year. However, during the winter season, herds of wild elephant raid crops, destroy other property and even cause death to human and cattle. Tiger sighting is rare. Hoolock gibbon commonly seen in Kakojan, Hollogaon, Dangori, Doomdooma and Tarani R.Fs. Similarly, sightings of Slow Loris are also common. During patrolling, the officers and staff of Doomdooma Division have recorded more than 100 elephants on the northern side of Brahmaputra River and 200 over these Reserve Forests of the ER. Big-Cat census was conducted under this Division during March 2000 recorded 1 female tiger, 6 male Leopards, 8 female leopards and 3 cubs are present in the RFs. Statement showing fauna and their habitats/microhabitats in Doomdooma Division is shown in Table 3.6.2a and potential areas for wildlife conservation is shown in table 3.6.2b.

Table 3.6.2a: Statement showing fauna and their habitats in Doomdooma Division, Assam.

S.No.	Name of the species	Habitat / microhabitat	Area (km ²)	Remarks
1	Deoanh (White winged Wood Duck)	Dangori RF, Doomdooma RF, Hollogan RF, Kukuramora RF, Buridehing RF, Hahkati RF, and Kakojan RF	100	It is extremely important to bring these areas under the Wildlife Protection Working Circle with an aim to upgrade it into Sanctuary, Conservation and Community Reserve.
2	Leopard (<i>Panthera pardus</i>)	All the RFs of the division	300	
3	Elephant (<i>Elephas maximus</i>)	Kakojan RF, Nalani RF, Torani RF, Philobari RF, Tokowani RF, Duarmara RF, Buridehing RF, and North of Brahmapura River	-	
4	Hoolock Gibbon	Eastern Population Hollogaon RF, Kundil	-	

		Kolia RF, and Kukuramora RF. Western Population Kakojan RF, Dangori RF, Doomdooma RF, Nalani RF, Buridehing RF and Tarani RF		
5	Gangetic Dolphin	Brahmaputra River	300	Sanctuary

Table 3.6.2b: Potential areas for wildlife conservation in Doomdooma Division, Assam.

Name of Range	Name of R.F.	Area (Ha.)	Toposheet	Remarks
Kakopathar Range	Doomdooma	2880.0	83 M/10 & 83 M/14	Comp. No. 1,2,3,8,9,10,11 and 12 comprising 1394.15 Ha. will be proposed as Sanctuary for protection of White-winged Wood Duck, Hoolock Gibbon, Wild Buffalo, primates, Barking deer, leopard etc. Remaining Comp. No. 4,5,6,7 and 13,14,15 comprising 1485.85 Ha will be managed as Buffer Zone to the Sanctuary.
	Dangori	919.0	83 M/10	Entire RF will be proposed for a Sanctuary in the name and style as Doomdooma-Dangori Wood Duck Sanctuary with a total area of 2313.15 Ha or 23 Sq. km.
Doomdooma Range	Kakojan	2346.0	83 M/10 & 83 M/11	Comp. No. 11, 12, 15 and 16 comprising 563.20 Ha has been proposed as Sanctuary for the protection of Wild Elephant, Hoolock Gibbon, WWW Duck etc. Remaining Comp. No. 1 to 10, 13, 14 comprising 1699.80 will be managed as Reserve Forests.
Sadiya Range	Kukuramara	365.0	83 M/13	Entire RF is proposed as Sanctuary for protection of Hoolock Gibbon, White-winged Wood Duck etc. Both the RFs to be connected with mass planting and constituting a "Community Reserve".
	Hollogaon	371.0	83 M/13	
	Kundil Kalia	7284.0	83 M/13	Entire RF is proposed as Sanctuary for protection of Hoolock Gibbon, White-winged Wood Duck etc.
Saikhowa Range and Sadiya Range	Brahmaputra and Dibang River	300.0		To constitute the Luit Dolphin Sanctaury

3.7 Threats and challenges to wildlife: The flagship species of the Doomdooma Division is the highly endangered White Winged Wood Duck (*Cairina scutulata*), both the Western and Eastern Hoolock gibbon (*Binopithecus hoolock hoolock* and *Binopithecus leuconedes*), the only Western Ape found in India. Both are Schedule-I species of the Indian Wild Life (Protection) Act 1972 and 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 1,000. The Hoolock Gibbon is considered as an endangered animal based on the criteria A2ac, C2a (i) (Recent). The population of the Gibbons

came down to mere 5000 which was One Lakh 50 years before. This is also the prime habitat of Asiatic Elephant and part of Dehing Patkai Elephant Reserve. Elephant estimation carried out during February 2011 recorded 204 nos. of elephants. These were found in Digboi Division and almost all of them visits different Reserve Forests of Doomdooma Division periodically. Big herds totaling 100-150 and few loners visit the RFs of Sadiya Sub Division from the nearby Dibru Saikhowa National Park in the west and from Arunachal Pradesh in the East.

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 conservational importance. Some of the common birds found in the forests are the Great White Billed Heron, Lesser Adjutant Stork, Slender Billed Vulture, etc. Moreover, it is a breeding ground of different species of reptiles and invertebrates. The Forests of Doomdooma Division is classified as *Assam Valley Tropical Wet Evergreen Forests, Semi Evergreen and Moist Deciduous Forests*. They provide a safe and secured home to all living forms. The top canopy is formed by Hollong (*Dipterocarpus retusus*) and Mekai(*Shorea assamica*) forests.

There are a number of threats to the wildlife of Doomdooma Forest Division such as encroachment, extraction of minor minerals, bypass running through the ER and movement path, railway line crossing through the RFs near Rupai and Dhola, poisoning, electrocution and blasting in river Brahmaputra for fishing. Pollution, navigation in Brahmaputra, encroachment in river Chapori also poses threat to the wildlife. In addition, burning/ trampling/collection of eggs of Bengal Florican, poaching, loss of habitat, grazing, practicing agriculture in the natural Florican habitat, removal of fodder of elephants, bank erosion, high flood, fishing in wetland inside the RFs together contribute towards the depletion of wildlife as well.

Butterflies and moths were found to be the easy victims during oil mining. However, such mining in Kakojan RF is non-operational at this moment. The Mining Contract Areas for mining Minor Minerals outside the RFs are not monitored. The new National Highway (bypass) from Borhajan to Dhola and further to Sadiya, and the traffic to and from Arunachal Pradesh, will certainly disturb the movement of the wild elephants. The elephants do not cross the Tinsukia-Dhola Railway line and hence it is not a threat. On the other hand, the Tea Gardens become possible threats after sometime as elephants die due to consumption of chemicals stored in the Gardens. Electrocution case was recorded in nearby Digboi Division and such accident may happen in Doomdooma Division also due to sagging of high voltage wire. If such wires are not insulated, hoolock gibbons may also die as they are fond of swinging (Brachiation). Poisoning, blasting and electrocution by generator are the major causes of death of dolphins, fishes, reptiles, amphibians, mammals and migratory/resident birds. Navigation in the Brahmaputra River was a hazard for the survival of the Dolphin population. Navigation by 200-250 mechanized boats at Dhola considerably polluted the Brahmaputra River till opening of the Bhupen Hazarika Setu in 2017. Encroachment in river chapories is also a major threat to wildlife. These areas are to be brought under EDC once the Luit Dolphin Sanctuary is created. Similarly, Govt. approved Fisheries are to be gradually withdrawn once the area is brought under Protected Area category. Burning of grasslands for agriculture in Dibang Valley PRF (Amarpur and North of it) up to Arunachal Pradesh border has seriously depleted the habitats of Bengal florican and shelters of elephants.

Trampling of the florican habitat and collection of eggs have affected the population of the highly endangered floricans. Sporadic poaching of wild animals for meat, trapping of birds, accidental poisoning of vultures, felling of nesting trees are recorded. Illegal grazing inside forests also disturb the wildlife and reduce their fodder. Reduction of food and fodder of elephants has increased the man-elephant conflict. Continuous bank erosion, particularly by River Brahmaputra is a major threat for reducing prime habitats of wild life. High flood also sometimes leads to destruction of habitat and wildlife mortality. Illegally felled/wind fallen trees, grazing by cattle alongwith fishing incidences in wetlands inside the RFs have disturbed the White Winged Wood Duck and gibbon population considerably. The Eastern hoolock gibbon in Hollogaon, Kukuramara and Kundil Kolia RFs are very badly affected by unabated encroachment and conversion of forests and wetlands into agriculture and habitation. This will make the gibbons disappear permanently and will lead to extinction of the Eastern Hoolock from Assam.

Death due to animal attack is an indicator of anthropogenic disturbance made to wildlife habitat. Major deaths reported in Assam are from elephant, tiger and leopard. The State average annual death of human is 60 while the average annual death of elephant is 50, both recorded to be the highest in the country.

3.8 Protection and management of fauna:

3.8.1 Ongoing wildlife schemes: Under the Centrally Sponsored Scheme - "Project Elephant", fodder species have been raised within the Reserve Forests that fall under Elephant Reserves. During the year 2003-2004, 20 ha of fodder plantation were raised at Tokowani Reserve Forests and during 2004-2005, 30 ha and 10 ha fodder plantations were raised at Kakojan RF & Buridehing RF, respectively. Intensive patrolling and protection measures have been undertaken with the available resources in the division to protect the wildlife and their habitat. Mobile Protection squad involving villagers of adjoining Reserve Forests have been constituted to assist the departmental staff in containing wildlife depredation as well as to provide protection to the wildlife. Such protection squad & the 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 has been found to be very effective. Generation of data will be done through Camera Trapping method with the help of high resolution digital camera which will be placed at suitable locations. In addition, the Beat Officer concerned were asked to monitor and record the movement of wildlife, their nesting/breeding ground, depredation etc.

3.8.2 Future management proposed: Seven numbers of Reserve Forests namely Buridehing (North and South Blocks including 1st addition), Duarmara, Nalani, Torani, Phillobari, Tokowani & Kakojan Reserve Forests of this Division constituted a part of the Dehing – Patkai Elephant Reserve vide Govt. Notification No. FRW.44/2002/67 Dated 7th April' 2003. The entire area of Hollogaon and Kukuramora RF have been proposed as Conservation Reserve. Moreover, the Doomdooma-Dangori Wood Duck Sanctuary encompassing the entire area of Dangori RF and a part of Doomdooma RF with a total area of 2374.95 ha have been proposed as Protected Area. 250-300 sq km covering the Brahmaputra

and Dibang River also proposed as the Luit Dolphin Sanctuary as the Dolphin with a worldwide population of 2200 is critically endangered. It may be a part of the "Recovery Plan" of a Centrally Sponsored Project. The Mirichapori Elephant Movement Path is to be recognized as another Conservation Reserve. Constitution of these Protected Areas (PAs) will ensure effective measures for better protection of the Wildlife over this area.

3.8.3 Habitat improvement: Development of Saltlicks, waterholes, fodder development, plantation of fruit bearing species, grassland management, and preservation of snag and den trees will be ensured at least in 20 different locations during the Plan period (10 years).

3.8.4 Infrastructural development: Development of infrastructure such as construction of watch towers (2 each at Kakojan RF, Doomdooma RF, Dangori RF and Hollogaon RF); Construction of Camps at 5 different places, development of roads and bridges/culverts, procurement of darting/tranquilization equipment, procurement of vehicles (3 numbers) and mobile phones (10 numbers), procurement of arms and ammunitions, construction of cages, procurement of binoculars, camera and telephoto lens, video camera, night vision camera, camera trap, and engagement of koonkie elephant are proposed. The following measures are to be immediately taken up -

- Creation of a Conservation Reserve by covering Hollogaon and Kukuramara RFs and, linking Hollogaon and Kukuramara RFs by planting fruit-bearing species for the gibbons and declaring it as a Community Reserve under Section 36 of the Wildlife (Protection) Act, 1972. The Mirichapori Elephant Movement Path is to be recognized as another Conservation Reserve.
- Undertaking mass awareness programmes and development of eco-tourism in these areas.
- Creation of the Luit Dolphin Sanctuary over Brahmaputra and Dibang River in between the Dibru-Saikhowa National Park and Arunachal Pradesh (*Tengapani area*) and also by persuading Arunachal Pradesh authority to declare a part of the Tengapani River as such. Further, the Dibang River also can be included in the Sanctuary for protecting the diverse flora and fauna of the river and along its banks.
- Creation of a Sanctuary by covering few compartments of Doomdooma RF and the entire Dangori RF to save the few surviving White Winged Wood Duck.

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CHAPTER 4

Maintenance and enhancement of forest health and vitality

4.1 Status of regeneration: Map showing status of regeneration in the division is shown in Figure 4.1a. Reserve forest wise regeneration status of different species is shown in Figure 4.1b. Hollong regeneration is high to moderate in the openings, but with sporadically scattered mother trees. In dense areas, seeds of Hollong and other species fails to reach the ground/soil due to thick undergrowth leading to seed decay and scanty regeneration.

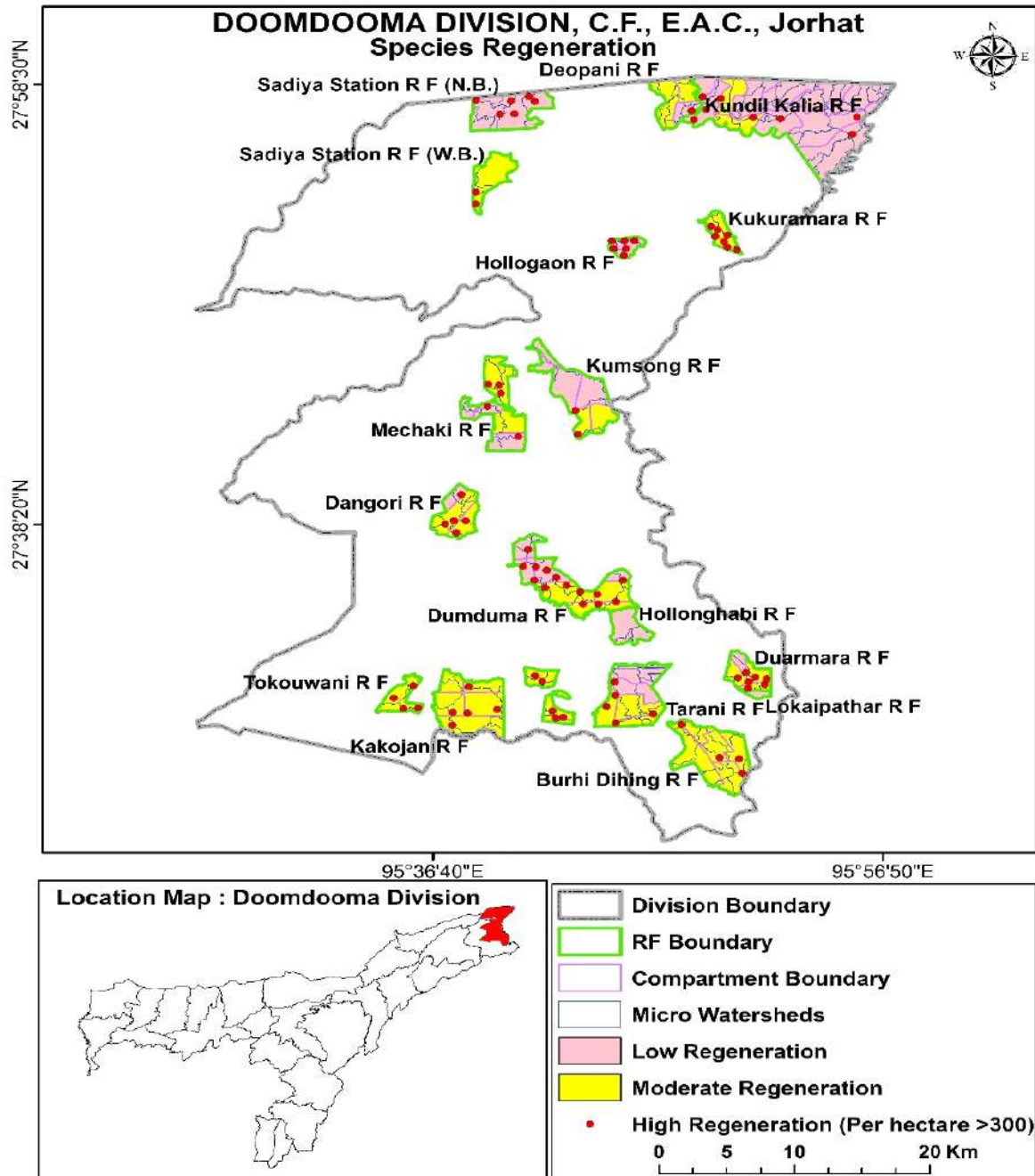


Figure 4.1a: Map showing regeneration status of species in Doomdooma division.

4.1C Table: Number of saplings/Ha. recorded in different compartments of RFs

Range	Name of the RF	Compartment No	Saplings/Ha.
Doomdooma Range	Hollonghabi R F	1	10
	Kakojan R F	1	255
		2	260
		3	273
		4	303
		5	247
Nalani R F	1	328	
Philobari R F	1	216	
Tokouwani R F	1	465	
Kakopathar Range	Dangori R F	1	450
		2	365
		3	378
	Dumduma R F	1	430
		2	470
		3	588
		4	368
		5	390
		6	595
		7	305
Khatangpani Range	Burhi Dihing R F	1	396
		2	130
		3	355
		4	115
		5	287
	Duarmara R F	1	245
		2	250
		3	393
		4	300
	Tarani R F	2	1440
		3	743
		4	320
		5	340
Sadiya Range	Deopani R F	1	180
		2	200
		3	1110
	Hollogaon R F	1	686
	Kukuramara RF	1	654
	Kundiil Kalia R F	1	520
		2	755
		3	410
		5	485
		7	520
		10	610
11	960		
Sadiya Station R F (N.B.)	1	988	
Sadiya Station R F (W.B.)	1	480	
Saikhowa Range	Hahkhathi R F	1	478
	Kumsong R F	5	353
		6	300
	Mechaki RF	2	340
		3	95
4		370	

Table 4.1D Compartment wise growing stock (cu.m./Ha.)

Name of the RF	Compt. No.	(cu.m./Ha.)	Name of the RF	Compt. No.	(cu.m./Ha.)
Burhi Dihing R F	1	50.81	Kumsong R F	5	33.23
	2	14.93		6	7.11
	3	60.42	Kundil Kalia R F	1	8.63
	4	17.48		2	35.06
	5	36.77		3	14.97
Dangori R F	1	7.74		4	10.39
	2	21.43		5	16.68
	3	38.00	6	7.82	
Deopani R F	1	1.47	7	8.27	
	2	18.67	8	13.11	
	3	74.86	9	15.00	
Duarmara R F	1	2.93	10	3.09	
	2	21.05	11	0.67	
	3	25.09	Lokaipathar R F	1	2.71
	4	27.67	Mechaki RF	1	0.70
Dumduma R F	1	23.90		2	22.40
	2	68.14		3	6.20
	3	161.41		4	40.21
	4	103.66	Nalani R F	1	94.34
	5	6.22	Philobari R F	1	34.50
	6	83.70	Sadiya Station R F (N.B.)	1	17.98
	7	26.74	Sadiya Station R F (W.B.)	1	2.06
Hahkhathi R F	1	36.85	Tarani R F	1	0.19
Hollogaon R F	1	58.44		2	37.77
Hollonghabi R F	1	0.00		3	136.16
Kakojan R F	1	43.38		4	76.83
	2	35.13		5	73.36
	3	91.38	Tokouwani R F	1	71.43
	4	31.47			
	5	44.85			
Kukuramara RF	1	35.85			
Kumsong R F	1	0.00			
	2	0.00			
	3	0.36			
	4	0.10			

Natural regeneration of Hollong is moderate in proximity of seed bearing trees and poor in openings. Regeneration success is reduced by pre and post dispersal pest attack and explicit microsite requirements for germination and growth. Weevils especially *Alicides craessus* attack fruits reducing germination percentage. Wild boars, barking deers, hog deer, sambar, and mongoose damage seeds a great deal. In addition, unabated encroachment in each Reserve Forests reduced the area under Hollong and natural germination. Hollong seeds loose viability after dispersal exhibiting low germination. Hence, only selected seeds of bigger size and more weight are to be put to polybags for maximising germination and vigorous growth of seedlings. The weight matters more in germination success and early seedling growth. Systematic tending operations will be beneficial.

4.1.1 Flagship species: In conservation biology, a 'Flagship species' is a species chosen to raise support for biodiversity conservation in a given place or social context. It can skew management and conservation priorities. Tilting the priorities towards the 'Flagship species' helps in drawing of fund, developing infrastructure, posting adequate and efficient staff etc. The 'Flagship species' in one sense

becomes ambassador, icon or symbol for a defined habitat, issue, campaign or environmental cause considered to be charismatic in character.

In Upper Assam, the Hollong (*Dipterocarpus retusus*) is the most 'Sought after' plant species considering its utility for making veneer and plywood. It is the 'State tree' of Assam found in the Districts of Golaghat, Jorhat, Sivasagar, Doomdooma and Tinsukia. It grows naturally in Assam and Arunachal Pradesh. Hollong is a sacred tree for Moran community in Assam. It is an Evergreen species and one of the tallest trees in Assam while the height reaches 150 feet and dominates the forests with its gorgeous character.

In Doomdooma Division, Hollong is found mainly in the Reserve Forests which fall south of the Brahmaputra River. The name of the RFs are Mesaki, Hahkati, Buridihing, Kakojan, Philobari Tarani, Duarmora, Nalani, Tokowani, Kumsong, Dangori, Doomdooma. On the North of Brahmaputra, they are found in Hollogaon and Kukuramora RFs.

Hollong is a large gregarious tree, trunk up to 6 mtr. in Diameter with a long cylindrical bole and a small spherical crown when mature. Flowering and fruiting takes place from January to March.

The Doomdooma Division is unique in the sense that it is the only Forest Division in Assam with two distinct species of Hoolock Gibbon- *Binopithecus hoolock hoolock* and *Binopithecus leuconedes*, the Eastern and Western population of Hoolock Gibbon. Assam, one of the seven states of Northeast region supports the highest primate diversity with 12 out of 26 primate species in India. Among these 12 species, Western Hoolock gibbon (*Hoolock hoolock*) and Eastern Hoolock gibbon (*Hoolock leuconedys*) represent the ape group in India. Habitat loss and fragmentation along with hunting have been identified as primary threats for gibbons in Assam and other Northeastern states. A number of conservation programs for Hoolock gibbon have been initiated by Aranyak and the US Fish and Wildlife Service in the state in recent past in the Doomdooma Forest Division which supports both the gibbon species. Further there is no current information regarding status of gibbon in the easternmost part of the state. From conservation perspective this gap in baseline information is very crucial because of the continuation of the area with neighboring state of Arunachal Pradesh which is another stronghold of the species. Moreover, the Assam Forest Department is interested in upgrading the potential forest pockets to wildlife sanctuary with gibbon as flagship species for conservation of gibbon along with the rich bio-diversity in the proposed study area.

4.2 Area effected by forest fire: Statement showing the area affected by fires in Doomdooma Division is shown in table 4.1.

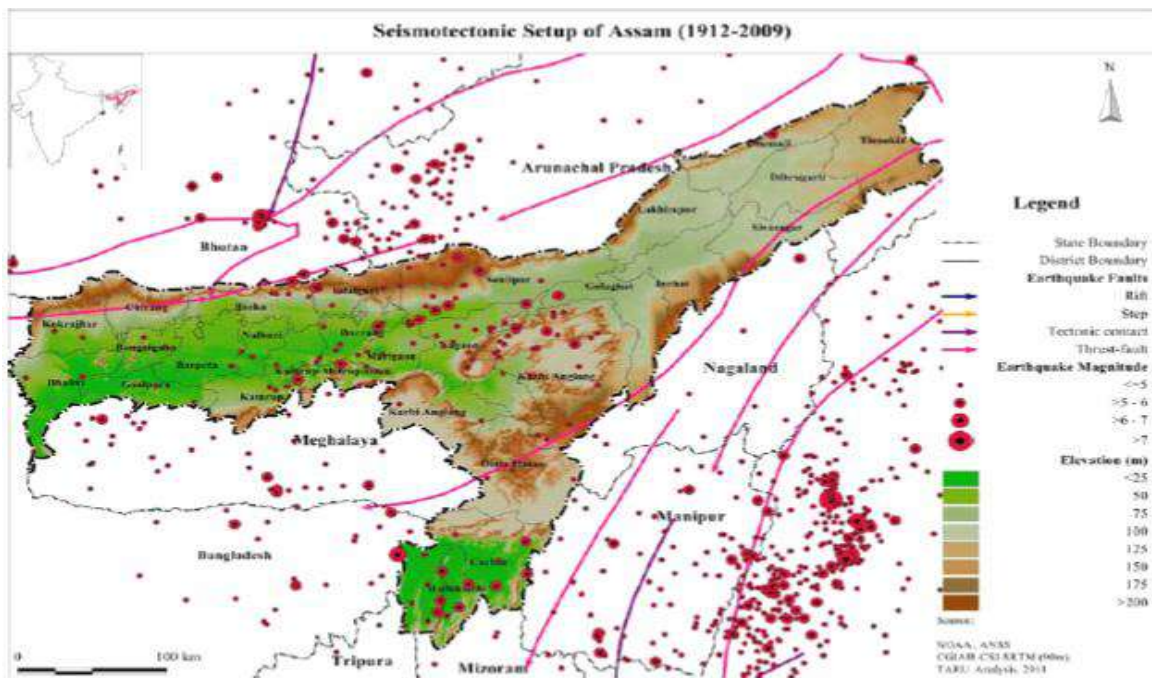
Table 4.1 Statement showing area affected by forest fire in Doomdooma Division, Assam

Location	Fire incidence date	Area (ha.)	Damages	Measures taken
Deopani RF, Comp No. 3	Nov/Dec, 2014	3.0	Damage to seedling	Appropriate measures were taken to extinguish fire.

4.3. Area damaged by natural calamities: Storms that are fairly common during the pre-monsoon period cause significant damage to the standing crop by breaking off the tops and uprooting the trees. Floods are responsible for damage to tree crop along the river banks and low lying areas.

Doomdooma forest Division falls in Tinsukia district which is situated in a riverine region, with proximity to Dihing-Patkai Range. This district experiences high amount of rainfall which causes flash floods. Erosion is a major problem as well. The major rivers flowing through the district are Brahmaputra, Buri-dihing, Na-dihing, Dirak, Dibru, Dangori, Dibang, Kundil kolia and Dhola which also experience annual floods and river bank erosion.

The whole Tinsukia district falls under the *seismic zone V* and is vulnerable to earthquakes. The whole district is on alluvial soil stratum and on the foothills of Himalayan range. The major earthquake that occurred in 1950 caused major changes in the physiographic appearance of Sadiya Sub- Division and disrupted the whole road communication network.



Source: TARU Analysis, 2011

Figure 4.3a: Seismotectonic Setup & Peak Ground Acceleration maps of Assam

4.4 Area protected from grazing: The grazing pressure is low to medium. The unproductive cattle need to be converted to hybrid to yield more milk by artificial insemination or cross breeding with Jersey or Sindhri bulls. Thus the number of cattle could be minimised while the income of the local people will shoot up. Simultaneously, fodder plantation with Napier grass and other nutritious plants will be cultivated as intercrop to encourage stall feeding. No data is yet available regarding the number of livestock grazing in the forest, availability of palatable species and pastureland, etc. for assessment of grazing pressure and potential based on socio-economic survey. The grazing pressure in the Forest area is less except in Doomdooma and Deopani RF.

4.5 Lopping practices: Lopping is an illegal act and not practiced in Doomdooma Division.

4.6 Area infested by invasive weed species in forests: The undergrowth comprises of woody shrubs like *Myrsine capitellata*, *Osbeckia* spp. *Laportea crenulata* (Sorat), Shrubs like *Phrynium*

placentarim, etc. Climbers are numerous and found profusely. Common among them are *Thunbergia grandiflora*, *Bauhinia vahlii* etc. Wherever, there is an opening *Michenia scandens* - an exotic species has invaded the forests, suppressing all shrubs and advance growth of trees and intercepting free falling seeds from reaching the ground. The invasion of weeds and climbers is very rapid with any opening in the forests and effects regeneration by swamping it out unless prompt and effective measures are taken. The greatest damage to these forests, however, caused by the climbers. When severe in intensity, climbers can, by sheer physical suffocation, kill trees outrightly. In general, when less insidious, the damage they cause to the crown development leadsto considerable loss of increment in the standing crop. The most harmful weed in Evergreen Forests is *Mikania micrantha*, also known as bitter/climbing hamp vine or American rope. It is vigorously growing perennial creeper which grows best in areas having high humidity with soil fertility. The featherlike seeds are dispersed by wind. A single stalk can produce between 20 to 40 thousand seeds in a season. In some places, Mikenia is tried as fodder to eradicate the same but that resulted in hepatic toxicity and damage of liver in dairy cattle.

Table 4.6: Status of weed (*Mikania micrantha*) in Doomdooma division.

Sl No	Location	Range	Intensity of weed infestation	Eradication measure taken and recommendations
1	Kundilkalia RF	Sadiya	Less	(1)Regular weeding is done-3/4 times in a year by engaging labour. (2)Vacancies are filled up with fresh seedlings and no blank space is left in the ground (3)The weeded Mikania can be used as medicine. Karbis use the leaf juice of Mikania as an anti dotes for insect bite and scorpion sting. They have antibacterial and antiseptic effect and used to heal wounds and bleeding. Leaves are also used to treat stomachache. Mikania green manure has been reported to increase the yield of rice in Mizoram. Application of Herbicide, Fungus or Insects as done in tea gardens are not recommended as such introduction may cause harm to bio diversity of the area. Cuscuta is a parasitic plant that suppresses the growth of Mikania. Affective Herbicide is the 2,4,D and 2,4,5, T and Paraquat. Puccinia spegazzinii is the fungus and Liothrips mikaniae is the insect used by Tea gardens as a biological means.
2	Sadiya Station (North Block)	-do-	Less	
3	Sadiya Station (West Block)	-do-	Less	
4	Doomdooma RF	Kakopathar	Less	
5	Dangori RF	Kakopathar	Less	
6	Kakojan RF	Doomdooma	Less	
7	Phillobari RF	Doomdooma	Less	
8	Nalani RF	Khatangpani	Less	
9	Torani RF	Khatangpani	Less	

4.7 Incidents of pest and diseases: Hollong is sometimes attacked by twig-borers. Hollong fruits are attacked by the weevil-*Alcides craessus* and this 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. Among the Epiphytes, *Ficus spp* is the only one that is capable of causing certain damage to the forests by spreading over trees and ultimately killing them. The incidence of *Ficus spp* is, however, not noticeable. Epiphytes of harmless nature occur profused in the evergreen forests and is a typical characteristic of these forests. 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. Insect pests of Hollong

(*Dipterocarpus retusus*) faces serious problem of poor regeneration due to various insect pests and diseases. The seeds, their periodicity, population density are badly affected by such seed insect pests. So, designing appropriate strategies to procure viable seeds for large scale plantation seems to be the top most priority of a Forester. As per published report of RFRI, Jorhat, Nine species of seven Genera of Coleoptera and Lepidoptera are on record, Seeds are preyed by 51 species (11 families) roughly classified as smaller moth, (Tortricidae, Pyralidae, Crambidae, Immidae, Sessidae, Cosmopterigidae, Scolytids and weevils. High abundance of beetle and moths damage the seeds of Hollong. *Thamnurgides monoceros* (Coleoptera) and *Enarmonia pulverula* (Lepidoptera)-both found in 100% frequency cause lot of damage to the Hollong seeds. Prevention of insect pest before germination in nursery is the best possible way. The following information is required to be kept in mind for protection of the seeds and their affective germination. The conditions which are favourable for such infestation and influx of insects, fungus, bacteria to be foiled with appropriate measures as shown in table 4.7.

Table 4.7: Plant protection measures against insect pest attack of imporntat tree species.

SI No	Species	Nature of the plant and nursery technique
1	Hollong (<i>Dipterocarpus retusus</i>)	Shade bearer in early stage, light demander in later stage. Cannot tolerate water logging, prefers sandy loam soil, better in high land-foot hill and in well drained slope, flowers in June, fruits starts ripening in the end of January to March, ripen fruits are collected from ground as they are very difficult to collect from standing tree, winged seeds are dispersed by wing, 64 seeds per KG, good seed year varies from three to six years, seed viability is low(15 days), recalcitrant (cannot survive drying and cold below 10° C), pre sowing treatment is not required, drying sowing in Polybags after removal of the wings, germination period is 8-10 days with 70% germination, fresh seeds are put to sunken bed over layer of 10cm sandy bed, covered with sand and jute regularly sprinkled until radical emerges, beds are shaded, germinated seeds are immediately transferred to polythene bags, micropyle of the seed is kept upward in the soil, germination is hypogeous (under ground)-starts after 8-10 days up to 45 days, seedlings are planted during monsoon after removing the polythene, planting is best when 25% overhead shade and 100% side shade is provided.
2	Mekai (<i>Shorea assamica</i>)	Prefers damp but rich soil, on high land, flowering from August to October, fruits ripens from Feb to March, winged, weevils (species of beetle) attack the fruits on the tree itself which are further damaged by insects and worms after falling on the ground, never seeds profusely or regularly, difficult to collect sufficient quantity of seeds, cleaning of ground before fall of the seeds is recommended, 600-1000 seeds per KG, seed viability 25 days, germination percentage 35%, pre sowing treatment not required, directly sown in to polythene bag, germination period 10-25 days, Roychoudhury (1960) recommended Bamboo Pots with both ends open instead of Polythene bags and can be planted in the field without removing the bamboo pot, natural regeneration is poor and hence the species is getting depleted in natural habitat, the saplings are heavily attacked by a species of mistletoe bug,
3	Nahor (<i>Mesua ferrea</i>)	Fruits 2.5 cm to 6.4 cm, 1 to 4 seeds, seeds are attacked by weevils, pigs, porcupines and other animals, local people collect them for burning, fruits are collected either from ground or tree, only matured fruits are to be collected, August to September, sunned until dehisce (to burst open), 230 seeds per KG, viability 4 months, germination percentage is 70%, seeds are dried in shade, seeds kept in open develop cracks and loose viability, seeds recalcitrant, during storage-seeds should be spread out under shade to examine insect attack, pre sowing treatment is not required, directly sown in polybags, germination 15 to 90 days, shade is nursery is necessary in the initial stage as the species is extremely sensitive to draught, soaking of seeds in cold water for 24 hours hastens germination, seedlings from open nurseries survive better than the seedlings raised in nurseries of evergreen forests,

4	Titachanp (<i>Michelia champaca</i>)	Prefers well drained soil and does not tolerate water logging, flowers in April-May, fruits from August to September next year by picking the fruits, branches bearing mature fruits also bear flowers of current year, seed viability is one month, good seed year in Assam is once in three years, number of seeds 12,000 per KG, germination percentage is 70%, pre-sowing treatment is not required, seeds sown in mother beds after de-pulping, germination period 10 to 45 days, seedlings are transplanted to shaded beds when they develop three leaves, planting done in next rainy season, titachanp is a good coppicing sps.
5	Amari (<i>Amoora wallichii</i>)	Shade bearer but frost tender and sensitive to fire, prefers moist area where water does not stagnant, fruits large with 3 / 4 celled capsules with milky juice when unripe. Fruits can be collected from June-July from standing trees, then sunned to open out and seeds are extracted, washed and dried, number of seeds 150 to 230 per KG, seed viability two months, germination percentage 60%, direct sowing in polythene bags keeping long axis horizontally, germination period 15 to 50 days, germination in shaded beds, young seedlings thrive better in shade when planted and regular weeding is required in the initial stage to protect from weeds.
6	Khakan (<i>Duabanga grandiflora</i>)	Semi evergreen tree with horizontally drooping branches, fruit capsule, good seed year every year, capsules are collected by lopping during March to May, dried for 2-3 days in sun and seeds are removed by gently thrashing. One KG fresh capsule gives 70-80 grams of seeds, seeds are very small and 48% of them are sterile. 50 million seeds are produced per KG, viability of seeds 3 months, germination percentage is 30%, seedling obtained per KG of seed is 15.00 Lakh, pre sowing treatment not required, seeds mixed with sand and sown in mother beds to prevent washing away during watering, germination period is 10-40 days, young seedlings are very minute requires proper care during watering, excessive watering is harmful and may lead to damping off of seedlings, raised mother beds to be prepared with shade, germination starts after 10-12 days, and for transplantation after 50-60 days and maximum germination is 80%.
7	Hollock (<i>Terminalia myriocarpa</i>)	A large evergreen tree with pendulous branch, panicle of small, pink fruits appear from October to November and ripen from end o December to January, seeds are collected by lopping and dried under shade for 2 to 3 days, number of seed per KG is 5.00 Lakh, seed viability is three months, germination percentage is 60%, pre-sowing treatment is not required, line sowing in mother beds, germination takes 10 to 35 days, epigeous, covering with thatch is required in the initial stage.
8	Dhuna (<i>Canarium strictum</i>)	A gigantic tree with fruits 2.5cm to 5.00 cm long, aromatic, stone hard, usually three seeds, flowers from Feb to April, fruits mature from Nov to January, ripen fruits are collected by lopping, seeds are dried under shade, fruits are eaten by wild animals, number of seeds per KG is 300, seed viability 18 months, pre-sowing treatment with hot water, germination period 26-140 days, seeds sown in shaded mother bed, germination up to 90%, direct sowing can be done in the field after reclaiming land from the encroachers,
9	Bogipoma (<i>Chukrasia tabularis</i>)	Evergreen tree with clean bole up to 17-20 mtr, fruits with wings, flowering April-May, fruits ripen in second week of January next year, can be collected up to March, pods collected at later stage gives better germination, seeds collected by lopping, dried in shade, each fruit has 250 to 400 seeds, capsules are opened with gentle hammering to collect the winged seeds, seeds can be collected for more than a year (at 4° C and 6% moisture), seeds per KG 90,000; seed viability 6 months, pre-sowing treatment overnight soaking in cold water, germination 7 to 35 days, direct sowing in evacuated area can be done.
10	Bola (<i>Morus laevigata</i>)	An evergreen species thrives best in alluvial well drained soil, light demander, fairly frost tender, availability of seed April-May, to be collected from branches and selected and fertile trees. Fruits are soaked in water for 2-3 days to decompose the pulp, seeds are separated by rubbing, and dried under shade, number of seeds 3,50,000 per KG, seed viability 6 months, percentage of germination 40%, pre-sowing treatment not required, seeds sown in mother beds, germination period 10-45 days, seedlings are transplanted after 2 months, after 6 months seedlings are ready for planting, stump planting is also quite successful, coppices and pollards well, growth is rapid only in the first few years, then they slowly.
11	Bonsum (<i>Phoebe</i>)	An evergreen tree with clean bole of 15-17 metres, flowers profusely in April-May, fruits aromatic, ripen fruits are just like jamun fruits in appearance and are eaten by

	<i>goalparensis</i>)	birds and animals, collected by lopping and dried under shade, over drying may lead to breaking of seed coat, seeds are recalcitrant, seed collection October-November, number of seeds 950 per KG, germination percentage 70%, pre sowing treatment overnight soaking in tap water, germination period 25-90 days, removal of the thin mesocarp is necessary before sowing of the seeds, germination is hypogeal, seedlings are ready for transplantation after 4 months, then planting after 6 months, stump planting successful to some extent.
12	Borpat (<i>Ailanthus grandis</i>)	A fast growing species, lofty evergreen tree with straight cylindrical bole, prefers deep alluvial well drained sandy loam soil, light demander and coppices well, flowers in September, fruits ripe in February-March, fruits are winged samara, insect damaged seeds are not to be collected from ground, erratic good seed year, number of seeds 1720 per KG, seed viability 7 months, germination percentage 85%, pre treatment of seed is not required, directly sown in polythene bags, germination period 25 to 120 days, direct sowing may be done in polythene bag after removing the wings, it has long period of dormancy till monsoon, shade is essential initially,

4.8 Forest degradation and its drivers: Details of forest-degradation drivers like encroachment, human habitation, practice of agriculture etc., alongwith the area description under different levels of degradation, is furnished in table 4.8.

Table 4.8. Different drivers for forest degradation

Sl. No.	Drivers, Factors responsible for forest degradation	Severe area affected	Medium area affected	Low area affected
1	Agriculture	Entire RF(Except SW) portion of Sadiya Station (WB); NW part of Deopani; entire Forests land of Hollonghabi; entire RF of Kumsong; entire forests of Kundil Kolia;	Northern and central portion of Tarani; Southern and Eastern part of Sadiya Station (NB); Northern and Eastern, western part of Hahkati, Northern and Eastern side of Kukuramara;	Northern-Western and Eastern portion of Tokouwani; Northern and Southern part of Phillobari; Northern part of Nalani; Southern, SW, NW, NE, SE part of Mesaki; Eastern, northern part of Buridehing; Western and Northern part of Dangori; Northern part of Duarmara; NE and SE part of Doomdooma; SE, NE and western part of Hollogaon; southern and eastern part of Lokaipathar; northern and southern side of Kakojan;
2	Artificial structure such as Brick kiln	--	--	Eastern part of Buridehing;
3	Encroachment and human habitation	Major portion of Hollonghabi;	NE and central portion of Tarani; Promising area of Sadiya Station (WB); Northern and middle portion of Kumsong; southern side of Kundil kolia;	Southern part of Sadiya Station(NB);Northern, NE portion of Nalani; Southern, SE portion of Mesaki; Western part of Deopani; Northern part of Duarmara; NE and SE part of Doomdooma; western part of Hahkati; NE part of Dangri; southern side of Kakojan; southern part of Lokaipathar;

4.9 Pollution control and protection of environment: Pollution of forests and environment is caused by destruction of forests due to encroachments, illegal felling of trees, setting fire to forests and other biotic interferences. If all these activities are stopped, nature will take its own course. Forests will return to normal and will be free from pollution.

CHAPTER 5

CONSERVATION AND MAINTENANCE OF SOIL AND WATER RESOURCES

5.1 Conservation and maintenance of soil and water resources: No soil and water conservation measures have been adopted so far in any part of the Division. Appropriate measures of soil and water conservation in the forest area, and their systematic documentation will be taken up during the tenure of this Working Plan. Also, restricted felling and least disturbance can result in the development of good watershed catchment areas. Microwatershed map of the division is shown in Figure 5.1. Compartment wise details is provided in Annexure 8.

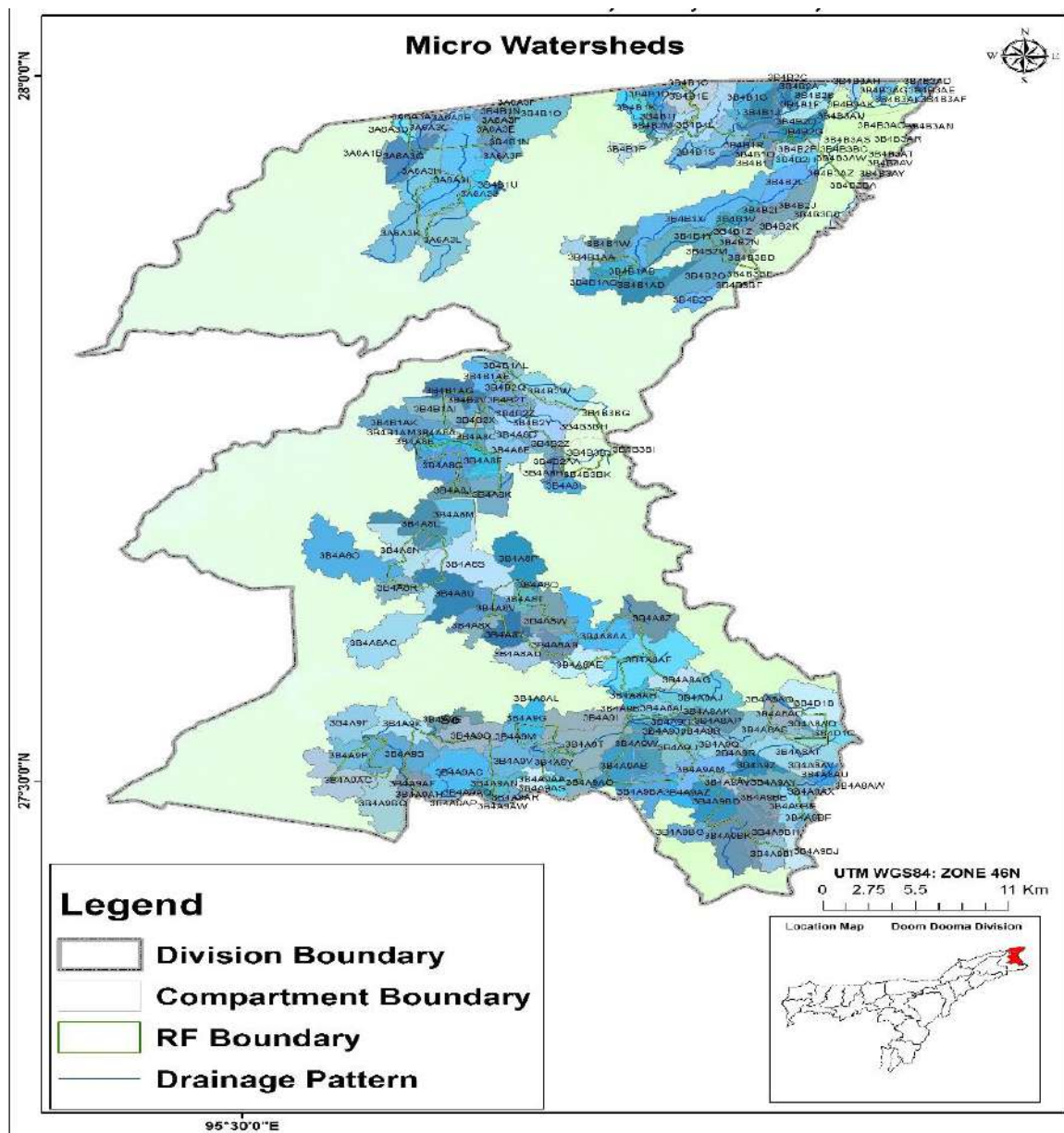


Figure 5.1: Microwatershed map of Doomdooma.

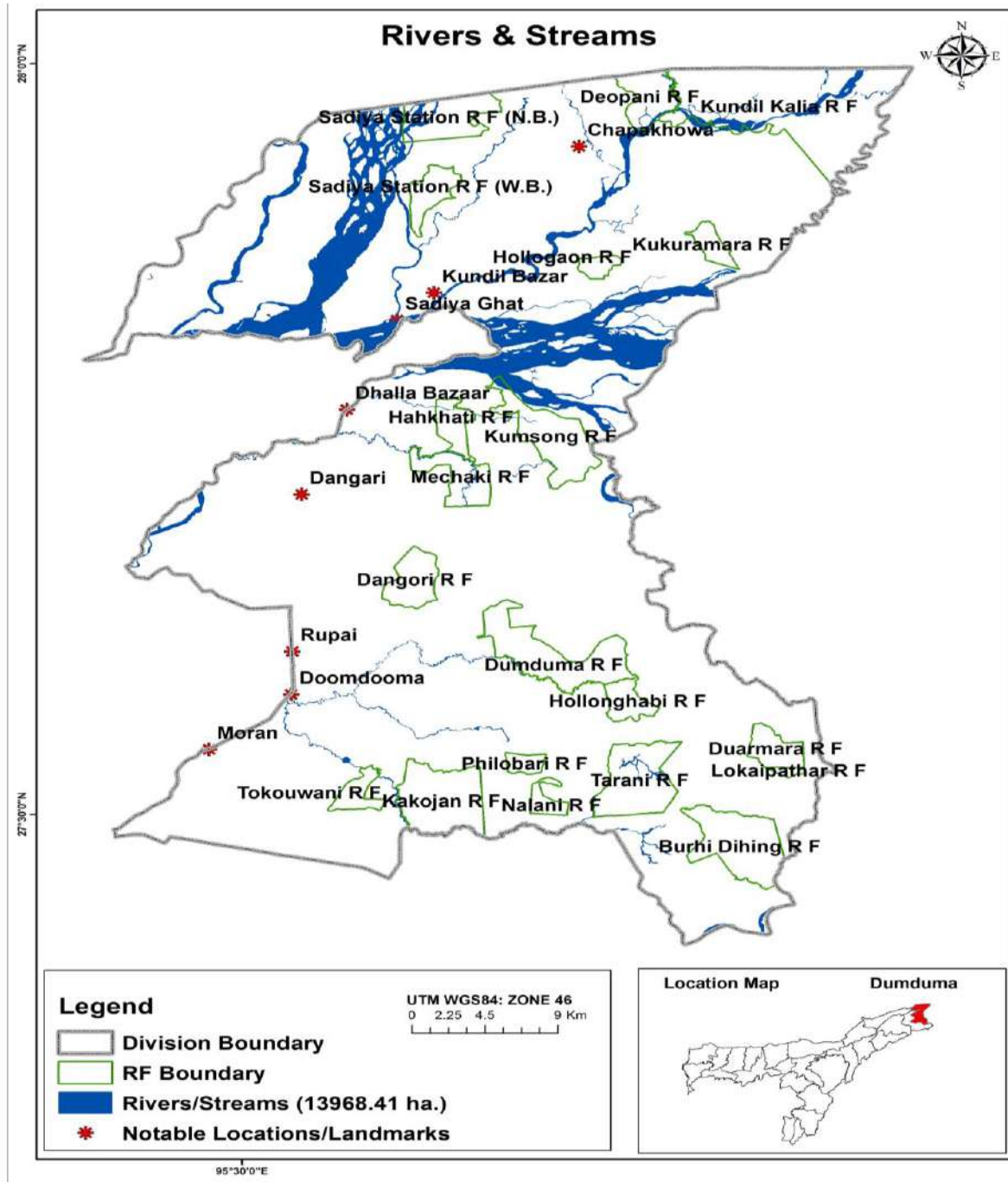


Figure 5.2a: River and streams map of Doomdooma division.

5.2 Duration of water flow in the selected seasonal streams: The total area covered by the rivers / streams in the division is 13, 968.41 ha. River/stream map of the Division is shown in Figure 5.2a. The district is drained by the mighty Brahmaputra River flowing from northeast to southwest direction, and its tributaries Dibru and Burhi-Dihing flowing from Naga-Patkai hill range in the south. All the rivers are temporary in nature. During rainy season, the rivers carry huge quantities of sediment along with the strong current of overflowing water and causes submergence of lowlying areas.

Brahmaputra, Dibang are the major rivers which flow through the Doomdooma Division. The Kundil Kalia, Deopani, Dirak, Dhola, Dibru, Buridehing, Doomdooma are the tributaries that flow through the Reserve Forests like Kundil Kalia, Deopani, Sadiya Station North and West Block, Duarmara, Hahkati,

Kakojan, Kumsong, Mesaki, Tokowani etc. There are many small rivers which are now dead and called “Suti” in Assamese. The Dangori Suti and Hullunghabi Suti, are very important wetlands in addition to small rivers like Dhola Nadi, Ghurmora Nadi, Dibrujan, etc. These rivers/rivulets dry up during winter months and people take up cultivation there as the land is very fertile and productive due to deposition of alluvium. The areas that fall north of River Brahmaputra are sandy to sandy loam and less fertile. The forest type is Semi Evergreen and moist deciduous. The foothill areas of Himalayas such as Kundil Kalia RF, Deopani RF, Sadiya Station RF (Both North and West Block) comprise of Bhabar formation where the water table is low. The areas get inundated very rapidly due to heavy down pour on the hills and resulting in flash floods. However, the submergence does not remain long giving respite to the young regeneration of deciduous and water tolerant plants. Though bamboo with fibrous root system is an excellent soil binder, schemes on Bamboo Plantation may not be successful here because of migration of wild elephants from Arunachal Pradesh and Dibru Saikhowa National Park. Protective measures to conserve soil and water should be practiced by plantation programmes in the degraded area. Also, periodic monitoring of river flow pattern with reference to annual rainfall/duration of flow has not been carried out during the last Working Plan. It will be taken up in the tenure of this Working Plan. Figure 5.2b shows the rate of flow of water in different streams in the division.

5.3 River Network that flow through the Doomdooma Division: Rivers like Brahmaputra, Dibang are the major rivers which flow through the Doomdooma Division. The Kundil Kalia, Deopani, Dirak, Dhola, Dibru, Buridehing, Doomdooma are the tributaries that flow through the Reserve Forests like Kundil Kalia, Deopani, Sadiya Station North and West Block, Duarmara, Hahkati, Kakojan, Kumsong, Mesaki, Tokowani etc. There are many small rivers which are now dead and called suti in Assamese. The Dangori Suti, Hullunghabi suti, are very important wetlands in addition to small rivers like Dhola Nadi, Ghurmora Nadi, Dibrujan etc. These rivers/rivulets dry up during winter months and people take up cultivation as the land is very fertile and productive due to deposition of alluvium. The areas that fall north of River Brahmaputra are sandy to sandy loam and less fertile. The forest type is Semi Evergreen and moist deciduous. The foothill areas of Himalayas such as Kundil Kalia RF, Deopani RF, Sadiya Station RF (Both North and West Block) comprise of Bhabar formation where the water table is low. The areas get inundated very rapidly due to heavy down pour on the hills and resulting flash flood. However, the submergence does not remain long giving respite to the young regeneration of deciduous and water tolerant plants. Though bamboo with fibrous root system is an excellent soil binder, because of migration of wild elephants from Arunachal Pradesh and Dibru Saikhowa National Park, such schemes on Bamboo Plantation may not be successful.

5.4 Wetlands in forest areas: The total area covered by the wetlands of the Division is 12,241.69 ha. Wetland map of the division is shown in Figure 5.3a. The waterbody/wetland areas of the RFs have been reduced, and wetlands fauna and flora population of the Division is declining as a result of degradation and disturbance of wetlands and breeding sites throughout its range. The wetlands of Doomdooma Division are very critical for the survival of the “Critically Endangered White Winged Wood Duck”- whose global population is barely 1200. Unless effective measures are taken to preserve its habitat, this species will become extinct forever. Therefore, conversion of these wetlands to other land-use forms, and felling of nesting trees are to be strictly prohibited. The identified wetlands are to

be monitored by remote sensing methods periodically. The riparian buffer zone (see Figure 5.3b) is also estimated and it was found that an area of 5605.81 ha falls under buffer zone in the division.

Table 5.4: Name of different RFs in Doomdooma Division having wetlands

Sl. No	Name of the RF having Wetland	Locality	Description
1	Dangori	North West	Small waterbody (dead river) of Dangori R in grassland. A known White Winged Wood Duck habitat, resident birds.
2	Deopani	Southern part	Kundil kolia, Jengtho nala, Borkolia River
3	Duarmara	Through the RF- East West	River
4	Hahkati	Northern and Southern side	Stream. Dhola nadi in the Southern side
5	Hollogaon	North to South	Swamp land
6	Hollonghabi	Northern side	Doomdooma River
7	Kakojan		Swamp land
8	Kumsong	Northern side	Na-dehing River
9	Kundil Kolia	Through the centre	Horu Kolia River
10	Mesaki	Criss crosses the RF	Hahkati River, Dhola R, water body
11	Sadiya Station North Block	Western side	Deopani River
12	Sadiya Station West Block	Southern side	Stagnant Water body
13	Tokowani	Northern side	Nazirating River

5.5 Status of aquifers: There are few aquifers in the Division. In the shallow aquifer, groundwater exists in unconfined and semi-confined condition. Thickness of aquifers increases from east to west. Tube well depth varies from 35m to 45 m. The water quality is fit for drinking purposes. Detailed monitoring of aquifers in the RF Division will be carried out and their sustainability will be assessed during the tenure of this Working Plan.

5.6 Water level in the wells in the vicinity (upto 5 km.) of forest area: The average water level as recorded from the wells in the vicinity of the forest areas during lean months (November to February) is 7.00 m, whereas water level in the wells during the rainy season is 3.00 m. The table below shows 10-year data on water levels in wells spread across Tinsukia at Kakopattan, Dangori, Philobari, Bordumsa, Jagun, Borhapjan, Bortorani and Tingrai Bangali.

Table 5.6 Water level data from wells in Doomdooma (units: metres below ground level mbgl)

Well Code	Year	January (Post monsoon Rabi) (mbgl)	Mar-May (Pre monsoon) (mbgl)	August (Monsoon) (mbgl)	November (Post-monsoon Kharif) (mbgl)
W12473	2006	3.05	1.28	1.69	1.38
W12470	2006	3.07	1.51	1.79	Null
W12472	2006	Null	Null	Null	7.94
W12476	2006	3.61	1.4	1.81	2.26
W12469	2007	Null	Null	2.15	Null
W12476	2007	Null	2.61	1.24	2.2
W12473	2007	Null	1.75	0.79	2.61
W12469	2008	3.71	Null	0.67	2.57
W12476	2008	3.69	Null	2.42	2.16
W12473	2008	3.22	Null	0.64	1.89
W12472	2008	Null	Null	0.96	2.17
W12476	2009	4.23	Null	0.6	2.05
W12469	2009	3.52	Null	0.89	2.06
W12472	2009	6.57	Null	1.81	Null
W12473	2009	1.63	Null	1.42	1.23
W12476	2010	3.99	Null	2.26	2.1

W12469	2010	2.94	Null	0.86	1.76
W12473	2010	1.55	Null	1.67	1.56
W12472	2010	6.43	Null	2.38	4.36
W12473	2011	1.33	Null	Null	2.47
W12476	2011	3.36	Null	1.95	2.8
W12469	2011	2.73	Null	1.2	1.56
W12472	2011	6.37	Null	Null	4.84
W12473	2012	Null	Null	Null	1.42
W12472	2012	4.26	Null	Null	2.39
W12476	2012	5.1	Null	Null	2.51
W12469	2012	3.47	Null	Null	1.16
W12476	2013	3.45	4.12	2.23	2.51
W12473	2013	1.72	2.35	1.09	1.42
W12472	2013	6.33	6.47	1.61	5.39
W12469	2013	2.63	2.86	0.68	1.16
W12472	2014	6.1	Null	0.98	Null
W12473	2014	1.66	0.28	0.84	Null
W12469	2014	2.35	1.9	0.54	Null
W12476	2014	3.6	4.42	1.27	Null
W12470	2015	Null	0.45	0.45	Null
W12473	2015	1.5	1.23	1.23	1.87
W12476	2015	3.97	4.64	1.76	1.7
W12472	2015	5.37	0.48	0.48	5.22
W12469	2015	2.3	1.27	1.27	1.71
W12472	2016	Null	Null	2.49	5.65
W12473	2017	Null	Null	1.73	1.83
W12476	2018	Null	3.75	2.76	2.02
W12469	2019	Null	Null	1.88	2.21

Source: Water Resources Information System of India.

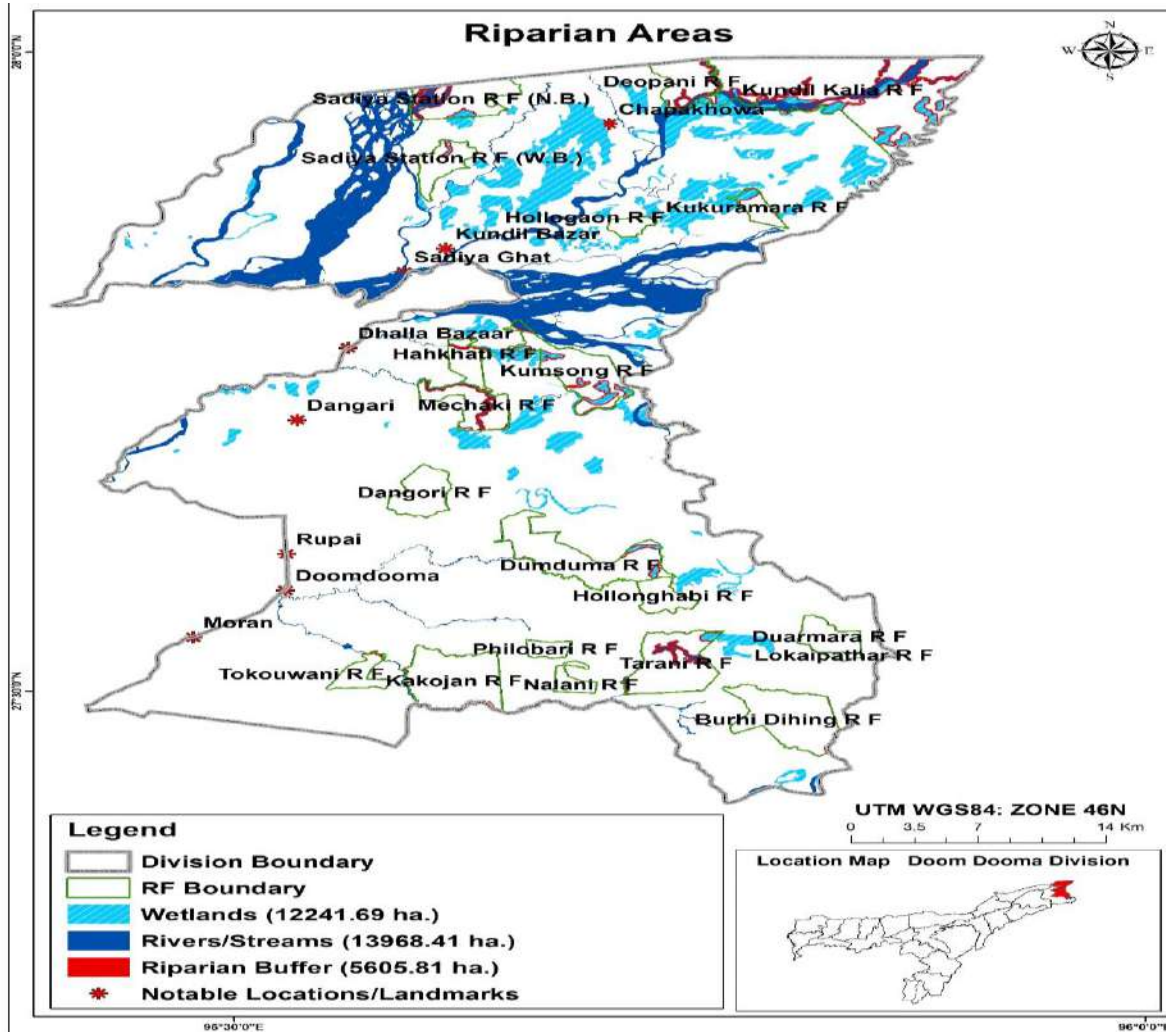


Figure 5.3a: Wetlands map of Doomdooma Division.

CHAPTER 6

MAINTENANCE AND ENHANCEMENT OF FOREST RESOURCE PRODUCTIVITY

6.1 Growing stock of wood: Forest inventory and analysis of growing stock is necessary to quantify tree growth and ensure 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 while considering conservation and ecological security.

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. Grid-based Systematic Stratified Random Sampling was carried out. Map of the sample plots is provided in Figure 6.1a. Sample plots were laid out and observational assessments of site quality, tree species, composition, its health, density and crop age etc. were recorded. 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.

Sample points were allocated by North East Space Application Center adopting the method as provided in the National Working Plan Code 2014. Plot locations are shown through figure 6.1a. 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 hand held GPS devices. 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 metres from the centre 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.

Growing stock analysis is a representation of 107 different tree species recorded in the sample plots. The most predominant species in terms of number of individuals are *Dipterocarpus retusus* Blume followed by *Bombax ceiba* L. and *Bischofia javanica* Blume. Other dominant species are *Terminalia myriocarpa* Van Heurck & Müll. Arg., *Lagerstroemia parviflora*, *Vatica lanceifolia* (Roxb.) Blume, *Lagerstroemia speciosa* (L.) Pers. and *Dillenia indica* L.

Plotting number of trees against the diameter classes shown in Figure 6.1b reveal that maximum number of trees are observed in the girth classes 20-30 cm and 30-40 cm. However, it must be admitted that the forest is fairly balanced. Compartment wise total growing stock (cu.m./hectare) of wood in the division is shown in Figure 6.1b and detail are provided in table 6.1a.

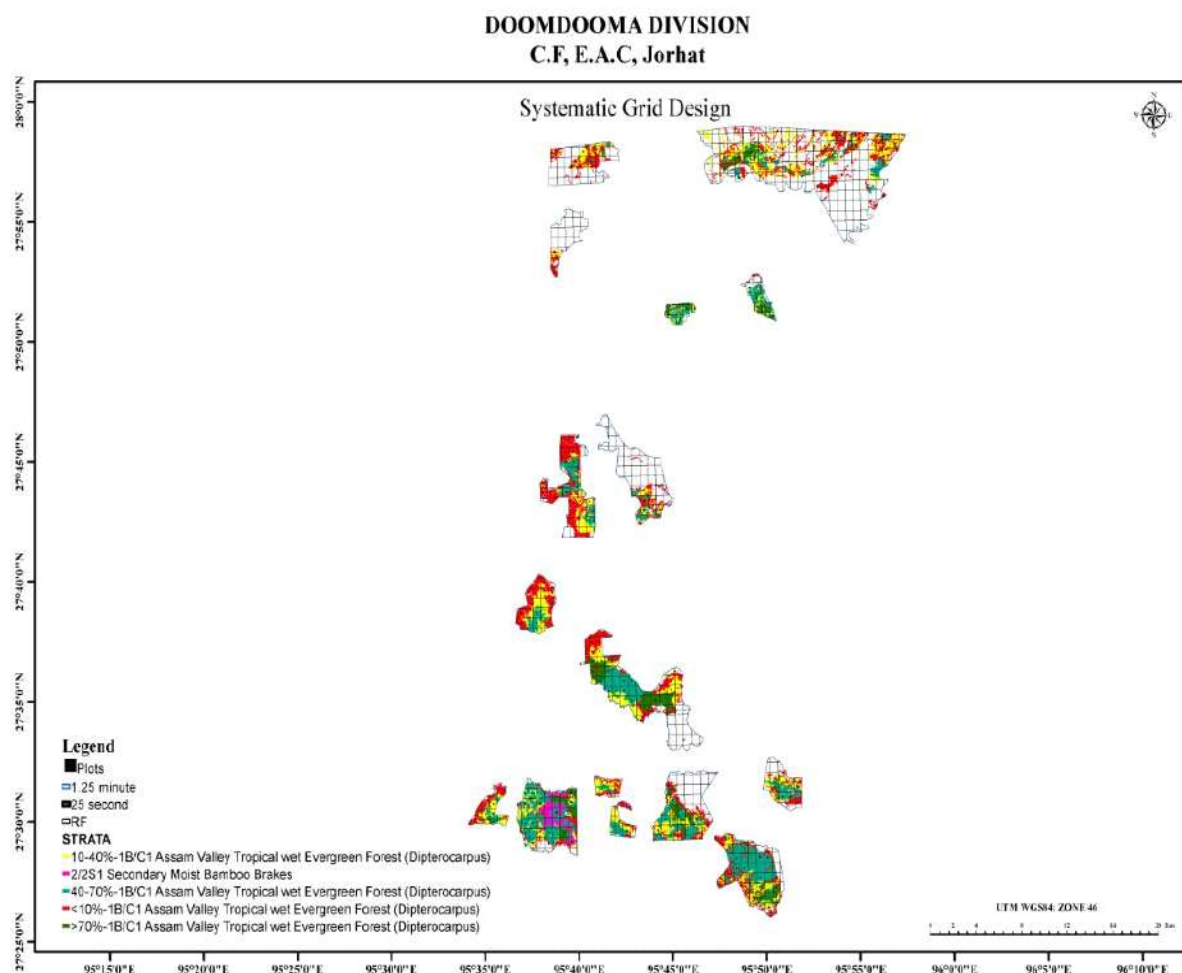


Figure 6.1a Grid based sample plot map for Doomdooma Division, Assam

Table 6.1b: Forest type wise volume Volume Growing stock across RFs

FOREST TYPE	DENSITY	GIRTH CLASS						TOTAL
		G1 30-60	G2 61-90	G3 91-120	G4 121-150	G5 151-180	G6 ≤181 cm	
Wet Evergreen Forest	D1 (<10%)	2062.80	11061.21	23823.28	11938.13	13856.29	26382.71	89124.42
	D2 (10-40%)	2017.06	15208.99	30827.02	26703.31	37455.39	169571.31	281783.08
	D3(40-70%)	2818.23	21263.38	43155.43	40916.33	59279.07	264817.97	432250.41
	D4 (>70%)	1242.89	12010.45	34312.49	31779.50	23283.82	80797.28	183426.43
TOTAL		8140.98	59,544.03	1,32,118.22	1,11,337.27	1,33,874.57	5,41,569.27	986584.34

Analysis of the crop: Under Doomdooma Forest Division, 148 Nos. of GPS points were provided by the GIS Cell of the Department for detail field study, covering all the forest areas of the Division. The field data obtained by the field staff was sent to NESAC, Meghalaya, for detailed spatial analysis after physical verification of each point in the field. All the forest areas of this Working Circle were enumerated to determine the number of Hollong and other tree species. The intensity of enumeration was kept at 1% and standard method of enumeration was adopted. The compartments were stock

mapped showing details such as different forest type, encroachments, cultivation, density etc. Stock maps were prepared with ocular observations of the growing stock, composition of crop, presence of bamboo, with detailed individual compartment history of various Reserve Forests. The regeneration status in various compartments was also assessed visually. The enumeration of trees for Hollong and other species was done for a different girth classes. The analysis is based on the field works carried during 2013-2014.

Forest Density	Girth classes						Total
	G1	G2	G3	G4	G5	G6	
Open Forest	1948.48	14691.88	29778.90	25795.40	36181.91	163805.89	272202.5
Moderately Dense Forest	2722.41	20540.43	41688.15	39525.17	57263.58	255814.16	417553.9
Dense Forest	1200.63	11602.09	33145.87	30699.00	22492.17	78050.17	177189.9

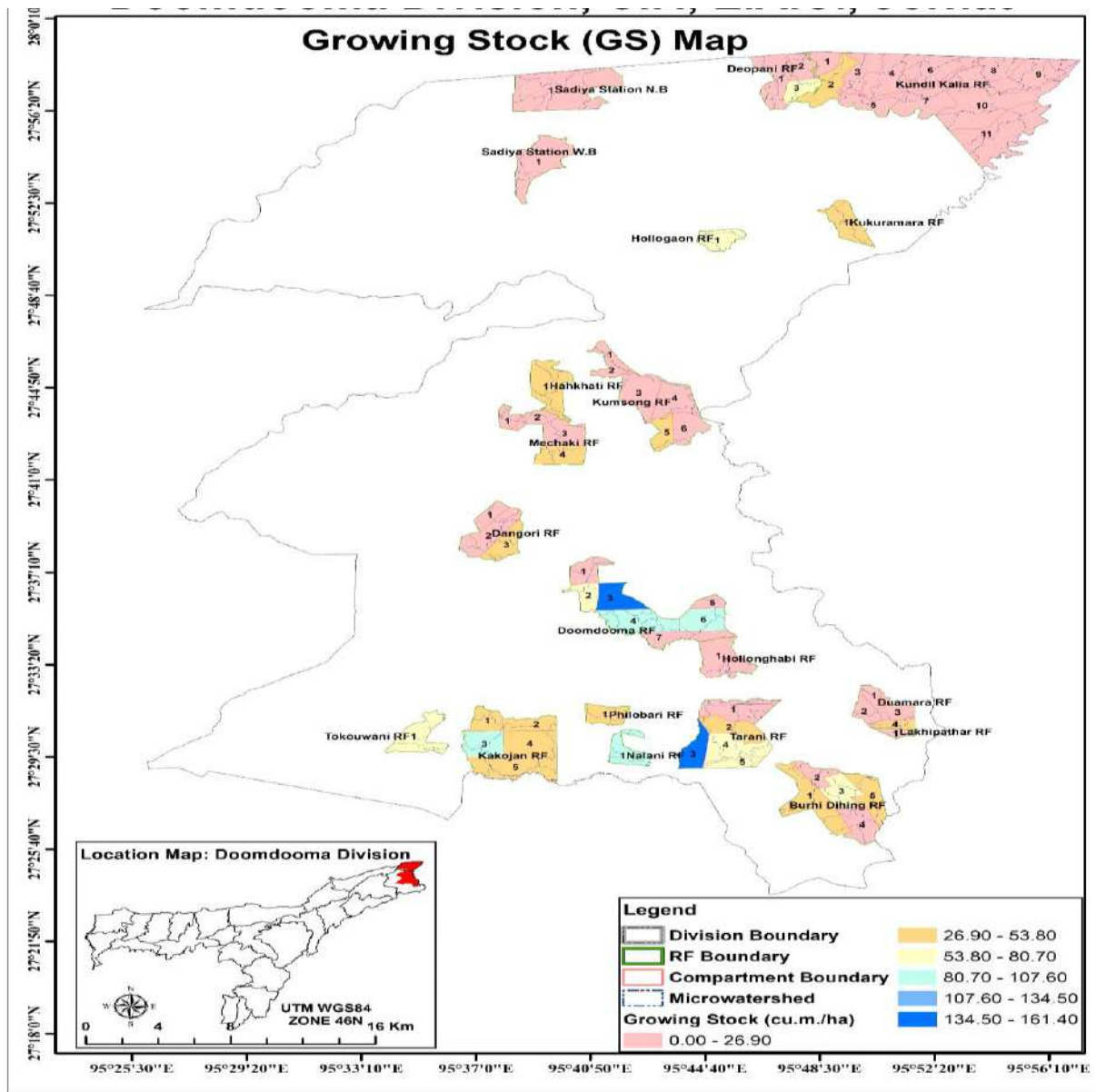


Figure 6.1c: Growing stock (cu.m./ha) of Doomdooma division.

Table 6.1a: Growing stock across RFs in Doomdooma Division.

Name of the RF	Compt. No.	Stock (cu.m/ha)
Burhi Dihing R F	1	80.09

	2	22.90
	3	65.14
	4	22.54
	5	90.96
Dangori R F	1	90.92
	2	43.35
	3	58.72
Deopani R F	1	9.58
	2	98.15
	3	124.71
Duarmara R F	1	18.51
	2	38.27
	3	42.12
	4	42.71
Doomdooma R F	1	112.08
	2	78.68
	3	202.02
	4	106.93
	5	29.76
	6	124.26
	7	53.38
Hahkhati R F	1	101.99
Hollogaon R F	1	68.00
Hollonghabi R F	1	0.56
Kakojan R F	1	50.53
	2	51.58
	3	104.09
	4	64.97
	5	76.22
Kukuramara RF	1	51.71
Kumsong R F	1	0.00
	2	0.00
	3	16.42
	4	16.42
	5	55.17
	6	41.63
Kundil Kalia R F	1	47.78
	2	73.45
	3	36.42
	4	41.63
	5	55.59
	6	41.63
	7	52.99
	8	41.63
	9	41.63
	10	26.49
	11	13.96
Lokaipathar R F	1	19.31
Mechaki RF	1	19.31
	2	52.07
	3	12.79
	4	94.92
Nalani R F	1	151.05
Philobari R F	1	63.04

Sadiya Station R F (N.B.)	1	113.35
Sadiya Station R F (W.B.)	1	49.51
Tarani R F	1	19.31
	2	219.30
	3	168.86
	4	104.75
	5	120.26
Tokouwani R F	1	135.53

6.2 Growing stock of bamboo: Extraction of bamboo for commercial purpose is not proposed as they provide natural shelter and food for animals, particularly the wild elephants. Moreover, they are a significant repository of carbon. Bamboos which were raised (520 Ha) in 10 different locations by JFMCs (Bamboo stock 13,000 Tons) will be harvested as per Bamboo Felling rules and usufructs will be distributed as per Assam Joint (People's participation) Forestry Management Rules, 1998.

Table 6.2: Compartment wise bamboo stock in Doomdooma Division

Reserve Forest	Compartment	Area (in ha)	Bamboo Stock (in tonnes)
Kakojan RF Secondary Bamboo	2	65.7159	82.802
	4	259.591	327.085
	3	19.2603	24.268
	5	59.0727	74.432
	TOTAL	403.64	508.587
Doom Dooma FDA (through JFMCs)	TOTAL	520	13,000
Total			13,508.587

6.2.1 Bamboo plantation created by JFMC: From 2006-2007 to 2013-2014 a total of 520 hectare of bamboo plantations was carried through different JFMC's in the division. Considering 25 tons of green weight of bamboo per hectare of matured clums it is estimated a total of 13000 tons of bamboo stock are present in these areas. Annual harvesting of 20% of the total area i.e. 104 hectare is recommended for harvesting on a sustainable basis and as per laid down felling rules.

6.3: Increment in volume of identified timber species: The following table shows the local volume table prepared on the basis of previous data of various species in the division.

Table. 6.3.1. Local volume table of different species in Doomdooma division.

Species	Volume in cubic meters for different diameter classes in cm											
	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	100-110	110-120	>120
Bonsum	0.29	0.53	0.79	1.12	1.65	2.49	3.32	4.20	5.12	5.98	6.92	8.09
Sopa	0.57	1.02	1.48	1.94	2.42	3.1	4.1	5.40	0.94	8.4	9.97	12.0
Simul	0.35	0.62	0.94	1.32	1.76	2.34	3.38	4.68	6.22	-	-	-
Amari	0.38	0.66	0.95	1.38	1.75	2.25	2.93	3.64	4.34	4.94	5.64	6.23
Sida	0.30	0.52	0.77	1.20	1.89	2.60	3.24	-	-	-	-	-
MakriSal	0.21	0.43	0.75	1.25	1.94	2.65	3.34	4.10	4.87	-	-	-
Koroi	0.41	0.74	1.06	1.37	1.78	2.88	3.83	-	-	-	-	-
Poma	0.50	0.85	1.20	1.58	1.99	2.70	3.95	5.45	-	-	-	-
Kuhir	0.19	0.34	0.55	0.84	1.31	1.95	2.57	-	-	-	-	-
Jia	0.36	0.63	0.91	1.20	1.55	1.86	2.61	3.37	4.43	5.74	-	-
Bogipoma	0.21	0.44	0.72	1.08	1.41	1.94	2.56	3.46	4.40	5.57	6.80	8.06
Aam	0.15	0.36	0.54	0.82	1.11	1.74	2.40	3.17	4.09	5.11	6.10	7.10

6.4 Efforts towards enhancement of forest productivity through quality plantation activities:

Details shall be provided based on survey and assessment of areas under plantation. About 10% of the total forest area may be brought under production forestry by raising quality plantation. No forest land or any portion thereof can be cleared of trees which have grown naturally in that land or portion, for the purpose of using it for afforestation. Statement showing plantation activities for enhancing forest productivity in Doomdooma Division, Assam is shown in Table 6.3.

Table 6.4a: Fuelwood plantations carried out by various JFMCs.

SI No	Name of the JFMC	Range	Area in Ha	Remarks
1	Dikrong	Sadiya	50	The Fuelwood plantations were carried out during 2015-16 and will be ready for Harvesting after 9/10 years.
2	Naharbari	Sadiya	50	
3	Lakhimijan	Sadiya	50	
4	Luit Eco tourism and Cultural Hub	Kakopathar	50	
5	Udit Suruj	Kakopathar	50	
6	Kachijan	Kakopathar	50	
7	Namholong	Kakopathar	50	
8	Kakojan	Doomdooma	50	
9	Koriajan	Khatangpani	50	
10	Nabudoy	Khatangpani	50	
		TOTAL	500	

Table 6.4b: Statement showing plantation activities for enhancing forest productivity in the Division

Year	Name of Scheme with area (ha)										Total area	Survival %
	CAMPA	ABY	NAP	RDF	Reg. of Silvi works	APFBC	Revolving Fund	Fodder Plant.	NBM	COMP AFF		
2005-06	--	--	300	--	--	--	150	20	--	150	620	50-60
2006-07	--	--	300	--	--	--	72	30	--		402	50-60
2007-08	--	--	100	--	--	--	78	--	160		438	50-60
2008-09	--	10	150	150	--	--	--	5	40		355	50-60
2009-10	--	--	200	30	50	--	--	5	40		315	50-60
2010-11	6	10		35	25	--	30	5	20		96	50-60
2011-12	--	20	--	100	100	--	--	--	--		120	50-60
2012-13	--	20	--	20	120	--	---	--	200		360	50-60
2013-14	--	4	--	--	10	130	---	--	100		244	60-70
2014-15	--	--	--	--	--	590	--	--	--		590	60-70
2015-16	--	--	--	--	--	500	--	--	--		500	60-70
2016-17	-	--	--	--	--	--	--	--	--	--	--	--
2017-18	-	--	--	--	--	--	--	--	--	--	--	--
2018-19	25	--	--	--	--	--	--	--	--	--	25	80-90
2019-20	--	--	--	--	--	--	--	--	--	--	--	--
2020-21	100	--	--	--	--	--	--	--	--	--	100	60-70
2021-22	--	--	--	--	--	--	--	--	--	--	--	--

6.5 Carbon stock: Forests sequester and store more carbon than any other terrestrial eco system.

Forest play an important role in mitigation and adaptation of climate change. Forestry activities are relatively inexpensive means of addressing climate change. Forests are sinks of carbon and matured forests are storehouse of carbon. The world's forests and forest soils store more than one trillion tons of carbon, twice the amount found floating free in the atmosphere. Therefore, assessment of carbon stock in forest division is vital.

6.5.1 Forest Carbon Inventory in India: India has been involved in climate change negotiations since the formation of UNFCCC (United Nations Framework Convention on Climate Change) in 1992, and is an international leader in carbon markets, especially in the Clean Development Mechanism (CDM). In forestry sector, India led the evolution of REDD to REDD+ (Reducing Emission from Deforestation and forest Degradation) through decisions adopted at the Climate Change COP (Conference of the Parties) at Bali, 2007. The Bali COP defined the instrument as “reducing emissions from deforestation and forest degradation; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries” (REDD+). With over 70 million hectares (ha) under forest cover (primarily stewarded by State governments and local communities), approximately 33% of which is managed through the Joint Forest Management (JFM) initiative, India is well-positioned to take advantage of and champion REDD+. The Ministry of Environment and Forestry (MOEF) has created a REDD+ Cell, to lead the nation’s efforts to participate in REDD+. To decrease national emissions and increase India’s forest cover by over two million ha annually and the carbon stocks within existing forest, the nation created the Green India Mission (GIM) and National Afforestation Program (NAP), along with other agricultural and rural development programs.

India is a country with tremendous human and institutional capacity and strong forest mapping capacity, extensive research and training capacity, and State Forest Departments (SFDs) that reach down into local communities or “beats.” The Forest Survey Institute (FSI) develops a bi-annual forest cover inventory, and it will lead the national-level carbon stock accounting system in coordination with the India Institute of Remote Sensing (IIRS), the India Institute for Sciences (IISc), and the India Council for Forestry Research and Education (ICFRE). All of these will be critical to the long-term success of REDD+ in India. One of the biggest challenges on carbon forestry is quantifying nation’s carbon emissions and storage in forests, which requires region specific information. A credible monitoring system that shall measure, report and verify carbon in the Indian forests is a very critical element for the mitigation activities of India. This involves developing cost-effective, robust and compatible national monitoring and MRV (Measurement, Reporting and verification) systems, innovating tools, methodologies, inclusive training and knowledge sharing that shall strengthen India’s technical and institutional capacity for effective MRV systems. Monitoring of forest carbon requires remote sensing as well as ground based data. Monitoring is essential for appropriate compensation of the carbon sequestered as well as fulfilling India’s commitments of the GIM. The Intergovernmental Panel on Climate Change (IPCC) 2006 Guidelines provides advice on estimation methods at three levels of detail, from tier 1 (default) to tier 3 (most detailed locally applicable data). This consists of mathematical specifications of the methods, information on emission factors or other parameters to use in generating the estimates, and sources of activity data to estimate the overall level of net emissions (emission by sources minus removals by sinks). When properly implemented, all tiers intends to provide unbiased estimates. Accuracy and precision should in general, improve from tier 1 to tier 3. The provision of different tiers enables inventory compilers to use methods consistent with their resources and to focus their efforts on those categories of emissions and removals that contribute most significantly to national emission totals and trends. The subsequent sub-chapters shall discuss the steps involved in carbon quantification of forests in Doomdooma division.

6.5.2 Inventorizing and reporting emissions and removals: The steps involved in inventorizing and reporting follows the National Working Plan Code – 2014, with additional references made to recommendations of reports of Forest Survey of India, Good Practice Guidance for Land Use, Land-Use Change and Forestry (Land Use Land Use Change and Forestry-LULUCF) (IPCC, 2003) and the National Greenhouse Gas Inventory Guideline (IPCC, 2006). The steps in brief are given below:

(i) Identify land use category and, estimate the land areas in each land use category for the time period required.

As per GPG LULUCF, the total area is to be categorised into six major land classes, which are, forest land, cropland, grassland, wetlands, settlements and other land. The exact land area under each land classification is to be done by remote sensing analysis to reach at the area covered by each category.

(ii) Carry out assessment for the relevant LULUCF categories. Within the key categories, carry out an assessment on which non-CO₂ gases and carbon pools are significant.

Carbon pools are broadly classified into three groups:

- Living biomass; consisting of above ground biomass (AGB) and below ground biomass
- Dead organic matter; consisting of Dead wood and Litter.
- Soil; consisting of soil organic matter.

For the computation purpose, all non-CO₂ gases and carbon pools that are significant are to be selected. As per the forestry regime in Doomdooma division, no non-CO₂ gases are considered to be significant. There are no peat lands identified in the landscape; and the emissions from and fertilizer application in the forest nurseries are considered to be negligible as only organic fertilizers are used as much as possible. Among the carbon pools, Above Ground Biomass, Below Ground Biomass and Soil Organic Carbon are considered to be significant; Dead Wood and Litter are considered to be *de minimis* and is not considered in the estimations.

(iii) Ensuring that the requirements in terms of emission and removal factors and activity data appropriate to the tier level are being met.

As far as possible region specific volume equations, wood density, root to shoot ratio and biomass expansion factors are to be applied in the absence of tier-3 data sets. In the absence of tier-3 data, efforts are to be made to make them available.

(iv) Quantification of emissions and removals and estimation of the uncertainty in each estimate.

Quantification of total carbon content in steps

It has been estimated that 50% of a tree's biomass by weight is carbon. By estimating the biomass of a tree, carbon content of a tree, or the AGB, can be calculated. Volume equations of most of the trees have already been developed by FSI. These regression functions in volume, height and DBH provide the mercantile or bole volume (m³) of a species. Each forest class has a specific biomass expansion factor (BEF), which is the ratio of the total volume of a tree above ground (including leaves, branches etc.) to that of its mercantile volume. Further, species have a specific wood density (WD) which is used to convert volume into mass (in tons). Volume of BGB depends on AGB. IPCC in its Good Practice Guidance for Land Use, Land-use Change and forestry (GPG-LULUCF) has provided root-to-shoot ratios (RF) from which the root volume can be calculated. Since the mass of AGB in tons is already calculated, BGB is calculated using RF. Sum of AGB+BGB gives total biomass in tons in a tree. 50% of biomass by weight is carbon. Carbon is completely assimilated from atmospheric CO₂. From the amount of carbon stored within a tree, the amount of CO₂ sequestered can be calculated

using the molecular weights of carbon and oxygen. To this the carbon content in the dead wood, litter and soil organic carbon are added to arrive at the total carbon content. Wood density has been sourced from country specific (tier-2) data. Biomass expansion factor and root-to-shoot ratio have been sourced from GPG LULUCF (tier-1 data). The volume equations used are sourced from Forest Survey of India (tier-2 data). Soil Organic Content has been estimated from Government recognized laboratories using the soil samples collected during ecological data collection exercises.

(v) Using appropriate reporting tables to report emissions and removals estimates.

Appropriate tables shall be used in reporting that shall ensure transparency in calculation.

(vi) Documentation and archiving all information used to produce the emissions and removals estimates.

Appropriate documentation and archiving practices shall be followed for all the records used in the calculations.

(vii) Quality control checks, verification, and expert/peer review of the emission estimates.

Appropriate quality control, which includes checking by competent source shall be undertaken to ensure the veracity of the calculations.

6.5.3 Calculations of carbon stock in Doomdooma division: The estimation of the carbon stock in forests of Doomdooma division has been carried out on the compilation of the estimated growing stock in natural forests, as given in the table 6.4.3a and RF wise carbon stock in tons/ha is given in table 6.4.3b. Compartmentwise carbon stock map (tons/ha) is shown in Figure 6.4.3.

Table 6.5.3a: Compartment wise carbon content in Doomdooma Division.

Reserve Forest	Compartment	Carbon (tons)
Burhi Dihing RF	1, 2, 3, 4, 5	137186.3
Dangori RF	1, 2, 3	36986.67
Deopani RF	1, 2, 3	24242.82
Doomdooma RF	1, 2, 3, 4, 5, 6, 7	161109.6
Duamara RF	1, 2, 3, 4	31812.18
Hahkhathi RF	1	21443.48
Hollogaon RF	1	25839.68
Hollonghabi RF	1	143.761
Kakojan RF	1, 2, 3, 4, 5	140783.7
Kukuramara RF	1	31800.85
Kumsong RF	1, 2, 3, 4, 5, 6	19386.6
Kundil Kalia RF	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	124959.6
Lakaipathar RF	1	1001.561
Mechaki RF	1, 2, 3, 4	33962.06
Nalani RF	1	17705.4
Philobari RF	1	12451.19
Sadiya Station N.B	1	16874.1
Sadiya Station W.B	1	2178.995
Tarani RF	1, 2, 3, 4, 5	81131.06
Tokouwani RF	1	22341.81

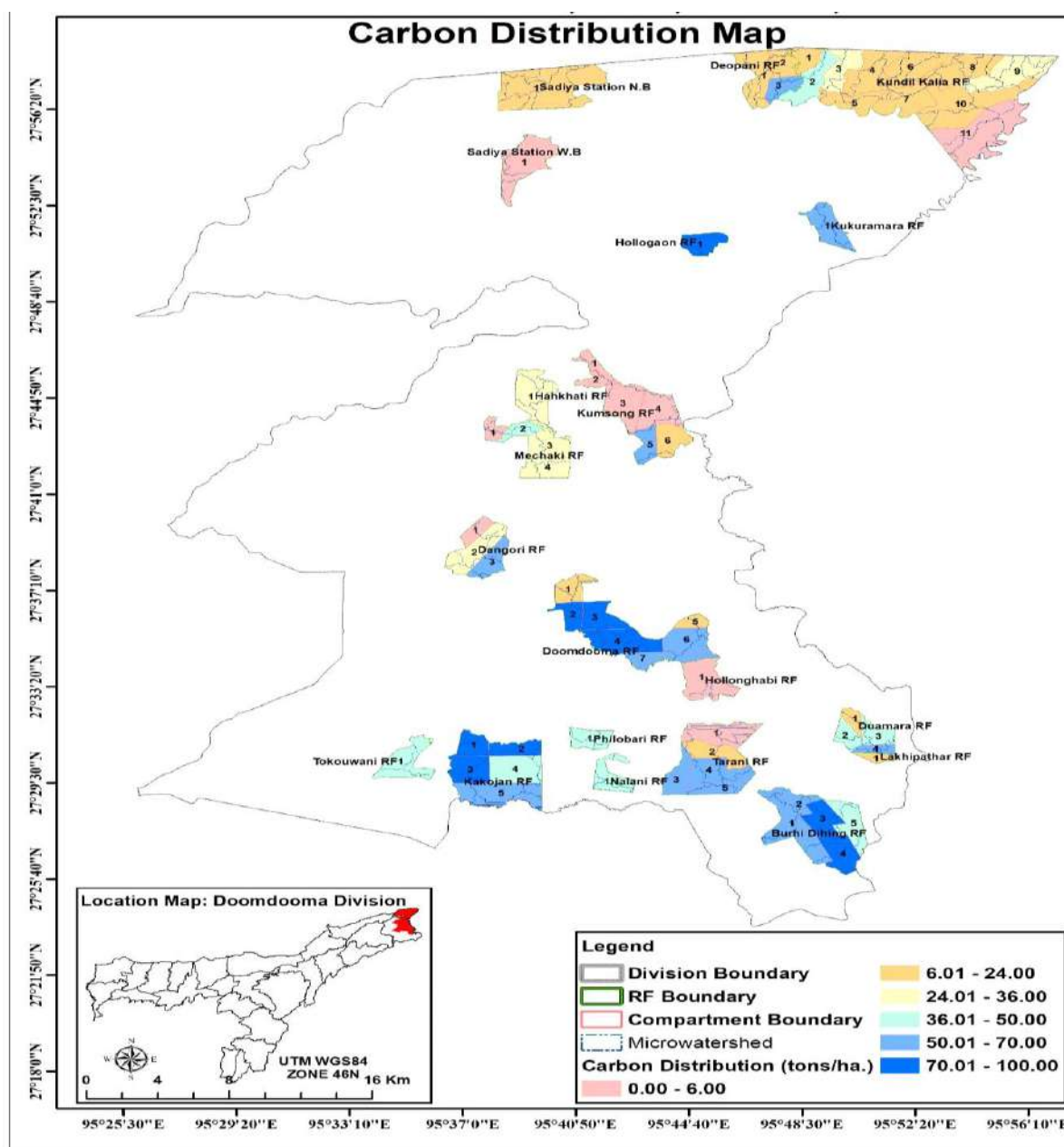


Figure 6.5.3: Compartment wise carbon stock (tons/ha) of Doomdooma division.

It is already mentioned that all the Reserve Forest (20 Nos) areas are heavily encroached to the tune of 30.50% and all Proposed Reserve Forests (4 Nos) are encroached by 100%. In addition to that 10,000 Ha areas are either open or low density area.

*Some Reserve Forests with best representation of Carbon are as follows:

Sl No	Reserve Forests	Total carbon (Ton)	Area of the RF (Ha.)	Carbon stock (tons/ha)
1	Buridihing R.F.	1,37,186.3	2,274.82	60.316
2	Doomdooma R.F.	1,61,109.6	2,492.39	64.64
3	Kakojan R.F.	1,40,783.7	2,313.49	60.85
4	Kundil Kalia R.F.	1,24,959.6	7,293.47	17.13
5	Tarani R.F.	81,131.1	2,097.17	38.69
6	Hahkati R.F.	21,443.5	673.54	31.84
7	Duarmara R.F.	31,812.2	755.72	42.10
8	Kukuramora R.F.	31,800.8	465.1	68.37
9	Hollogaon R.F.	25,839.7	318.08	81.24
10	Tokowani R.F.	22,341.8	541.66	41.25

Table 6.5.3c: Comparison of carbon stocks in carbon pools with the national and state figures.

Carbon Pools	Above Ground Biomass	Below Ground Biomass	Dead Wood	Litter	Soil Organic Carbon
National Level Estimate	31.68	9.84	0.50	1.80	56.21
State Level Estimate	30.30	7.47	0.39	2.55	54.66
Doomdooma Division	21,861	5,247	Not available	NA	NA

Note: National figure and state figure taken from FSI, SFR (2019).

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.

6.6.1 Note on 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.

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CHAPTER 7

OPTIMIZATION OF FOREST RESOURCES UTILIZATION

7.1 Recorded removal of timber: Harvest should not exceed the accretion. Statement of recorded removal of timber in Doomdooma Division is shown in table 7.1a. Timber removal effected in the table are seized and wind fallen timbers are shown in table 7.1b.

Table 7.1a: Statement showing recorded removal of timber in Doomdooma Division, Assam.

Sl. No	Year	Range	Compartment	Removal (m ³ /ha)
1	2006-07	Doomdooma	Kakojan R.F., Phillobari R.F.	7.565
		Sadiya	Sadiya Station R.F.	23.304 Encroachment, illegal felling
		Saikhowa	Mesaki R.F.	0.3807
2	2007-08	Doomdooma		9.073
3	2008-09	Doomdooma	Kakojan R.F. Compt. 9, 12, 16	7.917
4	2009-10	Khatangpani		8.383
		Entire division	Non sal	296.080 cft
5	2010-11	Khatangpani		0.953
		Sadiya		0.903
		Entire division	Non sal	70.322 cft
6	2011-12	Khatangpani	Duwarmora R.F.	3.103
		Sadiya	Kundilkalia R.F., Deopani R.F.	7.601
		Doomdooma		0.948
		Entire division	Non sal	378.011 cft
7	2012-13	Sadiya	Sadiya Station R.F. (NB)	2.001
		Entire division	Non sal	276.975 cft
8	2013-14	Khatangpani	Tarani R.F.	2.559
		Sadiya	Kundilkalia R.F.	2.243
		Sadiya	Sadiya Station R.F. (NB)	2.016
		Entire division	Non sal	240.777 cft
9	2014-15	Khatangpani	Tarani R.F.	151.041 From illegal felling
		Saikhowa	Kumsong R.F.	0.792
		Kakopather	Doomdooma R.F.	0.24
		Entire division	Non sal	5370.457 cft
10	2015-16	Khatangpani	Tarani, Buridehing, Duwarmora	298.864 From illegal felling
		Kakopather	Doomdooma R.F.	From wind fallen 6.28
		Entire division	Non sal	5370.457 cft
11	2016-17	Entire division	Non sal	10776.160 cft
12	2017-18	Entire division	Non sal	2599.837 cft
13	2018-19	Khatangpani Range	Tarani RF	23.627 CuM
14	2019-20	NIL		NIL
15	2020-21	Doomdooma Range	Kakojan RF	0.435 Cu M
		Sadiya Range	Kundil Kolia RF	14.6133 Cu M

During 2016-2017, 23.304 CuM of timber was removed by illegal doers during encroachment followed by illegal felling in Sadiya Station RF. It is to be noted that there are three Revenue villages inside the Tarani RF which were not settled at the time of constitution of the RF. Few of the encroachers resorted to illegal felling of trees during 2014-15 and 2015-16.

Table 7.1b: Statement showing recorded wind fallen timber in Doomdooma Division, Assam.

Sl No.	Year	VOLUME (IN M ³)
1	2010-2011	167.9105

2	2011-2012	27.144
3	2012-2013	--
4	2013-2014	117.121
5	2014-2015	67.507
6	2015-2016	--
7	2016-2017	105.343
8	2017-2018	--
9	2018-2019	117.668
10	2019-2020	31.8920
11	2020-2021	NIL
	Total	634.5855

7.2 Recorded removal of fuelwood: There is no legal extraction/removal of fuelwood from the Division's forests since it is banned in the Division. Haphazard and un-planned collection of fuel wood and fodder is prohibited. The Doomdooma Division has raised 500 ha of fuel wood plantation through 10 (Ten) JFMCs during 2014-15. So, the JFMC members will be able to collect the firewood after 2025-26 instead of illegal collection by destroying the natural forests. It is expected that the demand for fuel wood will come down gradually as Cooking gas, Solar charging device, Gobar gas, Improved chullah etc. have been proposed for the fringe villagers. As there was no approved Working Plan for the last three decades, no authentic data regarding unauthorized removal of fuelwood could be produced. It is obvious that the encroachment in some of the RFs of Doomdooma Division started as back as 1964 and continued even after 1980. This took heavy toll of the forests including firewood. In fact, there is sustainable growing stock of forests in the TOF area and therefore, illegal collection of firewood is not a major problem in Doomdooma Division. Sufficient 'Fuel wood' plantation has been created in the last few years. 500 Ha of Fuel wood plantations were carried out by JFMCs during 2015-16 at different locations as shown in table 7.2.

7.3 Recorded removal of bamboo/rattans: There is no legal extraction/removal of bamboo from the Division's forests. No plantation carried out for Rattan/Cane.

Table 7.2 Recorded removal of Bamboo and rattans

Reporting year	Bamboo area (Ha.)		Extraction Number notion tons/Ha.
	Natural (ha.)	Planted (RF & area Ha)	
2006-2007	403.64	Kumsong RF - 80	Not yet extracted though ready for harvesting as the Working Plan is not Yet approved.
2007-2008		Mesaki RF - 80	
2008-2009		Hahkati RF - 40	
2010-2011		Nalani RF - 20	
2012-2013		Buridehing RF - 200	
2013-2014		Doomdooma RF - 100	
	403.64 Ha	TOTAL - 520 Ha	

Table 7.3 Statement on Bamboo details (area in ha) and harvestable weight

Area (ha)	Harvestable Bamboo (Green Weight in tonnes)
Secondary Bamboo Brakes=403.64 Ha	Harvesting of Bamboo not recommended in Secondary Bamboo Brakes
Bamboo plantation created by JFMC 2006-2007 to 2013-2014=520 Ha	520 Ha X 20%=104 Ha (annual harvesting recommended on sustainable basis and as per laid down felling rules) Considering harvesting of 25 Tons of Green weight of Bamboo per Hectare of matured clumps, It is 520 X 25 Tons=13,000 Tons Annual harvest from 104 Ha= 2600 Tons
Total area: 923.64	

7.4 Recorded removal of locally important NTFPs including MAPs: There are no record available regarding removal of locally important NTFP or Medicinal and Aromatic Plants from this Division. The revenue collected from minor minerals in the division is shown in table 7.4b.

Table 7.4b: Revenue collected from minor mineral during the year 2009-2010 to 2020-2021

SI No.	Year	Amount (in Rs)
1	2009-2010	935075.00
2	2010-2011	932255.00
3	2011-2012	1905663.00
4	2012-2013	449810.00
5	2013-2014	686826.00
6	2014-2015	99765.00
7	2015-2016	2318250.00
8	2016-2017	13944982.00
9	2017-2018	2676313.00
10	2018-2019	2165578.00
11	2019-2020	37,22,376.00
12	2020-2021	36,92,861.00

7.5 Demand and supply of timber and important non-forest produce: The indigenous population is mixed in character as the forests in the Division, and it will therefore not be out of place to trace their origin. Prior to the invasion in the twelfth century by the Ahoms (hailing from Thailand) the plains areas were ruled by the Borahis, Morans and Motoks. The Cachari rule was flourishing with their capital at Dimapur. The beginning of the Nineteenth century saw the Burmese invasion and the downfall of these rules. This was subsequently followed by British rule. The opening of the Tea Industry in Assam saw the import of labour recruited and indentured from Chota Nagpur, Orissa and part of Bengal for work in the tea gardens as the local labour was altogether inadequate for the purpose. Some of these people preferred to settle down in Assam as Agriculturists after their period of indenture was over. Thus, the population in the tract has come to be made up of several kinds of people, all living together in perfect amity.

Apart from the origin of the population, the indigenous population comprises the local Moran, Deori and Cachari communities supplemented by the flood and erosion affected people of the Tinsukia, Doomdooma and adjacent districts. Most of them are Agriculturists by profession and paddy is their principal crop. The demand for the Agricultural land is very high resulting in a great pressure over reserve forest land and hence the problem of protection of R.F. land from encroachments. The rural population, consisting mostly of agriculturists, requires material for building houses, timber for making agricultural implements and dugouts, firewood etc. The requirements for house building consist of timber for house posts, bamboos, ekra or reeds for walling and thatch or tokoupat for roofing. The urban population, more affluent than the rural population and with the higher standard of living, requires better class of timber for their houses, furniture and firewood. Among the other requirements of the local population, mainly timber for boat making can be listed. The people, particularly those living near big rivers and in areas subject to inundation during the rains, require boats as means of communication. They prefer to make dugouts rather than first convert the timber into planks and then make good boats out of them. The former is cheaper to make but very wasteful, as a large portion of the best part of the timber is wasted.

The timber required for Agricultural implements is of small size and does not impose much burden on the Reserve Forests for their supply. For furniture making the reserves have to be depended upon to a large extent for the provision of good quality timber. This particularly refers to the needs of the population who have also to depend mainly on the reserves for the supply of their very essential firewood.

7.5.1 Implementation of Agro Forestry and plantation on private land: An ambitious project such as Agro-Forestry and plantation on private land will be practiced in Component 2 under the programme APFBC.

7.5.2 Tea Gardens: The tea gardens situated in the tract are almost self sufficient with regards to firewood and the demand for the same from forest is negligible.

7.5.3 Markets and marketable products:

7.5.3.1 Timber: The timber is in great demand in plywood industry is Hollong. This is because its logs have a good cylindrical shape and peeling quality. The Tea-Chest Industry also favours Hollock, but the supply of the species is limited. Apart from these species there are many other species which are quite suitable for the manufacture of plywood. Though there are trees of exploitable girth, they are to be retained during this Plan period as 'Mother Trees'. Moreover, exploitation of these trees will create large openings which will in turn encourage growth of weeds with negative impact on wildlife. The evergreen forests of this Division are very rich in wildlife particularly with White-winged Wood Duck, Hoolock Gibbon (2 species) and other Primates, Elephants, Leopard, Tiger, barking deer etc., and felling of trees from these RFs will create further discontinuity of the canopy leading to destruction of wildlife habitat.

7.5.3.2 Bamboos and Canes: The species of bamboo growing naturally in these forests - Kako, Bajal etc., do not have much commercial value. The Kakojan RF is well stocked with Bamboo but it is a part of the Dehing-Patkai Elephant Reserve. During 2011-12, an area of 20 Ha was planted with Bamboo under National Bamboo Mission. Because of very high elephant population, the existing stock of bamboo cannot be recommended for exploitation as they are preferred food of the elephants.

The other bamboo bearing areas are Kundil Kolia RF, Deopani RF and Kukuramora RF under Sadiya Range. Bajal bamboo dominates these RFs. But the bamboo clumps are sparsely distributed. Exploitation of bamboos from these RFs will disturb the Eastern Hoolock Gibbon population, hence only planting of bamboo is recommended at a spacing of 5m X 5m. Wild elephants, presently 100-150 in number, forage these areas regularly except Kukuramora and Hollogaon RF, but very close to Hollogaon RF.

7.5.3.2 Lejai and Jatibet are the main varieties of cane found in the area. Exploitation of the same is not recommended from the RFs of Sadiya Range during this plan period.

7.6 Import and export of wood and wood product: Following table shows data on import and export of wood and wood products.

Table 7.4 Statement showing import and export of wood and wood products timber

S.No.	Year	Item	Range	Import (m ³)	Export (m ³)
1	2006 - 2007	Sawn timber	Imported	1,136.2	--

2	2007 - 2008	& veneer	from Arunachal Pradesh through Kakopathar Range	1,111.67	--
3	2008 - 2009			1,219.10	--
4	2009 - 2010			1,479.85	--
5	2010 - 2011			1,122.70	--
6	2011 - 2012			1,222.13	--
7	2012 - 2013			1,084.00	--
8	2013 - 2014			1,368.80	--
9	2014 - 2015			1,162.97	--
10	2015 - 2016			1,038.09	--

7.7 Import and export of NTFPs: There is no record on the import and export of NTFPs

7.8 Removal of fodder: There is no record of collection of fodder from the forests of Doomdooma Division.

7.9 Valuation of the products: Valuation of products may be done by including past and current prices of different forest products with price trend. Past and current prices of products in Doomdooma Division, Assam are shown in table 7.5.

The following tables show the past average market rates prevalent in the area for the various forest produce.

Table 7.5 Past and current prices of products in Doomdooma Division, Assam

S.No.	Items-Timber logs	Past prices per CuM	Current prices per CuM
1	Hollock	Rs. 2450/- to Rs. 2625/-	Rs. 4,327/- to 5,297/-
2	Khokon	Rs. 1925/- to Rs. 2100/-	Rs. 3,178/- to 3,531/-
3	Sam	Rs. 1575/- to Rs. 1750/-	Rs. 3,178/- to 3,531/-
4	Tita Sopa	Rs. 2450/- to Rs. 2625/-	Rs. 4,237/- to 5,297/-
5	Hollong	-----	Rs. 8,050/- to 8,838/-
6	Other	Rs. 1400/- to Rs. 1575/-	
Planks = per cum.			
1	Hollock	Rs. 19250/-	Rs.2 8,050/- to 28,838/-
2	Tita Sopa	Rs. 33250/-	Rs. 38,838/- to 41,594/-
3	Sam	Rs. 16800/-	Rs.2 4,237/- to 35,297/-
4	Simul	Rs. 8750/-	Rs. 12,825/- to 18,150/-
5	Borpat	Rs. 8750/-	Rs. 12,768/- to 15,987/-
6	Khokon	Rs. 12600/-	Rs. 14,337/- to 15,297/-
7	Jutuli	Rs. 11550/-	Rs.13,657/- to 14,560/-
8	J. Poma	Rs. 19250/-	23,567/- to 25,342/-
9	Nahor	Rs. 33075/-	38,657/- to 41,564/-
10	Lali	Rs. 11550/-	14,567/- to 17,560/-
11	Gonosoroi	Rs. 19250/-	23,456/- to 25,654/-
Cane			
1	Lezai	Rs. 450/- per bdl. = 100 ps.	Rs. 800/-
2	Jati (Hoka)	Rs. 12/- to Rs. 62/-per piece of length 3 mtr. to 4 mtr.	Rs.150/-
3	Boulder	Rs. 1500/- per cum	Rs.7500/-
4	Sand	Rs. 450/- per cum	Rs. 2000/-
Crushing stone			
1	1 ½ down	Rs. 2300/- per m ³	Rs. 3500/-
2	¼ down	Rs. 2450/- per m ³	Rs. 3800/-
3	¾ down	Rs. 2182/- per m ³	Rs. 2700/-

CHAPTER 8

Maintenance of Social, Economic, Cultural and Spiritual Benefits

As per the National Forest Policy of India 1988, the participation of local community living in and around the forest areas is vital for the forest conservation. Government of India issued a clear Guideline on 1st. June, 1990 to develop and manage degraded forestland with the help of the local communities and voluntary organizations. Communities organize themselves into a Joint Forest Management Committee (JFMC) to protect and manage forests. The benefits to them is in terms of direct access and control on the use and sale of NTFPs, and a share in the income from timber as well as other intangible benefits from local ecosystem services such as water recharge, pollination, wildlife habitat etc. Thus involvement of communities in conservation of forests and wildlife is of paramount interest. The Assam Forest Policy 2004, Joint Forest Management (JFM) practices would form the basis of forest management in the State. This Working Plan will keep provisions for participation of forest fringe communities, aiming for sustainable forest management and benefits to the communities.

8.1. Number of JFM committees and area (s) protected by them: There are 35 number of JFMCs constituted under Doomdooma Division, details shown in the table 8.1a. JFMC's location shown in Figure 8.1a and villages under JFMC created under APFBC & FDA shown in figure 8.1b, 8.1c.

Table 8.1.a: Number of JFM Committees and area protected by them

Division	Name of Range	Name of JFMCs	Name of RF	JFMC protected area (Ha)			
				NAP	NBM	APFBC	
Doom Dooma	Sadiya	Deopani	Deopani	50	20	--	
		Lakhimipathar	Deopani	38	--	--	
	Saikhowa	Hakhati	Hakhati	80	20	--	
		Mesaki	Mesaki	89	80	--	
		Kumsong	Kumsong	94	80	--	
		Dirak F.V.	Kumsang	28	--	--	
		North Mesaki	Mesaki	28	--	--	
	Kakopathar	Doomdooma	Dum Duma	88	20	--	
		Dangori	Dangori	73	--	--	
		Rongpur	Dum Duma	75	50	--	
		Litong	Dum Duma	75	30	--	
	Doomdooma	Kakojan(NZT)	Kakojan	48	50	--	
		Kakojan(Duar)	Kakojan	93	50	--	
		Phillobari	Phillobari	53	30	--	
		Tokawani	Tokawani	58	--	--	
		Noloni	Noloni	28	20	--	
	Khatangpani	Buridehing	Buridehing	76	70	--	
		Tarani	Tarani	48	--	--	
		Mihaliritu	Buridehing	28	--	--	
	New JFMC under APFBC (fuelwood purpose)						
	Kakopathar	Udito Suraj	Dangori	--	--	50	
		Kachijan	Dum Duma	--	--	50	
		Namhollong	Dum Duma	--	--	50.	
Doomdooma	Kakojan	Kakojan	--	--	50		
Saikhowa	Luit Eco-Tourism &	Mesaki &	--	--	50		

	Sadiya	Cultural Hub	Hahkhati			
		Dikrang	Sadiya Stn (WB)	--	--	50
		Lakhimijan	Deopani	--	--	50
	Khatangpani	Nahorbari	Sadiya Stn (NB)	--	--	50
		Kariajan Gaon	Buridehing	--	--	50
	Nabudoy	Torani	--	--		
				1152		450

Specific position of each JFMCs (Geo-cordinates) and range specification is given in Fig 8.1a to enable identifying the adjacent compartments to the individual JFMCs.

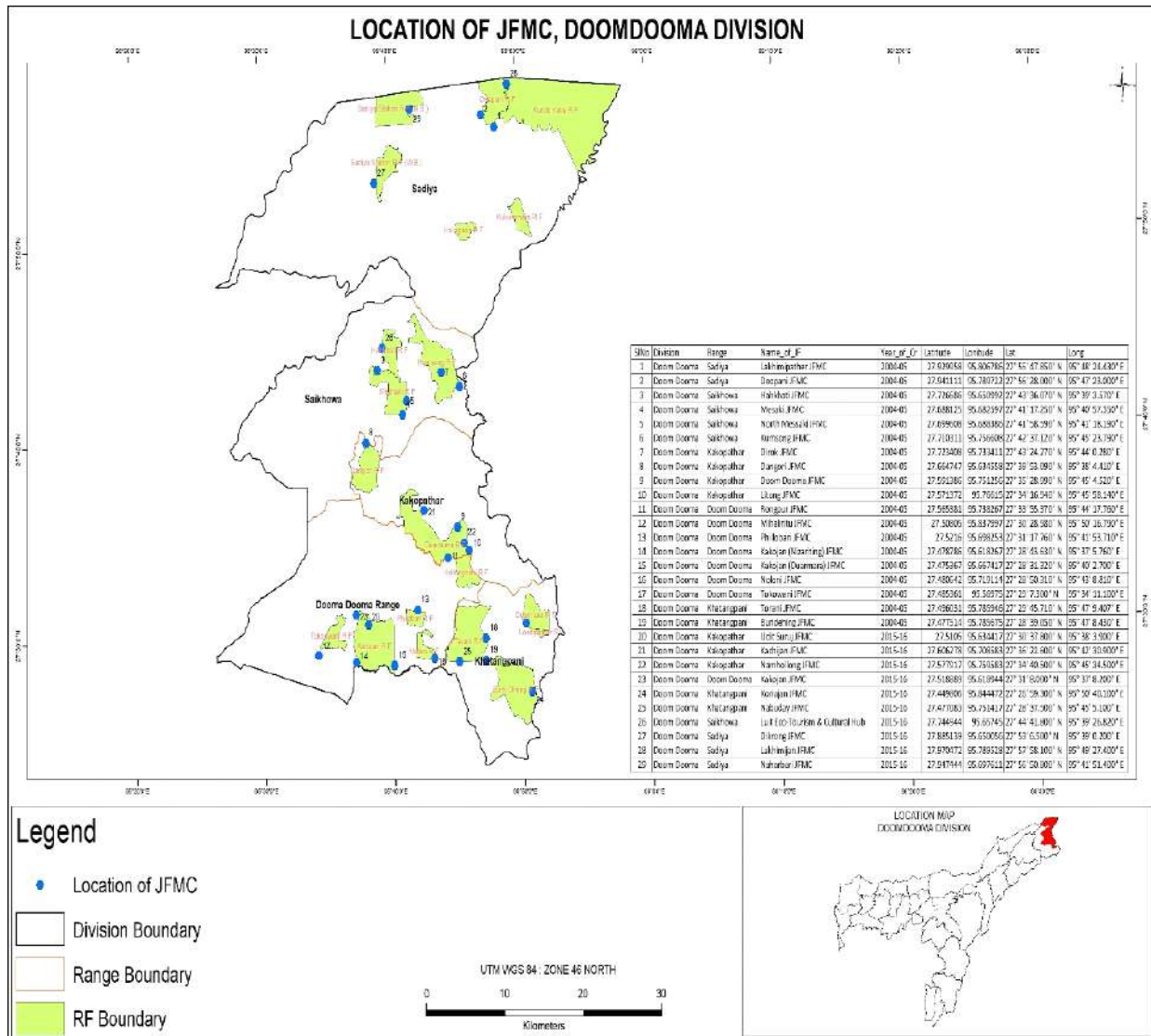


Figure 8.1a: Location of JFMC in Doomdooma division.

8.2 Status of empowerment of JFMCs: The JFMCs are constituted under the Doomdooma Forest Development Agency (FDA) which is already registered under the Societies Act. The JFMCs are on the other hand, registered with the Conservator of Forests, Eastern Assam Circle, Jorhat, who is the Chairman of the Doomdooma FDA. The Divisional Forest Officer (DFO) of the Doomdooma 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 from 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 a particular 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. The Executive Committee can be changed periodically if the Members decide so. All other activities are performed as per Societies Act.

8.2.1 Flow of Fund: The sanctioned fund under a Scheme/Programme is directly deposited to the Account of Doomdooma FDA through Core Banking System. The CEO, then immediately transfers the fund to the Account of a particular 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/drawal of the fund by writing to the concerned Bank. The CEO further offers suggestions for better management of the JFMC activities and provides technical guidance for achievement of the targets.

8.2.2 Distribution of the ‘Usufructs’: The authority to distribute the ‘Usufructs or related benefits’ lies with the JFMC, but in presence of the CEO. In case of timber/thinning material, the JFMC is authorised to receive 25% of the value after selling the same departmentally and deducting the expenses etc. as per Assam Joint (People’s participation) Forestry Management Rules, 1998.

8.3 Labour welfare: The labours collect MFP like kachu, Dhekia, Betgaj, Bamboo shoots and other edible fruits like Outenga, Hilikha, Amora, Bhomora, Amlakhi, Jalphai, Jackfruit, Mango etc. Medicines are also being provided to the labours engaged as and when required during forestry activities. Wages according to prescribed rate by the Forest Department or by the JFMCs are paid to the labours when engaged for any forestry activities. Minimum wage provided to labour employed by forest department is Rs. 250 per day.

8.4 Use of indigenous knowledge: The record of the documentation of the indigenous traditional knowledge is not yet available for incorporation of the same in the microplans and other prescriptions of the plan. But, the local people are dependant on the medicinal plants available locally for their needs. The following shows the list of medicinal plants and their uses.

Table. 8.4 List of locally available medicinal plants and their uses.

S No	Common Name	Botanical Name	Use
1	Surpagandha	<i>Rauwolfia serpentine</i>	Sex stimulant
2	Kalmegh	<i>Andrographis paniculata</i>	Cancer
3	Brahmi	<i>Bacops monnieri</i>	For problem of Nerves, brain tonic
4	Satmul	<i>Asparagus racemosus</i>	Oil good for rheumatic pain
5	Purnanawa	<i>Boerhaavia diffusa</i>	Pain relief
6	Palas	<i>Butea monosperma</i>	Medicine, dye, astringent
7	Chalkunwori	<i>Aloe vera</i>	Skin, high temperature
8	Chaulmugra	<i>Hydnocarpous kurzil</i>	Treatment of Leprosy

9	Anantamul	<i>Hemidesmus indicus</i>	Roots woody and aromatic, blood purifier, urinary disorder
10	Hilikha	<i>Terminalia chebula</i>	Digestion, laxative, rejuvenative, astringent, healing of ulcer, stops bleeding of gums, cancer, improves memory
11	Bhomora	<i>Terminalia belerica</i>	Digestion, laxative, astringent, improves body immunity, adds longevity, cures vomiting, thirst, reduces problem of cataract
12	Amlakhi	<i>Emblica officinalis</i>	High vitamin, astringent, blood purifier, reduces cough,
13	Jamun	<i>Syzygium cumini</i>	Diabetes, source of vitamin A and C
14	Bhatghila	<i>Oroxylum indicum</i>	Digestion, analgesic, anti-inflammatory, rheumatism
15	Kadam	<i>Anthocephalus cadamba</i>	Enormous pharmacological values; alternative to several synthetic chemical compound in several incurable disease, anticancer, antioxidant,
16	Bael	<i>Aegle marmelos</i>	Stomach trouble, chronic diarrhea, gastric ulcer, cholera, haemorrhoids, vitiligo, leaves controls cholesterol
17	Arjun	<i>Terminalia arjuna</i>	Bark iron rich, anti oxidant, good for treating cardio vascular problem
18	Sajina	<i>Moringa oleifera</i>	It gives immunological support, reduces hypertension, high calcium, improves sexual activity, very good for skin, effective in arthritis
19	Ou tenga	<i>Dillenia indica</i>	Anti diabetic, Anti oxidant, Digestion
20	Jamun		Anti Diabetic,
21	Bor thekera	<i>Garcinia pedunculata</i>	dysentery , anti microbial, menstruation problem, HIV, cancer
22	Boch	<i>Acorus calamus</i>	Loss of appetite, dysentery, oil is used to massage for knee and joint pain
23	Hoguni lata	<i>Tinospora cordifolia</i> (Climber)	Cancer, sugar control juice, immunity booster, anti inflammatory, psychological disorder, diabetes, anti aging
24	Pipoli	<i>Piper longam</i>	Aromatic herb, to control hiccups, sedative in insomnia and epilepsy, headache, Stroke, fever, Vitamin B 1 deficiency
25	Ashok	<i>Saraca indica</i>	To prevent excessive uterine bleeding, dysmenorrhoea (painful menses, cramps)
26	Bhringaraj	<i>Eclipta prostrata</i>	For health of hair, growth etc.
27	Letaguti	<i>Caesalpinia crista</i>	Malaria fever,young leaves good treating insect bites, menstruation pain
28	Hijol	<i>Barringtonia acutangala</i>	Seed anti tumour, antibiotic, antifungal
29	Harjura lata	<i>Cissus quadra</i>	Bone fracture
30	Ada	<i>Zinziber officinalis</i>	Spice, digestion, nausea, in fighting common cold, morning sickness, muscle pain, soreness, osteoarthritis, lower blood sugar, cancer, improves brain function
31	Jaluk	<i>Piper nigrum</i>	Bronchitis, muscular pain, spice, cough
32	Manimuni	<i>Centalla asiatica</i>	Dysentery
33	Kola kachu	<i>Colocasia esculenta</i>	Remedy for piles and tonsillitis
34	Kona simalu	<i>Commelina benghalensis</i>	To stop bleeding, fever, snake bite
35	Bioni habota	<i>Desmodium gangeticum</i>	To cure Ulcer
36	Helonchi	<i>Enhydra fluctuans</i>	Leaf paste against ring worm. Antibilious, demulcent
37	Mochondori	<i>Houttunia cordata</i>	Bodyache
38	Nikori	<i>Euryale ferox</i>	Dry seeds are spermatorrhoea, astringent
39	Dom deuka	<i>Impatiens balsamina</i>	To reduce muscular pain
40	Doron	<i>Leucas aspera</i>	Sinasisitis, stomach

41	Bihlongoni	<i>Polygonum hydropiper</i>	Leaf Paste externally used to reduce pain
42	Naharu	<i>Allium sativum</i>	Against blood pressure, cholesterol
43	Mati kanduri	<i>Alternanthera sessilis</i>	Diuretic, cools the body, tonic, benefits eyes, hair oil, increases milk in lactating mother, leprosy, itching, night blindness
44	Khutura	<i>Amaranthus spinosus</i>	Antidote against snake bite, leaves good for scorpion sting
45	Dhopat tita	<i>Clerodendron infortunatum</i>	Tumour, leaves against malaria fever
46	Dupartenga	<i>Bryophyllum pinnatum</i>	Snakebite, quick healing of wounds, urinary problem
47	Sirata	<i>Andrographis paniculata</i>	Common cold, diarrhoea, cholera, pneumonia, TB, chicken pox, headache, ear infection, mumps
48	Chirota	<i>Artemisia vulgaris</i>	Against worm, juice blood purifier, brain disorder
49	Lajukilata	<i>Mimosa pudica</i>	Leaf juice for Piles
50	Tita bhekuri	<i>Solanum indicum</i>	Asthma, Roots used for toothache
51	Agora	<i>Xanthium strumarium</i>	Malaria fever, urinary bladder
52	Akon	<i>Calotropis procera</i>	Sprain, Pain, cough, asthma, cold, elephantiasis, juice good for tooth ache
53	Nayantora	<i>Catharanthus roseus</i>	Cancer
54	Methi	<i>Trigonella foenum-graecum</i>	Diabetes
55	Laijabori	<i>Drymaria cordata</i>	Laxative, cooling property
56	Bon kopah	<i>Erechthites valerianaefolia</i>	Leaves used for quick healing against wound
57	Kehraj	<i>Eclipta alba</i>	Hair tonic, blackens hair, jaundice, fever
58	Medelua	<i>Cassia occidentalis</i>	Hysteria, nervous disorder
59	Nephaphu	<i>Clerodendrum colebrookianum</i>	Against Blood pressure
60	Aparajita	<i>Clitoria ternatea</i>	Earache
61	Kochu	<i>Colocasia</i>	For coagulation of Blood against minor injury
62	Kothonaphul	<i>Coffea bengalensis</i>	Eye ball
63	Jomlakhuti	<i>Costus speciosus</i>	Liver problem, Jaundice
64	Haladhi	<i>Curcuma longa</i>	Cancer, digestion

Documentation of the indigenous traditional knowledge and incorporation of the same in the micro-plans and other prescriptions of the plan will be undertaken during the tenure of this Working Plan.

8.5 Extent of cultural/sacred groves: The Sacred Groves found in Doomdooma Division are:

- Bhelou Tree Grove-with 20 feet circumference, inside the Kakojan Reserve Forests, Tamuli Bongaon area.
- During 1984, a temple called Bolia Baba Than inside Duarmara RF, at Khatangpani, was established by the Deoris.

8.6 Eco-tourism areas and activities: Some of the areas near/inside RFs, which have ecotourism potential and are being visited by tourists are as following:

- At Zero Point, Dhola- at the river bank of Brahmaputra. A Sanctuary namely Luit Dolphin Sanctuary may be constituted to protect the endangered Gangetic Dolphin. Similarly, the Doomdooma-Dangori Wood Duck Sanctuary may be created for protection of the Critically Endangered White Winged Wood Duck.
- Hollogaon and Kukuramora Conservation Reserves under Sadiya Range, may be created to save the Gibbon (Eastern population) and White Winged Wood Duck from getting extinct,

- Tourism Zone at the bank of Dibang River, Sadiya may be created to develop water sports, boating, rafting, angling, nature camping,
- At Tongona gaon, Kakopathar, to adopt the village in order to preserve the Moran culture,
- At Samdang Tea Garden, Doomdooma, to promote the culture of Tea community and other ethnic culture. Short trips to be arranged to Barekuri to present the Gibbon families
- Details of areas inside and adjoining designated forests which have ecotourism potential and are being visited by tourists, are identified and are documented. The natural attributes viz. landscape, waterscape, wildlife and also the humanscape will be enlisted and explained for effective ecotourism management during the tenure of this Working Plan.

8.7 Social customs: There are no major prevalent social customs related to forest in this Division. Although the worship of hollong tree (*Dipterocarpus*) is not a custom of the Morans-an ethnic community, yet the Moran Students are devoting themselves to protect the trees. These are very laudable efforts.

8.8 Status of compliance of Forest Right Act (FRA): No rights were granted under the Forest Right Act to any forest dweller of Doomdooma Division.

8.9 Other rights and concessions: The major other rights and concession provided in the Divisions was existence of certain concessions made to specific villages near Duarmara & Kumsong Reserve Forests, but these are non-existent now.

8.9.1 Distribution of the 'Usufructs': The authority to distribute the 'Usufructs or related benefits' lies with the JFMC, but in presence of the CEO. In case of timber/thinning material, the JFMC is authorised to receive 25% of the value after selling the same departmentally and deducting the expenses etc (As per JFMC Rules, 1998).

- As per approved Micro Plans, income generating activities will be taken up in each JFMC. Trainings will be imparted to the JFMC members at the expense of the Government. Equipments, machines, yarns etc. will be distributed under the projects.
- Eco tourism spots will be established at various locations with the help of JFMC/EDC members. A major share of income (not specified yet) will go to them.
- Collection of tokou pat was allowed only from Duarmara RF. Public Rights of way by roads/paths in Kakojan, Tokowani, Dangori, Hahkhati, Duarmara & Doomdooma and other Reserve Forests were specified during their constitution, but, after declaration of the Sanctuary namely Doomdooma-Dangori Wood Duck Sanctuary, these will be restricted. Certain concessions made to specific villages near Duarmara & Kumsong Reserve Forests are non-existent now.
- The following rights and concessions will be granted to the 35 JFMC and EDC members as per the Assam (Peoples Participation) Joint Forestry Management Rules, 1998. They are brought under the Joint Forest Management (Overlapping) Working Circle and will cover the fringe areas of 14 RFs. Similarly, 13 EDCs will be constituted around 2 Proposed Sanctuaries and Conservation and Community Reserve.

It is proposed to take up 2700 hectares of plantation under JFMC in the coming 9 years i.e. from 2022-2023 to 2030-31 with an annual target of 300 hectares. But such plantation alongwith nurseries will be restricted to the fringe areas of the RFs. Therefore, the right of entry in RF, JFMC activities,

collection of NTFP will be restricted to allow the endangered animals to increase their population and flourish. Under Eco Tourism, small groups of tourists accompanied by JFMC and EDC members (Members of Forest Protection and Regeneration Committee) may visit areas beyond the designated areas, but under close supervision of Forest Staff. It is worth mentioning that out of 35 JFMCs, only 6 JFMCs (In three RFs) are constituted on the northern side of Brahmaputra River (Sadiya Range). Thus there is no JFMC to cover the Hollogaon, Kukuramora and Kundil Kolia RF. All these RFs are very important from 'Bio diversity conservation' point of view, particularly for a different species of Hoolock Gibbon (Eastern Hoolock) and White Winged Wood Duck. In fact, all the 20 RFs of Doomdooma Division are excellent habitats of wildlife and as per present Forest Policy, 'Bio diversity conservation' deserves the top most priority. Under the circumstances, the role of Forest Protection and regeneration Committee becomes crucial in regeneration of forests, their protection and collection/marketing of NTFP. Accordingly, few more JFMCs/EDCs will be created in the First/Second Year of the Working Plan period.

8.10 Dependency of local people on NTFPS: Collection of NTFP is not considered as right except collection of Tokou pat from Duarmara RF. However, the fringe villagers collect bamboo and the shoot, cane, small timber, posts, jengu leaf, bhatghila, fern, elephant apple, etc. but without any authority. Such nuisance has reduced the elephant food/fodder to a considerable extent.

In line with the legally enforced Assam Forest Regulation, 1891, beyond the individual demand of the Right Holders, the local selling and marketing should be under proper transit pass or challan, for commercial use of NTFPs. However, due to traditional practices, the provision of T.P/T.C. has not yet been properly implemented. The forest administration shall impose the mechanism for assessing the quantity domestically used and also the quantity marketed in the local market. During the constitution of the RFs, certain rights and concessions were allocated to the people living in and around the RFs which will be taken in to consideration. Many NTFP, mainly fruits, seeds, flower, leaves, roots, rhizomes, barks, medicinal plants, herbs, aromatic oil, etc will be available after a period of six/seven years and will be available from areas under Rehabilitation and Energy Plantation Working Circle if the 'Ejection' of encroachers from RF areas are successful. Otherwise these NTFPs and Sericulture leaves, coccons etc will be available from the plantations carried by the JFMCs in the fringe forest areas.

8.11 Other aspects: Value addition of the NTFP and quality control will be done by taking up the matters with line departments. The value addition includes processing, packaging, certification of quality, export etc. which will be done by discussin with concerned authorities. 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.

CHAPTER 9

Adequacy of Policy, Legal and Institutional frame work

9.1 Existing policy and legal frame work and their compliance:

The following Acts and Laws are enforced for regulation of forestry activities in the division: --

- Assam Forest Regulation Acts 1989 (Amended 1995)
- Wild Life Act 1972
- The Assam Wildlife Protection Rule 1997
- Indian Forest Act 1927
- Forest Conservation Act 1980
- The Biological Diversity Act 2002
- Assam Bio-diversity Rule 2010
- The Wood Base Industries (Establishment and Regulation) Rules 2000
- The Cattle Trespass Act 1871.
- The Assam Forest (Removal and storage produce) Regulation Act 2000
- The Assam (Control of Felling and Removal of trees from Non-Forest Land) Rules 2002
- The Schedule tribe and other traditional Forest Dwellers (Recognition of Forest Rights) Acts 2006
- The schedule tribes and other traditional Forest Dwellers (Recognition of Forest Rights) Rules 2007
- The Assam Joint (Peoples Participation) Forestry management Rule 1998
- The Assam Minor Mineral Concession Rules-2013

The Forest Department is authorized to practice the Indian Penal Code, Criminal Procedure code etc. for arresting the culprits and undertaking necessary investigation of offences etc. The

9.2 Status of approved Working Plan and compliance: As the previous Working Plan was not approved, valid reason for deviations in implementation of the plan and compliance can't be provided. The Suresh Chand's plan 1990-91 to 1999 – 2000 was not approved. The following two circles were constituted in the plan

1. Hollong – Mekai Plantation Working Circle and
2. Miscellaneous Plantation Working Circle.

The areas allotted to the Hollong–Mekai plantation Working Circle included the areas classified as Hollong–Nahor forests, some of the miscellaneous forests and productive blanks suitable for raising Hollong plantation. Such suitable formations occurring in nine RFs covering a total of approximately 11,746 Ha. was included in this Working Circle.

This Working Circle was further divided into three felling series, namely

- (i) Doomdooma Felling Series,
- (ii) Kakopathar Felling Series and
- (iii) Khatangpani Felling Series.

Although the aim, objectives and prescriptions of this Working Plan were conservative on all counts, and despite of the bans imposed by various authorities during different segments of this Working Plan, the ever increasing menace of illegal felling/encroachment had made the task much more difficult and complicated.

9.3 Number of forest offences: The following records reveal that vehicles were seized. There were also reports of illegal felling of trees, where the out-turns recovered were unclaimed. Seized trees were disposed by following departmental procedures.

Table 9.3a. Details list of forest offences in Doomdooma Division

Assessment year	Types of offence	Number	Volume of outturn recovered (cu.m.)	Volume of outturn lost (cu.m.)	Types of loss to forest and revenue (lakhs)
2012 - 2013	Illegal removal of Sand	12	84.7311	5.842	0.18
	Stone	1			
	Earth	1			
	Timber	3			
	River Silt	7			
	Firewood	4			
	Sand gravel	4			
	Vehicle seized	3			
2013 - 2014	Illegal removal of Sand	18	60.1880	6.818	0.21
	Stone	1			
	Timber	3			
	River Silt	2			
	Firewood	11			
	Sand gravel	1			
	Vehicle seized	4			
2014 - 2015	Illegal removal of Sand	7	50.9733	2.073	0.66
	Timber	5			
	Firewood	11			
	Sand gravel	3			
	Vehicle seized	5			
2015 - 2016	Illegal removal of Sand	1			
	Timber	1			
	River Silt	4			
	Firewood	6			
	Sand gravel	1			
	Vehicle seized	5			
2016 - 2017	Illegal removal of Sand	10			
	Stone	2			
	Earth	4			
	Timber	8	1		
	River Silt	1			
	Firewood	6			
	Sand gravel	8			
2017 - 2018	Illegal removal of Sand	8			
	Stone	1			
	Timber	5			
	River Silt	1			
	Firewood	9			
	Sand gravel	2			

9.4 Status of research and development:, various research works have been carried out from time to time by research scholars in different RFs. The Division is rich in floral as well as faunal biodiversity and studies regarding the status of endangered plants in the division have also been carried out in the division. Assam is one of the most important pocket of rich biodiversity in India as well as the world. There are many scopes for forestry research in Assam. Our forest has rich diversity of timber species, like in the Evergreen forest of Upper Assam *Dipterocarpus retusus* Blume (Hollong), *Terminalia myriocarpa* Van Heurck and Mull.Arg. (Hollokh), *Magnolia* spp (Phulsopa, Pansopa, Gahorisopa, Titasopa Khorikasopa, Kothalsopa etc.), *Ailanthus excelsa* Roxb (Borpat) *Shorea assamica* Dyer (Mekai) *Dipterocarpus retusus* Blume (Hollong), *Terminalia myriocarpa* Van Heurck and Mull.Arg. (Hollokh) etc. But in present days the abundance of valuable tree species has gradually declined due to many biotic and abiotic factors. We may perhaps take steps to protect those valuable indigenous species in their natural habitat as the Silviculture Division, Assam has recently introduced three new preservation plots with an aim to protect such species like *Morus laevigata* Wall. (Bola) in Behali Reserve Forest, *Dipterocarpus turbinatus* C.F.Gaertn. (Garjan) in Innerline Reserve Forest, *Shorea assamica* Dyer (Mekai) in Upper Dihing Reserve Forest. The main aim and objective of creating such plots is to study the species in their natural habitat by focusing – a) Percentage of natural regeneration, b) Search of healthy mother tree for quality seed production, c) Study of soil and other biotic and abiotic factors etc.

For comparative data base study we may also lay out some Control Plots of those specifically targeted species in the selected areas where there were past records of abundant growth of that species, but at present there are no further records of satisfactory growth. Here we may carry out the study related to the poor growth of the concern species by studying the a) Soil condition of both plot 1 and plot 2. b) Study of any invasive species in the control plot which may threaten the growth of particular species.

9.4.1 Orchids: Orchids are good bioindicators because they have very low tolerance for changes in their environment and are most valuable and commercially demanding flowering plant. The forest of entire North East and Assam is naturally blessed with numerous beautiful orchids. Not only orchids have highest market demand for its long lasting beautiful flowers but also medicinal properties. Many of Dendrobium orchids are used as Ayurvedic medicine to cure many diseases like treating cancer, strengthen the immune system and improve eye sight. The Jeypore Reserve Forest of Doomdooma division and UDRF of Digboi division is itself a big hotspot of many rare and endangered orchid species. This zone has the most rare and beautiful orchid like *Anoectochilus sikkimensis* King & Pantl (Jewel orchid), *Rhynchostylis retusa* alba (white Rhynchostylis). Similarly Garampani area, in Karbi Anglong, Borail range in Barakvalley, Dibru - Saikhowa and Chandubi Forest etc, we have very good concentration of orchids. In Garampani R.F. we have valuable species like *Vanilla pillefera* (climbing orchid), *Phalaenopsis manni*, *Acanthephippium sylhetense*, etc. According to the concentration of occurrence of orchid species in various reserve forest areas we may create some special plots to conserve and preserve these beautiful flora. Again we may also propose an orchid park, orchid sanctuary, etc which will help us to protect the orchids in their natural habitat and by which we may also generate revenue.

9.4.2 Medicinal plants: The variety of medicinal plants found in the North Eastern part of India makes Assam the perfect spot to harbour the process for conserving, preserving and utilising the important aspects of medicinal plant. The traditional system of medicine plays an important role in the health care of rural people for all types of ailments. However the scope of development in this field is almost none and so, we need to look into the miraculous and potential phytochemical constituents which could be modified for formulating medicines, which are present in the plants grown in wild and ignorance on the roadside, backyards and villages of Assam. Freshly, 13 Research projects have been proposed on various subjects under this Plan. The research study conducted in the division is shown in table 9.4

Table 9.4: Status of research study conducted in the Doomdooma division

SI No	Subject	Name of the University/College	Name of the Research Scholar	Findings
1	Study on status of Morhal (<i>Vatica lanceaefolia</i>), a critically endangered plant of Dipterocarpaceae family. Dt.04.11.2016 and 10.11.2016	Cotton College, Guwahati	Smt. Dorothei Das	Natural growth in profusion in Kukuramora RF. Sporadic presence in Kundli kalia RF
2	-do-	-do-	Smt Pragati Kalita	-do-

9.5 Human resource capacity building efforts: The department organizes a short term training/refresher course and several programmes in the circle level towards human resource and capacity building efforts. There should be a human resource capacity building plan (training plan) for efficient utilization of the human resources where at least 2/3rd staff should be trained. Details of such programmes are listed in table 9.4 below.

9.6 Forest resource accounting: Tangible benefits from forests are timber, NTFPs, fuelwood, fodder, livelihood, ecotourism, biodiversity, etc. The non-tangible benefits of forests are carbon sequestration, soil erosion control, water recycling, oxygen production, control of air pollution, animal habitat, etc. During the tenure of this Working Plan positive efforts will be made to quantify intangible benefits. Details of forest resources have been furnished in table 9.6.

Table 9.6: Forest resources accounting in Doomdooma Division, Assam

S.No.	Range	Forest resources available	Tangible benefit	Intangible benefits
1	Doomdooma	Sand, Timber/Lots	Tangible benefit	Carbon sequestration, ecological service, fresh air, water, fertility to soil, amusement, cultural value, repository of bio diversity.
2	Sadiya	Sand gravel, Timber lots	Tangible benefit	
3	Khatangpani	Sand gravel, Timber lots	Tangible benefit	
4	Kakopathar	Timber Lots	Tangible benefit	
5	Saikhowa	Timber Lots	Tangible benefit	

9.7. Budgetary allocation to the forestry sector: The budgetary Allocation to the Doomdooma Division as per records available, is tabulated below in table 9.7.

Table 9.7. Budget allocated to the forestry sector in Doomdooma Division.

Reporting year	Budgetary allocation	Total budget received (Rs. in lakhs)	Timely completion of the work	Efficiency in cash flow	Audited report and reporting
2015 - 2016	Plan CSS(NBM)	– 12.50	Yes	Yes	Yes
	Non-Plan	3.50465			
	FDA	Nil			
	GIM				
	CAMPA	14.7514			
	APFBC	7481895.00			
2016 - 2017	Plan CSS(NBM)	– Nil	Yes	Yes	Yes
	Non-Plan	595.660			
	FDA	Nil			
	GIM				
	CAMPA	18.1544			
	APFBC	7226700.00			
2017 - 2018	Plan CSS(NBM)	– Nil	Yes	Yes	Yes
	Non-Plan	637.91			
	FDA	Nil			
	GIM				
	CAMPA	22.75605			
	APFBC	9817100.00			
2018-2019					
2019-2020					
2020-2021					
2021-2022					

9.8 Existence of monitoring, assessment and reporting mechanism: Monitoring and assessment of the executed works are done by the Divisional Forest Officer himself or through the Assistant Conservator of Forests and then reported to the Circle Conservator. In their fortnightly diaries the Assistant Conservator of Forests and Divisional Forest Officer record their findings of monitoring and assessment and submit a report 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 monitors and assesses the work from time to time and reports to the Principal Chief Conservator of Forests.

9.9 Public awareness and education: Efforts will be made to increase public awareness of the importance of and the benefits provided by forests and sustainable management of forests. Public awareness camps are organized for various schemes and their implementation. Awareness camps and meetings are also organized regularly on various occasions like Banamahotsava, Seuji Saptah, World Environment Day, Wild Life week etc. for the stake holders, Govt. departments, other social organizations and NGOs of the Division. Additionally, list of the published material such as brochures, pamphlets, leaflets, posters, etc., are also provided to the general public to inform them about benefits provided by forests to society; details of forestry/environmental awareness and education programmes are conducted for students. Meetings and workshops are also regularly organized through the help of resource persons. Powerpoint presentations and documentary films are also exhibited during such workshops.

9.9.1 Awareness programme:

1. Awareness Camps will be organized to motivate the local people for conservation of nature and natural resources. Weekly meetings at Range/Beat levels are proposed.
2. Economic development activities in the adjoining villages of Reserve Forests will be taken up with active participation of the local people by forming JFMCs/Eco-Development Committees.

9.10 Adequate manpower in Forest Division: The Doomdooma Division comes under Eastern Assam Circle headed by Conservator of Forests, with its Headquarter at Jorhat. A Deputy Conservator of Forest is in charge of the Division with headquarters at Doomdooma. A tabular statement is shown below which gives the strength of the establishment as on 01.01.2020 as communicated by the D.F.O. Doomdooma vide email Dated: 15th February 2020.

Table 9.10.1: The following table shows the strength of the staff as existed as on 01.01.2020.

Sl. No.	Name of post	No. of posts	Total amount of the month (₹)	Total amount for the year (₹)
1	Dy. C F	1	92,035.00	11,04,420.00
2	ACF	3	1,69,080.00	20,28,960.00
3	Forest Ranger	9	3,35,641.00	40,27,692.00
4	Dy. Ranger	4	1,25,689.00	15,08,268.00
5	Forester Grade - I	27	7,24,164.00	86,89,968.00
6	Forester Grade - II	4	1,47,168.00	17,66,016.00
7	Forest Guard	51	56,31,16.00	67,57,392.00
8	Draftsman	1	51,764.00	6,21,168.00
9	H. Asstt.	1	-	-
10	Acctt.	2	1,16,161.00	13,93,932.00
11	U. D. Asstt.	3	1,40,445.00	16,85,340.00
12	L. D. Asstt.	3	1,43,638.00	17,23,656.00
13	O.P.	3	31,476.00	3,77,712.00
14	Driver	3	1,36,978.00	16,43,736.00
15	Gate Chowkidar	4	35,333.00	4,23,996.00
16	Night Chowkidar		-	-
17	I. B. Chowkidar		-	-
18	Mali	2	-	-
19	Dak Runner	0	-	-
20	Chalnmam	1	33,803.00	4,05,636.00
21	Boatman	2	35,813.00	4,29,756.00
22	Sweeper	2	35,813.00	4,29,756.00
Total		133	29,18,117.00	3,50,17,404.00

CHAPTER 10

FIVE YEARS PLANS

10.1 Forest Management under Five-Year Plans: The First Five Year Plan (1951-56) laid significant emphasis on the development of forests. The Plan aimed for improvement as well as expansion of the areas under forests to cater to the increased demand for timber and forest produce in a 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 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 in hilly regions and 20% in the plains. An overall provision of Rs 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 emphasis on 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, 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 labour 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 Rs 21.21 crores was provided in the plan (in both Centre and State budgets) for the development of forestry and wildlife. Funds were also allocated for soil conservation.

The Third Plan (1961-66) 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, and 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 Rs 45.85 crores for various programmes of forest development in States and Union Territories including a sum of Rs 6.7 crores for Centre and centrally sponsored schemes. The plan also initiated various programmes related to soil conservation and an outlay of about Rs 72 crores was provided for their execution (The Third Five Year Plan, 1961-66).

The Fourth Five Year Plan (1969-74) laid emphasis on three main objectives 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 (including wildlife) in the Fourth Plan was Rs 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 Rs 208.84 crores were tentatively allocated in the Centre and State budgets for forestry and wildlife conservation programmes for the Fifth Five Year Plan, 1974-79.

Mass afforestation and social forestry programmes were emphasised during the Sixth Five Year Plan (1980-85). 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 Rs 692.49 crores was provided for forestry and wildlife conservation programmes.

During Seventh Five Year Plan (1985-90) 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 Rs 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 (1992-97) 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 (2002-07) 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, 2002-07). 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 envisaged in the Plan (in Centre and State budgets) for forestry and wildlife conservation programmes.

10.1. Funds allocated to the division during five year plan.

Table 10.1: Funds allotted to the division for development works during five-year plan.

Development agencies	Year	Development programmes	Total funds allocated (Rs.)
Bamboo Mission (JFMC)	2011-12	Maintenance of Bamboo Plantation = 20 Ha.	2,50,000.00
	2012-13	Bamboo Plantation = 200 Ha.	25,00,000.00
		Dist. Level workshop = 1Unit	1,00,000.00
		Micro irrigation	10,00,000.00
		Total	38,50,000.00
	2013-14	Maintenance of Bamboo Plantation = 200 ha	25,00,000.00
		Creation of Bamboo Plantation = 100 ha	12,50,000.00
		Improvement of existing Bamboo = 20 ha.	1,60,000.00
		Dist level workshop = 1No.	1,00,000.00
		Total	40,10,000.00
	2015-16	Maintenance of Bamboo Plantation = 100 Ha	12,50,000.00
Total		12,50,000.00	
2016-17	Nil	-	
2017-18	Nil	-	
NAP (JFMC)	2011-12	Nil	-
	2012-13	Maintenance of Plantation, EPA and committed liabilities	3896000.00
	2013-14	Maintenance of Plantation	311000.00
	2014-15	Nil	-
	2015-16	Nil	-
	2016-17	Nil	-
	2017-18	Nil	-
CAMPA	2011-12	Creation of nursery = 1.5 ha	1,60,000.00
	2012-13	Maintenance of nursery = 1.5 ha	2,95,959.00
		Maintenance of site specific plantation = 6.0 ha	59,796.00
		Total	3,55,755.00
	2013-14	Construction of R.O. Qtr = 1 unit	18,65,000.00
		Construction of Fgd Qtr = 1unit	9,10,000.00
		Construction of Forest force camp = 1 unit	52,93,000.00
Maintenance of road = 5 Km		75,000.00	
Maintenance of site specific plantation =		32,652.00	

		6.0 ha	
		Maintenance of nursery = 1.5(created during 2011-12)	1,36,800.00
		Total	83,12,452.00
	2014-15	Maintenance of site specific plantation = 6.0 ha	14,208.00
	2015-16	Maintenance of nursery = 1.5 ha 1.5(created during 2011-12)	8,28,645.00
		Maintenance of site specific plantation = 6.0 ha	5,910.00
		Construction of Fgd = 1unit (1 st instalment)	6,40,585.00
		Total	14,75,140.00
	2016-17	Construction of Fgd. quarter = 1unit (balance fund during the year 2016-17)	6,40,585.00
		Maintenance of nursery = 1.5 ha. (created during 2011-12)	6,24,480.00
		Construction of Assam type Forester Barrack = 1unit (1 st instalment)	5,50,375.00
		Total	18,15,440.00
	2017-18	Maintenance of nursery = 1.5 Ha. (created during 2011-12)	6,24,480.00
		Construction of Assam type Forester Barrack = 1unit (balance fund during the year 2016-17)	16,51,125.00
		Total	22,75,605.00
APFBC	2013-14	ANR =60ha (Creation)	5,91,300.00
		NTFP = 20ha(Creation)	4,68,800.00
		MHW = 50ha (Creation)	6,38,400.00
		Total	16,98,500.00
	2014-15	ANR = 60 ha (maint.)	1,50,840.00
		NTFP = 20 ha (maint.)	73,500.00
		MHW = 50 ha (maint.)	1,83,750.00
		NTFP = 390 ha (creation)	40,24,125.00
		MHW = 200 ha (creation)	30,49,680.00
		Total	74,81,895.00
	2015-16	NTFP=20 ha (maint.)	1,50,840.00
		MHW=50ha. (maint.)	73,500.00
		NTFP=390ha (maint.)	1,83,750.00
		MHW=200ha(maint.)	40,24,125.00
		Fuel wood=500 ha (creation)	30,49,680.00
		Total	74,81,895.00
	2016-17	ANR=60 ha (maint.)	1,72,800.00
		MHW=50 ha (maint.)	34,400.00
		NTFP=390 ha (maint.)	9,36,000.00
		MHW=200 ha (maint.)	3,84,000.00
		Fuel wood = 500 ha (creation)	36,00,000.00
		Block plantation = 50 Ha (creation)	20,99,500.00
		Total	7,22,6700.00
	2017-18	NTFP = 390 ha (maint.)	18,55,500.00
		MHW=200 ha (maint.)	21,20,600.00
		Block Plantation = 50 ha (maint.)	23,91,000.00
Fuel wood = 500 ha (maint.)		34,50,000.00	
Total		98,17,100.00	
2018-19	Block Plantation = 50 Ha.(maint.)	7,84,200.00	
	Total	7,84,200.00	
	2019-20		
	2020-21		
	2021-22		

CHAPTER 11

PAST SYSTEMS AND MANAGEMENT

11.1 General history of the forest: The first scientific management of Doomdooma RFs was compiled by Purkayastha. The plan came into force in 1933-34. The period of the plan was 20 years. The forests were covered by three Working Circles namely – Shelterwood Working Circle, Selection Working Circle and Clearfelling Working Circle.

The next Working Plan was Srinivasan's Plan which was compiled in 1950 and covered the period from 1949 to 1959. The plan was a revision of Purkayastha's plan. It constituted four Working Circles – Veneerwood Working Circle, Hollong local trade Working Circle, Miscellaneous Working Circle and Clear Felling Working Circle. This plan was later revised in B.N. Das's Plan which was meant for the period from 1965-66 to 1979-80. The revised Working Circles were – Hollong-Mekai Shelterwood Working Circle, Hollong-Mekai selection Working Circle, Miscellaneous Working Circle and Clearfelling Working Circle.

The Working Plan written by B.N Das was revised before its expiry in order to accommodate two plantation schemes during the fifth five-year plan. The schemes were (1) Regeneration of Hollong/Mekai forest and (2) Raising of plywood plantations. In this revised Working Plan (1974-75 to 1988-89) written by A.C. Das two Working Circles were constituted – Hollong Plantation Working Circle and Miscellaneous Plywood Working Circle.

11.2 Past system of management and their results: The past system of management i.e. Sri Suresh Chand's plan 1990-91 to 1999 – 2000 was not approved. In the Working Plan written by Sri Suresh Chand, I.F.S, the following two Working Circles were constituted, namely:

- Hollong – Mekai Plantation Working Circle and
- Miscellaneous Plantation Working Circle.

The areas allotted to the Hollong–Mekai plantation Working Circle included the areas classified as Hollong–Nahor forests, some of the miscellaneous forests and productive blanks suitable for raising Hollong plantation. Such suitable formations occur in nine RFs covering a total of approximately 11,746 Ha. which was included in this Working Circle.

This Working Circle was further divided into three felling series, namely

- (i) Doomdooma Felling Series,
- (ii) Kakopathar Felling Series and
- (iii) Khatangpani Felling Series.

The silvicultural system was adopted to raise plantations of Hollong in order to maintain evergreen composition of the crop. Advance growth of all other important species was to be retained. The areas covered under the Working Circle were also classified into two types, namely, high forest area and open degraded areas, and separate plantation techniques were prescribed accordingly. To overcome the difficulties faced in raising successful plantations in thalis, Hollong seedlings were recommended to be raised in large size biodegradable polybags to be supplemented by tall transplants with ball of

earth raised in site to facilitate casualty replacement. The spacing was recommended at 5 mts. intervals in the open degraded areas, mixed plantations of Hollong, Mekai with Sopa, Hollock, Kadam, Dhuna, Amari, Borpat etc., and in low lying areas, species like Urium, Ajhar, Pichala etc were recommended.

The rotation for Hollong was fixed at 75 years corresponding to an average girth of 180 cms. The conversion period was fixed at 6 years for restocking the poor, open and degraded areas by uniform crop as early as possible.

Area of each felling series was divided into three periodic blocks, namely:

1. Regeneration block
2. Young block
3. Unalloted block

Felling cycle was fixed at 10 years for selection marking of Hollong and other miscellaneous species silviculturally available in the unalloted block.

i)	Kakopathar F. S.	59.5 Ha.	1,325 m ³
ii)	Doomdooma F. S.	50.5 Ha.	1,500 m ³
iii)	Khatangpani F. S.	80.4 Ha.	1,800 m ³

Yield was regulated by area with annual plantation coupe. Annual yield for Hollong was also calculated using Smythie's modification of the Van Mantle's formula as a guidance factor. The annual coupe area and the volume were calculated for the three felling series as follows.

11.2.1 Yield for non-Hollong species was regulated by area and girth limit: No sequence of felling was prescribed and it was left to the Divisional Forest Officer to select suitable areas in continuation to the areas already planted up. Method of executing the Felling in regeneration blocks included the following, viz.

- a. Annual coupe to be demarcated in contiguity to the existing plantation covering open encroached area first.
- b. Advance growth upto 90 cm. in girth of all important species to be retained.
- c. Natural regeneration of valuable species to be retained.
- d. Immature trees at regular intervals to be retained and marked with coal tar rings along the plot boundary.
- e. No marking of trees was prescribed in areas subjected to erosion.

No sequence of areas, to be felled or otherwise, was prescribed for demarcation of annual plantation coupes. It was left to the Divisional Forest Officer to select suitable areas in continuation to the areas already planted up.

Method of executing the felling, both in regeneration block and unalloted block was prescribed in detail. In the former, annual coupes were to be demarcated in contiguity to the existing plantations, covering encroached areas first. Advance growth upto 90 cm. in girth of all important as well as natural regeneration of valuable species was prescribed to be retained. Prominent immature trees at regular intervals were to be retained and marked with coal tar rings along the plot boundary. No

marking of trees was prescribed in erosion – prone areas while no selection marking was to be done in the area brought under regeneration block, except for removal of dead dying and wind fallen trees.

In the unallotted blocks, selection marking of Hollong only in the form of thinning and improvement felling was prescribed. Girth limits for miscellaneous species to be marked for selection felling without creating a permanent gap, were prescribed for Sam, Sopa and Hollock at 2.7 mts., Amari, Gonosori, Bogipoma at 2.1 mts., Nahor at 1.5 mts., and other species at 1.8 mt.

Subsidiary Silvicultural operations like two rounds of weeding during the first three years and one climber cutting during the 4th and 5th years etc. were prescribed. Climber cutting was also prescribed upto the 9th year or as long as required. Casualty replacement was to be carried out at the time of first weeding. At the age of 15 years, all suppressed, malformed and crooked stems were to be removed and thereafter, at the age of 45 years the final felling was prescribed to be done retaining 300 – 350 trees per Ha. Similarly, thinning was prescribed in the mixed plantations raised in degraded areas also.

The Miscellaneous Plantation Working Circle, was divided into 6 (six) felling series, namely **(i)** Kumsong F. S. **(ii)** Kundil – Kalia F. S. **(iii)** Deopani F. S. **(iv)** Sadiya F. S. **(v)** Kukuramara F.S. **(vi)** Hollonghabi F. S. The silvicultural system adopted for this Working Circle was that of clear felling with standard system, followed by artificial regeneration of the desired mixture of ply and matchwood species constituting the original natural crop of the area.

The rotation for all the species in this Working Circle was fixed at 60 years. The conversion period prescribed for this Working Circle was fixed at 45 years.

The entire area of the Working Circle was divided into three periodic blocks, namely:

(i) Regeneration Block, **(ii)** Young Block, **(iii)** Unallotted Block. The area worked out under the above periodic blocks was as table 11.2.1a.

Table 11.2.1a: Periodic block with the area (ha.) for non-hollong species.

Regeneration Block	1,818.41 Ha.
Young Block	4,184.78 Ha.
Unallotted Block	6,175.90 Ha.

Since no trees of exploitable girth were available for felling, no selection felling was prescribed in Unallotted Block except removal of dead, dying, diseased and ‘windfallen’ trees as and when necessary. As such, no felling cycle was fixed. The yield was to be regulated by area with annual coupes.

Table 11.2.1b: Area under diferent felling series.

Coupe No.	Felling series	Area (Ha.)
i.	Kumsong F. S.	54
ii.	Kundil – Kalia F.S	44
iii.	Deopani F.S.	22
iv.	Sadiya F.S.	31
v.	Kukuramara F.S	9
vi.	Hullonghabi F.S.	25
	Total	185

In order to cover-up the encroached area by raising plantations while retaining evergreen composition of the crop, mixed plantations with proportionate number of evergreen species were recommended. Again, to fulfil the object of management, locally suited fast growing plywood and matchwood species were also recommended for raising the annual plantations. Transplanting of nursery raised seedlings, line sowing and patch sowing methods were recommended to be adopted.

No sequence of felling was prescribed and it was left to the Divisional Forest Officer to select suitable areas in continuation to the areas already planted up. Methods of executing felling and marking rules in regeneration block comprised of the following prescriptions.

- a. Annual coupes to be demarcated in contiguity to the existing plantation covering open and encroached areas first.
- b. Trees of all valuable species upto 90 cm. girth to be retained to form part of the future crop.
- c. Natural regeneration of valuable species and prominent trees at regular intervals to be retained.
- d. Felling of trees in submerged areas and areas subjected to erosion, was not prescribed.

In Unallotted Blocks no selection marking was prescribed except removal of dead, dying, wind fallen and diseased trees in the form of improvement felling. Subsidiary silvicultural operations were prescribed for the Working Circle which included prescriptions like protection of young plantations against grazing upto the age of 10 years. Three rounds of weeding during the first two years followed by one weeding and one climber cutting during the 3rd & 5th year and thence, one climber cutting upto 9th year or as long as required, were recommended. Mechanical thinning was prescribed to be carried out by the end of 2nd year with spacing of 25 cm. in case of line sowing. First and second ordinary thinning were prescribed at the age of 5th and 10th year. Only one healthy seedling was recommended to be retained between 5th and 8th year in case of patch sowing. At the age of 15 years alternate plants were recommended to be removed. After 35 years. Final thinning retaining 400 trees per Ha was prescribed. Miscellaneous regulations like demarcation and maintenance of compartment and reserve boundaries on ground, maintenance of plantation record etc. were prescribed.

The main objectives of Sri Suresh Chand's Working Plan were to protect the denuded and encroached forest from further degradation, to improve the growing stock by adopting suitable method of regeneration and plantation technique, to meet the requirements of forest produce for the local people and try to obtain the sustained annual yield for industrial use. In order to increase the productivity of soil, the rotation of Hollong was fixed at 75 years. The conversion period was fixed at 60 years with the aim of restocking the poor, open and degraded areas by uniform crop as quickly as possible. The main objective of this plan was not only production, but also environmental and social considerations, vis-à-vis in very poor and degraded forests the rotation of all species in the miscellaneous Working Circle was fixed at 60 years and the conversion period at 45 years.

In Sri Suresh Chand's Working Plan, only fifty percent of the volume calculated was prescribed for the Hollong-Mekai plantation Working Circle in view of gradual degradation of the forest stock due to illicit felling and encroachment. All extra felling beyond Working Plan prescription such as salvage operation of timber due to floods, wind damage or illegal felling etc. were to be adjusted against the

yield of that year. In the miscellaneous plantation Working Circle, yield was expected from only one felling series (Kukuramara and Hollogaon R.F.'s) and the annual plantations raised in all other degraded forests were expected to form the future growing stock after carrying out eviction in the encroached areas. Although the aim, objectives and prescriptions of this Working Plan was conservative on all counts, and despite of the bans imposed by various authorities during different segments of this Working Plan, the ever increasing menace of illegal felling/encroachment had made the task much more difficult and complicated. A more scientific and systematic plantation technique was prescribed for raising Hollong etc. species in biodegradable polybags to ensure better survival.

11.3 Special works of improvement undertaken: The works of improvement undertaken during the plan period of 1974 – 2000 are furnished below.

Communication: No new roads have been constructed during the plan period 1990 – 2000, however the following table shows and statement of new roads constructed year wise in between 1975 – 76 to 1988 – 89.

11.4 Past yield, revenue and expenditure: The record for past yields not yet calculated as there was no Working Plan of this Division till date., revenue and expenditure is not readily available and will be incorporated later. The past yield is not yet calculated as there was no Working Plan of this Division till date. But the yield as per the Working Plan of Suresh Chand (1990-2000) though not approved, is shown below. The statement showing the past yield, revenue and expenditure is given in table 11.4 below.

Table 1`1.4: Past yield, revenue and expenditure in Doomdooma Division, Assam.

Year	Revenue (Rs)	Expenditures	
		Non-Plan (in Rs)	Expenditure Plan Expenditure (in Rs)
2008-2009	44,71,712	1,66,82,457.00	81,45,172.00
2009-2010	43,04,333	2,11,63,708.00	98,18,060.00
2010-2011	18,87,633	3,00,26,903.00	42,34,950.00
2011-2012	51,05,429	2,86,18,411.00	94,75,420.00
2012-2013	31,01,832	3,42,74,263.00	55,92,270.00
2013-2014	42,54,588	3,32,47,103.00	92,74,377.00
2014-2015	40,39,777	3,27,23,831.00	53,57,828.00
2015-2016	52,16,313	3,38,12,612.00	13,00,000.00
2016-2017	1,89,75,158	3,17,37,998.00	23,69,480.00
2017-2018	1,46,69,521	3,98,44,409.00	1,08,31,835.00
2018-2019	15681045	36432260.00	394000.00
2019-2020	14456619	42616517.00	2844900.00
2020-2021	6788683	43939277.00	3966300.00

CHAPTER 12

STATISTICS OF GROWTH AND YIELD

12.1 Statistics of growth: Compartment wise statistics of growth in term of volume is shown in table 12.1a and carbon stock is shown in table 12.1b.

Table 12.1a: Growing stock (cu.m) in different compartment under different RFs

Name of RFs	Compartment No.	Sum of Growing Stock (cu.m)
Burhi Dihing R F	1	38,804.96
	2	3,477.52
	3	23,707.05
	4	7,612.35
	5	16,554.23
	Total	90,156.11
Dangori R F	1	1,452.98
	2	11,504.33
	3	12,511.23
	Total	25,468.54
Deopani R F	1	839.22
	2	5051
	3	18,459.56
	Total	24,349.78
Duarmara R F	1	432.67
	2	4,545.07
	3	6,214.18
	4	3,991.16
	Total	15,183.08
Dumduma R F	1	7,313.09
	2	16794.41
	3	62,478.07
	4	63,765.17
	5	903.87
	6	34,942.28
	7	10,025.97
	Total	1,96,222.86
Hahkhati R F	1	24,816.96
	Total	24,816.96
Hollogaon R F	1	18,587.44
	Total	18,587.44
Hollonghabi R F	1	0.63
	Total	0.63
Kakojan R F	1	12,146.8
	2	10,182.6
	3	39,714.12
	4	18,351.36
	5	32,556.16
	Total	1,12,951.04
Kukuramara RF	1	16,672.59
	Total	16,672.59
Kumsong R F	1	0
	2	0
	3	203.28
	4	48.77

	5	8,819.25
	6	2,526.24
	Total	11,597.54
Kundil Kalia R F	1	1,998.01
	2	16,866.45
	3	6411.3
	4	6,988.88
	5	6,490.77
	6	5,014.6
	7	5,069.82
	8	8,089.04
	9	12,090.06
	10	3,600.06
	11	833.47
	Total	73,452.46
Lokaipathar R F	1	298.35
	Total	298.35
Mechaki RF	1	103.31
	2	4,335.08
	3	2533.24
	4	15,761.71
	Total	22,733.34
Nalani R F	1	34,123.35
	Total	34,123.35
Philobari R F	1	10,709.95
	Total	10,709.95
Sadiya Station R F (N.B.)	1	27,438.1
	Total	27,438.1
Sadiya Station R F (W.B.)	1	1,664.16
	Total	1,664.16
Tarani R F	1	109.69
	2	15,170.99
	3	47,009.72
	4	43,389.08
	5	15,901.85
	Total	1,21,581.33
Tokouwani R F	1	38,689.39
	Total	38,689.39
Grand Total		8,66,697

The table 12.1b shows the volume of timber of different species under different diameter classes in the Doomdooma Division

Table 12.1b: Volume of different species under different diameter classes

S.N	Species	<10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	>90
1	<i>Acacia catechu</i>	0	1.16	5.07	3.75	1.71	2.81				
2	<i>Aesculus assamica</i>					1.75					
3	<i>Aglaia spectabilis</i>		0.15	5.18	9.48	5.02	2.08	13.49	3.59		
4	<i>Ailanthus integrifolia</i>		0.86	12.35	28.29	27.81	65.46	32.33	21.9	20.68	27.53
5	<i>Alangium chinense</i>	0	3.44	10.08	9.93						
6	<i>Albizia lebbeck</i>			3.11	2.62		7.28	7.28	10.2		

7	<i>Albizia lucidior</i>		1.48	17.46	47.66	39.38	20.11	26.24	14.75		25.42
8	<i>Albizia procera</i>		0.09	1.64	2.5	1.27		3.25			
9	<i>Alstonia scholaris</i>		0.09	2.12	9.22	1.89	4.4	4.12			
10	<i>Altingia excelsa</i>		0.62	1.56		1.4					
11	<i>Antidesma ghaesembilla</i>			0.28							
12	<i>Artocarpus chaplasha</i>		0.08	0.67	4.33	2.51	11.09	5.82	7.97	6.57	49.98
13	<i>Artocarpus lacucha</i>		0.5	2.47	3.21	6.26	8	8.25	15.36		14.92
14	<i>Baccaurea ramiflora</i>		0.89	5.08	5.54	1.02					
15	<i>Balakata baccata</i>		0.52	8.59	19.95	29.33	66.51	72.14	59.65	37.43	67.33
16	<i>Barringtonia acutangula</i>				0.7						
17	<i>Bauhinia purpurea</i>		0.35	1.4	1.8	1.17	1.54	2.43			
18	<i>Bischofia javanica</i>	0.6	5.4	58.32	102.2	72.34	65.08	28.87	31.49	12.97	57.93
19	<i>Boehmeria nivea</i>	0	3.87	12.24	3.32						
20	<i>Bombax ceiba</i>	0.1	0.7	13.94	71.24	107.9	203.2	220.1	118.7	87.63	118.13
21	<i>Butea monosperma</i>			0.4							
22	<i>Callicarpa macrophylla</i>		0.32	2.04	3.08						
23	<i>Camelia caudata</i>		0.36	1.07	1.11			4.12			
24	<i>Canarium bengalense</i>		0.52	5.48	9.55	9.49	6.95	13.24	3.53	20.19	
25	<i>Carallia brachiata</i>		0.18	1.19	1.81						
26	<i>Caryota urens</i>						2.9				
27	<i>Castanopsis indica.</i>	0.1	2.36	17.69	46.43	43.21	40.75	34.22	41.91	20.18	39.71
28	<i>Ceriscoides campanulata</i>				0.7						
29	<i>Chisocheton cumingianus</i>		0.82	7.91	25.61	15.35	10.14	23.31			
30	<i>Chrysophyllum roxburghii</i>			0.28							
31	<i>Chukrasia tabularis</i>				1.92						19.74
32	<i>Cinnamomum bejolghota</i>			0.28	0.83						
33	<i>Cinnamomum glaucescens</i>		0.15	0.62	1.74						
34	<i>Cinnamomum tamala</i>		0.09	0.22							
35	<i>Citrus maxima</i>		0.2								
36	<i>Cordia grandis</i>		0.36	3.64	2.47		8.14		11.3		22.45
37	<i>Croton tiglium</i>	0	1.6	6.46	1.6	2.95		7.81			
38	<i>Dalbargia sissoo</i>			1.05	3.66	3.82					
39	<i>Dillenia indica</i>	0	2.5	20.1	51.01	51.83	51.79	25.93	31.3	12.82	80.12
40	<i>Dipterocarpus retusus</i>	0.1	7.04	92.95	402.5	363.2	515.4	681	959	677.3	1228.1
41	<i>Duabanga grandiflora</i>		0.63	6.32	15.23	5.39	25.57	27.55		15.78	9.2
42	<i>Dysoxylum mollissimum</i>			0.51			2.2		5.57		31.42
43	<i>Elaeocarpus floribundus</i>			1.48	0.81						
44	<i>Elaeocarpus sphaericus</i>		0.1	2.08	2.69	3.17	3.29			7.9	
45	<i>Erythrina stricta</i>		0.36	3.56	7.61	2.09	9	12.11			
46	<i>Evodia meliaefolia</i>	0.2	1.53	3.32	2.52		5.1	8.47			

47	<i>Ficus benghalensis</i>							3.96			
48	<i>Ficus hispida</i>			0.51			14.92	3.14		15.29	172.82
49	<i>Ficus racemosa</i>	0.2	3.14	15.21	12.74	9.73		20.65	20.59	21.15	124.51
50	<i>Garcinia cowa</i>		0.11	0.28							
51	<i>Garcinia kydia</i>		0.48	0.54	2		2.37				
52	<i>Garuga pinnata</i>		0.07								
53	<i>Gmelina arborea</i>		0.29	6.48	21.56	32.16	14.24	19.53			
54	<i>Gynocardia odorata</i>		2.3	21.35	34.53	15.47	23.63	4.12	21.25		
55	<i>Heteropanax fragrans</i>	0	0.48	4.8	1.32	1.34		3.69			
56	<i>Holarrhena pubescens</i>		0.1		0.76						
57	<i>Horsfieldia amygdalina</i>		0.92	5.99	4.43	2.95		3.69			
58	<i>Kayea assamica</i>				1.11	3.36	5.79	3.69	5.57	7.24	77.61
59	<i>Kydia calycina</i>	0.7	5.58	26.28	34.03	15.09	7.03	5.26		0.49	
60	<i>Lagerstroemia speciosa</i>		2.03	22.2	61.47	51.32	67.6	26.93		6.46	27.52
61	<i>Lannea coromandelica</i>		1.05	0.53	1	2.7	1.85				
62	<i>Leea indica</i>		0.37	1.42							
63	<i>Litsea cubeba</i>			0.4							
64	<i>Litsea glutinosa</i>						2.9				
65	<i>Litsea laeta</i>		2.58	13.57	30.36	24.34	4.9	10.87	5.06	13.31	
66	<i>Litsea salicifolia</i>		0.11	0.28							
67	<i>Machilus gamblei</i>			0.8		10.2					
68	<i>Magnolia baillonii</i>			1.49	6.02	6.59	7.63	6.97	4.58		
69	<i>Magnolia champaca</i>		0.17	4.3	9.59	6.84	9.25	8.69	26.62		
70	<i>Magnolia griffithii</i>		0.74	4.39	9.84	8.06	12.73		5.57		27.88
71	<i>Magnolia kingii</i>		0.21	3.46	19.64	11.57	13.09	4.12	15.2	6.66	
72	<i>Magnolia pterocarpa</i>		0.65	23.31	41.41	30.26	45.64	32.83		6.66	
73	<i>Mallotus nudiflorus</i>	0	0.36	4.94	10.4	6.56	2.59	1.34			
74	<i>Mallotus tetracoccus</i>		2.33	20.8	23.71	6.33	2.65		1.84		
75	<i>Mangifera sylvatica</i>		0.18	1.19	1.22	1.75					
76	<i>Meliosma simplicifolia.</i>		0.61	2.37	5.81	7.79		4.12			
77	<i>Mesua ferrea</i>	0	0.21	7.72	17.85	24.34	19.06	30.84	11.85	16.14	61.19
78	<i>Michelia oblonga</i>		0.52	2.07	13.77		13.53	21.81	14.26		
79	Misc						2.2				
80	<i>Morus macroura</i>		0.18	1.21	4.09	3.21		3.28			
81	<i>Neolamarckia cadamba</i>			0.38	4.52		5.27				
82	<i>Olea dioica Roxb.</i>		0.29	2.02	2.3			7.39	3.06		
83	<i>Oroxylum indicum</i>		0.37	2.55	2.3	3.78					
84	<i>Palaquium obovatum</i>		0.64	1.09		1.34					
85	<i>Phoebe cathia</i>			0.4	2				4.58		
86	<i>Phoebe goalparensis</i>				10.59						
87	<i>Premna bengalensis</i>		0.13	3.84		5.01	3.51				
88	<i>Pterospermum acerifolium</i>		0.11	0.77	1.47	4.15		3.08		6.26	
89	<i>Salix tetrasperma</i>				1.11						
90	<i>Sapindus saponaria</i>			0.28							

91	<i>Shorea assamica</i>		0.05		3.22						
92	<i>Spondias pinnata</i>		0.9	3.79	1.91	4.98	3.27				
93	<i>Sterculia villosa Roxb.</i>		2.06	8.02	34.43	39.31	46.54	21.58			9.1
94	<i>Stereospermum chelonoides</i>		0.31	2.2	5	5.15	7.71	13.33	36.24	9	145.58
95	<i>Syzygium cumini</i>		0.3	3.09	8.18	2.91	2.73	4.08	8.22		
96	<i>Tamarindus indica</i>				0.89						
97	<i>Tectona grandis</i>	0.1	0.8	5.27	8.58	5.75					
98	<i>Terminalia arjuna</i>			0.3	1.14	5.93	12.08	4.14	5.08	7.61	
99	<i>Terminalia bellirica</i>		0.09	5.92	18.72	18.99	29.48	9.22	5.67	13.58	27.75
100	<i>Terminalia catappa</i>	0.2		0.83		1.38					
101	<i>Terminalia chebula</i>			0.46		4.27	11.24	12.81		4.97	
102	<i>Terminalia myriocarpa</i>		1.3	19.65	94.25	95.12	50.85	20.85	26.81	6.96	42.7
103	<i>Terminalia tomentosa</i>			1.05	2.51	2.6			5.36		7.86
104	<i>Tetrameles nudiflora</i>		0.21	0.26	1.4			9.19	6.48	8.88	31.37
105	<i>Toona ciliata</i>	0.4	0.69	4.88	22.37	21.73	16.72	37.23	29.75	20.2	
106	<i>Trema orientalis</i>		0.11	2.77	1.41		2.54				
107	<i>Vatica lanceifolia</i>	0.4	9.11	53.89	67.73	44.2	25.78	7.37	4.82		

12.2. Statistics of forest carbon stock: Compartment wise forest carbon stock in Doomdooma Division is tabulated in the following tables.

Table 12.2. Forest Carbon stock under different compartment in Doomdooma Division

Reserve Forest	Compartment	Carbon (tons)
Burhi Dihing RF	1	41044.69
	2	13330.15
	3	33468.35
	4	32191.43
	5	17151.67
Dangori RF	1	1036.095
	2	19276.93
	3	16673.64
Deopani RF	1	5679.131
	2	3382.131
	3	15181.56
Doomdooma RF	1	4229.237
	2	23966.42
	3	29398.51
	4	55359.75
	5	1968.076
	6	27204.27
	7	18983.31
Duamara RF	1	1737.792
	2	9969.732
	3	11777.66
	4	8326.994
Hahkhati RF	1	21443.48
Hollogaon RF	1	25839.68

Hollonghabi RF	1	143.761
Kakojan RF	1	20526.2
	2	21829.55
	3	32035.38
	4	27813.05
	5	38579.53
Kukuramara RF	1	31800.85
Kumsong RF	1	0
	2	0
	3	1146.36
	4	273.0792
	5	13480.82
	6	4486.338
Kundil Kalia RF	1	2824.644
	2	22624.8
	3	13325.93
	4	11691.89
	5	8008.593
	6	8188.319
	7	7043.904
	8	14708.85
	9	20384.49
	10	11426.84
	11	4731.308
Lakhipathar RF	1	1001.561
Mechaki RF	1	346.13
	2	7330.628
	3	14436.87
	4	11848.44
Nalani RF	1	17705.4
Philobari RF	1	12451.19
Sadiya Station N.B	1	16874.1
Sadiya Station W.B	1	2178.995
Tarani RF	1	721.976
	2	7189.424
	3	22489.07
	4	39267.81
	5	11462.77
Tokouwani RF	1	22341.81

PART II



FUTURE MANAGEMENT

CHAPTER 1

BASIS OF PROPOSAL

The working plan of Doomdooma Division is a technical document prepared to manage the forest under Doomdooma 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 Doomdooma 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:

- **Combating 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. Doomdooma 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

1.3.1 Plantation 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. 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.

The Plantation Working Circle is divided into

- (A) Hollong Plantation Working Circle and
- (B) Miscellaneous Plantation Working Circle.

In Hollong Plantation Working Circle, all areas covered by Hollong trees have been brought under this Working Circle and to rehabilitate and restock the depleted forest of poor quality by raising plantations of local species and with proper silvicultural practices in order to improve the health and quality of the growing stock. Plantation Working Circle aims to cover the existing plantations done by the department which have blanks and under stocked areas not suitable for ANR, illegally felled areas, and lands under compensatory afforestation etc. Such areas will be identified and allocated to different years of plan period along with prescription of sustainable management. Apart from above, all encroached area of different RFs of the Division have been kept in this Working Circle. These encroached areas will be evicted and plantation of fast growing indigenous species will be taken up in the second year and third year of the Plan period. Every effort shall be made to restore the ecology of such areas nearly to their previous status. All the plantation areas shall also focus on enhancement of the carbon stocks. Effort shall be made to register such plantations under REDD+. Periodic monitoring of carbon stocks in such areas would require support from the state government in the form of instruments and subject matter experts.

The Miscellaneous Plantation Working Circle comprised of the encroached 9,344.8 Hectares RF/PRF areas, the plantation will be done after reclamation of the encroached areas which is one of the primary objectives of this Working Circle. It can be achieved by planting locally suitable quick growing species of fruit, fodder, medicinal plants and fuel wood involving people living in forest villages and fringe area of the Reserve Forests. Involvement of Joint Forest Management Committees in protection and regeneration of these forests would be a great help in raising such plantations. The encroacher families will be offered economic packages for their rehabilitation; and they have to vacate the RF/PRF areas of their own after receipt of the package. To get the continuous support of these people, they may further be asked to join the JFMCs/EDCs and to derive the benefits of various

activities out of it. Restoration of the encroached areas and creation of a forest cover anew will be a herculean and extraordinary task, which needs sincere and undivided attention.

The Working Circle includes poorly stocked miscellaneous evergreen and semi-evergreen forests of the Division. The 'Encroached Areas-9,344.8 Hectares' will be reclaimed after Ejection under 72(C) of AFR, 1891 and granting economic package or ejecting the encroachers. Every attempt will be made to make the plantation programmes a grand success.

1.3.2 Joint Forest Management (Overlapping) Working Circle: This Working Circle has been constituted considering the present requirement of the local people for planning and implementation of the various forestry activities. Past experience has shown that unless and until the people residing near forest are taken into confidence and their regular requirements are met, the probability of creating a good forest cover is very less. The management of forests will be as per micro-plans prepared by the community through Participatory Rural Appraisal (PRA), with technical help from the officials of the Forest department. The characteristic features of this Working Circle will be participatory approach, participatory planning, participatory implementation and sharing of the usufructs as per *The Assam Joint (Peoples' participation) Forestry Management Rules 1998*.

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 involves 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 and high forest in some locations. All the areas treated under this circle along with the Microplan prescriptions shall be synchronized with the Working Plan prescriptions and the compartment boundaries shall be realigned according to boundary of village/JFMC unit.

The microplans of the JFMCs constituted in Doom Dooma Division include activities such as creation of fuel wood, NTFP, aromatic and medicinal plantations based on the needs and expectations of the local 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 Department's seriousness to involve people as partners in sustainable management of forests. Based on the microplans of the JFMCs under the Division, the special objectives of management under this Working Circle shall be:

- To demonstrate to the people, the seriousness of the department in promoting 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 term.
- 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.
- This Working Circle will comprise of the degraded areas of the Reserve Forests adjacent to the Forest villages and other revenue villages.

1.3.3 Non Timber Forest Produce and Bamboo (Overlapping) Working Circle: The NTFP Working Circle shall comprise largely of fringe forest areas or such other areas, which according to WPO, are fit for extraction of a particular NTFP at a rate prescribed by him, without causing long term decline of the biological diversity, and maintain its potential to meet the needs and aspirations of present and future generations. Therefore, the WPO will prescribe appropriate steps such as 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 extraction 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.

This Working Circle will be an overlapping Working Circle covering all the areas where NTFP can be profitably managed in a sustainable, scientific manner. The Main NTFP products that are being extracted are bamboo, Cane, Rattan, etc. The collection of these materials from forest areas is proposed to be undertaken as per rules in vogue. Medicinal plant products are presently collected by the people freely from the forests which are not recorded and regulated by the Department. All the potential NTFPs which have marketable value should be surveyed and their protection and improvement works should be prescribed for sustainable management.

The major objectives of this Working Circle shall be:

- To protect and improve the quality and productivity of various non timber forest produce.
- To provide livelihood to the forest dwellers by proper valuation of NTFPs and providing proper processing, storing and marketing facilities.

- To involve communities working in JFM areas or community forests for sustainable management of NTFPs.
- To develop good practice guides not only to ensure purity and quality of collected material, but also for its good storage, regulated transit and chain of custody so as to facilitate issuance of certificates for NTFPs.

1.3.4 Wildlife Protection (overlapping) Working Circle: This will be an overlapping circle covering all the areas of the Division. The plan should prescribe measures for wildlife habitat conservation, identification of corridors for movement of elephants and their protection, and management for reducing man-animal conflict. The forests of this Division harbor significant levels of bio-diversity and are rich in wildlife, including migratory birds. Varieties of migratory birds visit during winter season in the water bodies located along the river Brahmaputra.

The Dangori & Doomdooma Reserved Forests are known worldwide as the habitat for Deohanh "**White-winged Wood Duck**" one of the endangered avifauna and is declared as the "State bird of Assam". Leopards are commonly observed in this tract. There are some resident leopards in the big tea-gardens that are situated near the Reserve Forests. Among the other mammals, elephant is commonly sighted, particularly in Kakojan & Buridehing R. Fs throughout the year. But during winter season, herds of wild elephant raid crops, destroy other property and even cause death to human life. Tiger is not very commonly seen. Hollock gibbon is commonly seen in Kakojan, Hollogaon, Dangori, Doomdooma and Tarani R.F. Similarly, Slow Loris is also commonly seen. Further, man-animal conflict is a complex problem which this Division has been facing for years. Generally, a huge number of wild elephants come out from adjacent Dehing-Patkai Elephant Reserve as well as Dibru-Saikhowa National Park and bordering areas of Arunachal Pradesh, and create panic in the areas under Doomdooma, Saikhowa, Khatangpani and Sadiya Ranges under this Division from the first week of October every year. Ever increasing man-elephant conflict is a serious 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 has 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. The main objectives of the circle shall be:

- To improve and restore the demographic indicators of growth relating to population of all endangered, endemic, rare species of animals and plants.
- Management of wildlife and improvement of its habitat.
- Reduction of man animal conflict.
- Rescue and rehabilitation of wild animals
- Ensuring that development of roads, railways in these areas does not lead to habitat fragmentation.
- To identify and promote ecotourism in the areas rich in wildlife.

Conservation of Biodiversity: 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 the Division and 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.

The strategies for biodiversity conservation shall be:

- 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 Value Index etc., shall be calculated for each compartment.
- To map herbs, shrubs and climbers, and to make inventories of various NTFPs and Medicinal Aromatic Plants.
- 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.
- To make efforts to improve forest health by periodically measuring the nutrient status of soils in the forest, and by identifying and selecting superior individuals as a source of resistance against various types of disease.
- To identify and evaluate lesser known species (and weeds) of an area for their biochemical profiling, including bio-pesticide properties, so that an effective, eco-friendly, economical and easily available source for pest/disease management can be developed.
- 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.
- To initiate non-polluting, non-degrading ecotourism activities 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.

1.4 Period of Working Plans and necessity of intermediate revision: The period of Working Plan will be for 10 years i.e. from 2021-22 to 2030-2031. Two midterm reviews of the Working Plan will be undertaken for mid-course correction by the consultative committee under the chairmanship of PCCF (HoFF) with representation from RAPCCF (MoEF) as below:

- First midterm review after two years will be done to assess the areas reclaimed by way of rehabilitation of the encroachers as it is expected that they will vacate the occupied RF land

after being satisfied with the economic package. per Otherwise, they will be ejected from the encroached areas as per Section 72(C) of the Assam Forest Regulation, 1891.

- Second midterm review after six/seven years will be done to finalize the distribution of usufracts which will be available for collection/harvesting etc.

Based on the performance of the Working Plan 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.

1.4 Funding Source:

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,	Forestry developmental work	Buildings, Roads, Silvicultural operations, marking, etc.
6.	French Government	APFBC	Biodiversity Conservation,.....
7	World Bank/ JICA/ KfW	Climate resilient forests	Plantation, watershed management, livelihoods generation
8	Carbon financing		

Statement showing allocation of forest areas (Ha.) under the RFs into different working circles

Range_Name	Name	Compt	Area (Ha)	Hollong Reg WC	Plantn WC	JFMC WC	NTFP WC
Sadiya	Deopani	1	571.61	155	85	330	60
	Deopani	2	270.56	245	0	150	70
	Deopani	3	246.58	105	65	100	-
	Hollogaon	1	318.08	30	200	80	15
	Sadiya Station	1	807.34	315	200	250	50
	Sadiya Station	2	1525.94	75	70	670	80
	Kundil Kalia	1	231.43	40	35	180	120
	Kundil Kalia	2	481.11	80	135	90	40
	Kundil Kalia	3	428.24	70	170	200	140
	Kundil Kalia	4	672.37	95	160	400	130
	Kundil Kalia	5	389.24	50	115	-	-
	Kundil Kalia	6	641.44	140	110	400	140
	Kundil Kalia	7	613.03	60	95	250	90
	Kundil Kalia	8	617.23	230	195	120	50
	Kundil Kalia	9	805.79	180	285	200	30
	Kundil Kalia	10	1166.47	155	135	800	40
	Kundil Kalia	11	1247.12	40	60	800	100
Kukuramara	1	465.10	25	215	150	20	
Saikhowa	Kumsong	1	148.95	-	-	100	20

	Kumsong	2	147.49	-	-	140	10
	Kumsong	3	570.72	20	10	480	50
	Kumsong	4	498.04	30	-	450	60
	Kumsong	5	265.38	90	140	30	-
	Kumsong	6	355.33	110	60	150	40
	Mechaki	1	148.25	100	0	20	10
	Mechaki	2	193.53	100	80	-	-
	Mechaki	3	408.37	180	200	20	-
	Mechaki	4	392.03	120	160	100	20
	Hahkhati	1	673.54	340	230	110	50
Doomdooma	Hollonghabi	1	647.83	-	-	645	10
	Philobari	1	310.47	100	160	85	60
	Tokouwani	1	541.66	210	280	75	50
	Nalani	1	361.71	90	225	70	50
	Kakojan	1	280.03	20	240	30	20
	Kakojan	2	289.89	10	75	150	80
	Kakojan	3	434.61	30	380	-	10
	Kakojan	4	583.14	40	210	-	60
	Kakojan	5	725.83	100	365	200	120
Khatangpani	Burhi Dihing	1	763.76	265	450	30	20
	Burhi Dihing	2	232.96	55	150	40	30
	Burhi Dihing	3	392.39	20	350	20	-
	Burhi Dihing	4	435.52	70	205	150	40
	Burhi Dihing	5	450.19	75	160	220	90
	Duarmara	1	147.86	10	15	110	-
	Duarmara	2	215.97	35	100	75	40
	Duarmara	3	247.64	55	140	70	50
	Duarmara	4	144.25	45	90	-	-
	Tarani	1	568.78	30	0	445	50
	Tarani	2	401.66	75	35	200	50
	Tarani	3	345.25	55	260	30	-
	Tarani	4	564.72	90	290	170	30
	Tarani	5	216.77	80	120	15	10
	Lokhipathar	1	110.25	35	15	75	30
Kakopathar	Dangori	1	187.82	15	0	155	30
	Dangori	2	536.74	190	70	200	40
	Dangori	3	329.21	110	100	120	10
	Dumduma	1	306.04	220	65	50	30
	Dumduma	2	246.45	25	50	50	-
	Dumduma	3	387.09	55	255	40	20
	Dumduma	4	615.12	10	490	50	-
	Dumduma	5	145.26	55	30	40	20
	Dumduma	6	417.47	90	130	150	40
	Dumduma	7	374.96	90	75	100	40
				5635	8790	10630	2565

CHAPTER 2

Hollong Regeneration Working Circle

2.1 Name of the Working Circle: Hollong Regeneration Working Circle

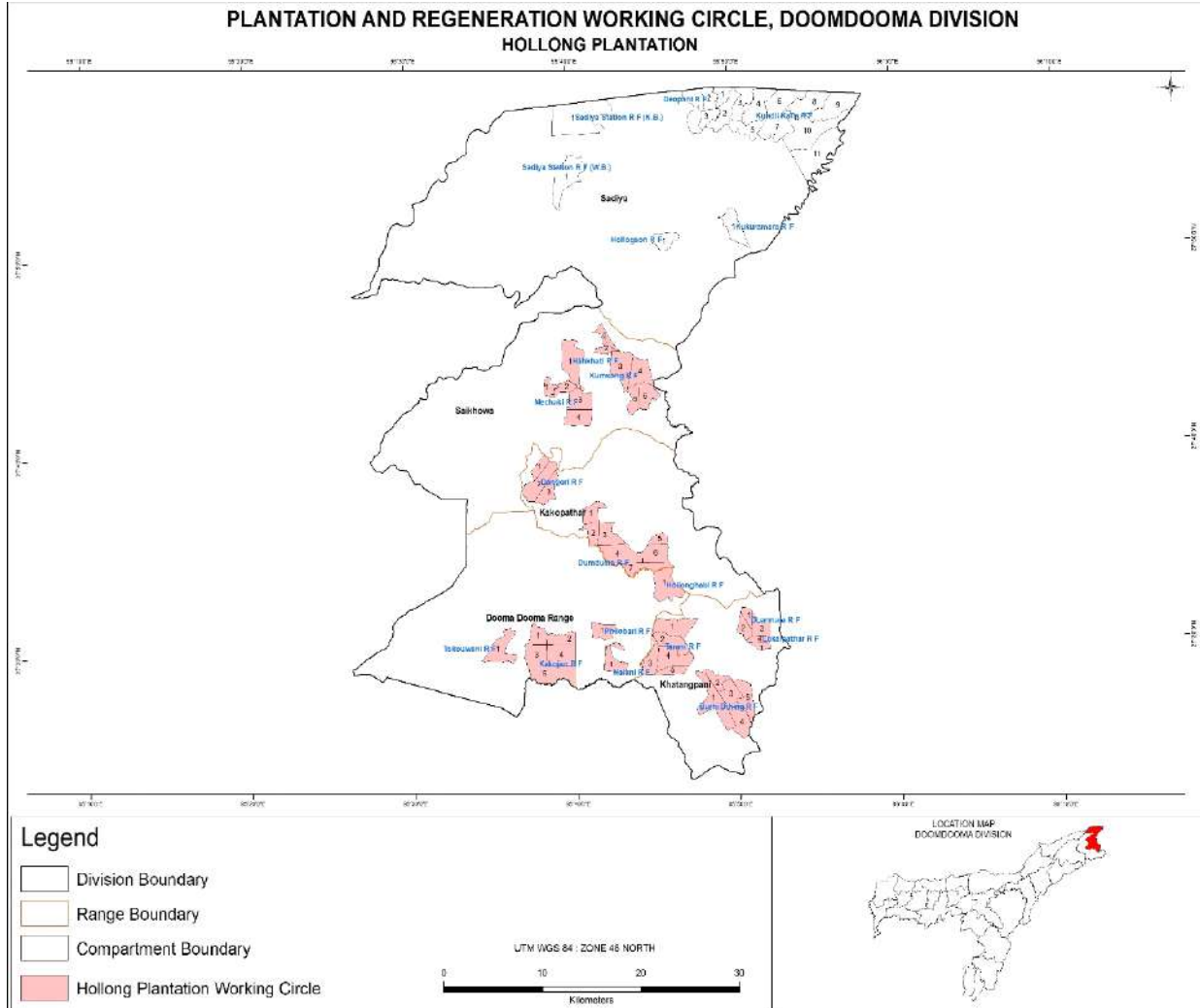


Figure 2.1: Hollong Plantation Working Circle of Doomdooma division.

2.2 General constituents of the Working Circle: This Working Circle has been constituted to cover areas falling South of the Brahmaputra River. This Working Circle includes some of those areas where Hollong is found in considerable numbers mixed with other species. As the outcome of the past systems of management is very discouraging, the pace of regeneration of Hollong is to be accelerated within a reasonable period. The appropriate silvicultural operations shall be followed to improve the health of growing stock. This Working Circle comprises of all commercially important and well stocked forests of Hollong situated on the almost flat floor and along slopes. This Working Circle corresponds to the unmanaged Hollong growing areas.

2.3 General characteristics of the vegetation:

Composition: The forest type of Doomdooma Division is mainly the Assam Valley Tropical Wet Evergreen Forests (1B/C1) of Champion and Seth Classification. Hollong is the dominating species

which is recognized as the 'State Tree' of Assam and is the most 'sought after' plywood species of the region. So, the areas predominant in Hollong and contiguous areas poor in Hollong stocking but suitable for raising the same, deserve to be enriched by aided/assisted natural regeneration and even by regular Plantations of Hollong polypot seedlings. On the other hand, the evergreen character of the crop requires to be maintained by promoting establishment of Hollong associates side by side.

2.4 Blocks and compartment allotment areas: The compartment areas under this circle are given as follows-

Range_Name	Name	Compnt	Area (Ha)	Hollong Reg WC
Sadiya	Deopani	1	571.61	155
Sadiya	Deopani	2	270.56	245
Sadiya	Deopani	3	246.58	105
Sadiya	Hollogaon	1	318.08	30
Sadiya	Sadiya Station	1	807.34	315
Sadiya	Sadiya Station	2	1525.94	75
Sadiya	Kundil Kalia	1	231.43	40
Sadiya	Kundil Kalia	2	481.11	80
Sadiya	Kundil Kalia	3	428.24	70
Sadiya	Kundil Kalia	4	672.37	95
Sadiya	Kundil Kalia	5	389.24	50
Sadiya	Kundil Kalia	6	641.44	140
Sadiya	Kundil Kalia	7	613.03	60
Sadiya	Kundil Kalia	8	617.23	230
Sadiya	Kundil Kalia	9	805.79	180
Sadiya	Kundil Kalia	10	1166.47	155
Sadiya	Kundil Kalia	11	1247.12	40
Sadiya	Kukuramara	1	465.10	25
Saikhowa	Kumsong	1	148.95	-
Saikhowa	Kumsong	2	147.49	-
Saikhowa	Kumsong	3	570.72	20
Saikhowa	Kumsong	4	498.04	30
Saikhowa	Kumsong	5	265.38	90
Saikhowa	Kumsong	6	355.33	110
Saikhowa	Mechaki	1	148.25	100
Saikhowa	Mechaki	2	193.53	100
Saikhowa	Mechaki	3	408.37	180
Saikhowa	Mechaki	4	392.03	120
Saikhowa	Hahkhati	1	673.54	340
Doomdooma	Hollonghabi	1	647.83	-
Doomdooma	Philobari	1	310.47	100
Doomdooma	Tokouwani	1	541.66	210
Doomdooma	Nalani	1	361.71	90
Doomdooma	Kakojan	1	280.03	20
Doomdooma	Kakojan	2	289.89	10
Doomdooma	Kakojan	3	434.61	30
Doomdooma	Kakojan	4	583.14	40
Doomdooma	Kakojan	5	725.83	100
Khatangpani	Burhi Dihing	1	763.76	265
Khatangpani	Burhi Dihing	2	232.96	55
Khatangpani	Burhi Dihing	3	392.39	20

Khatangpani	Burhi Dihing	4	435.52	70
Khatangpani	Burhi Dihing	5	450.19	75
Khatangpani	Duarmara	1	147.86	10
Khatangpani	Duarmara	2	215.97	35
Khatangpani	Duarmara	3	247.64	55
Khatangpani	Duarmara	4	144.25	45
Khatangpani	Tarani	1	568.78	30
Khatangpani	Tarani	2	401.66	75
Khatangpani	Tarani	3	345.25	55
Khatangpani	Tarani	4	564.72	90
Khatangpani	Tarani	5	216.77	80
Khatangpani	Lokhipathar	1	110.25	35
Kakopathar	Dangori	1	187.82	15
Kakopathar	Dangori	2	536.74	190
Kakopathar	Dangori	3	329.21	110
Kakopathar	Dumduma	1	306.04	220
Kakopathar	Dumduma	2	246.45	25
Kakopathar	Dumduma	3	387.09	55
Kakopathar	Dumduma	4	615.12	10
Kakopathar	Dumduma	5	145.26	55
Kakopathar	Dumduma	6	417.47	90
Kakopathar	Dumduma	7	374.96	90
				5635

2.5 Objectives of the Working Circle: The broad objectives of this Working Circle are to improve the Hollong stocks of the forest Division by regeneration and gap filling. Specific objectives are given below:

1. To facilitate the existing young crop for its establishment at a faster rate and promote the natural regeneration in the Hollong areas of the Division.
2. To convert all blank areas and poorly stocked areas of the Working Circle into regular Hollong forest.
3. To conserve the present growing stock and to improve them to get productive Hollong forest having uniform age gradations and uniformly distributed over the entire area, forming the basis of proper management and resulting in sustained yield in future (after completion of the Plan period).
4. To arouse a sense of ownership in the people towards forests, especially those residing in the periphery of RFs, so that the forests which are presently under heavy biotic pressure and quantitatively insufficient to fulfill the local requirements of timber as per scientific prescriptions of management, are put under a system of management and control with their active involvement and co-operation under Joint Forest Management (JFM) mechanism.
5. Consistent with the above, to conserve soil and water, and to provide proper habitat for preservation of wild life.
6. To Support livelihood needs of the Villagers residing in the periphery of the RFs by promoting Hollong Leaf Plate and Bowl Making activities. This would further integrate them with the Hollong Forests.
7. To sequester more carbon by increasing the area under forests by massive plantation and stopping illegal felling.

2.6 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, 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, besides, 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. Series for plantation and regeneration that will be formed is described in Table 3.10.

***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 Jenggooleaves' 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 *Crotalaria 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.

2.7 Thinning

Thinning is considered as principal tending operation. The aim of thinning is to achieve appropriate stand density and enhance diameter growth. In Doomdooma Division, the provision of thinning is in each compartment of plantation W.C. The thinning is targeted for sapling, pole and young tree within the compartments. Proper method for thinning operation is lacking in the Division. If the nature of stand is uneven aged (old trees to young pole and saplings); the challenge is to apply appropriate method. In Doomdooma Division the size of stem (diameter distribution) is heterogeneous. Thinning shall be undertaken in compartments having uniform girth class or uniform age class. The spacing between the stems depends upon the number 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.

Silvicultural thinning supported by Mechanical thinning by using Laurie's Formula is prescribed in Hollong Working Circle.

Year wise thinning sequence is not prescribed to give DFO flexibility in the field. Though, broadly '**A' grade thinning (Light Thinning)** has been prescribed; thinning operations will depend upon the density of the crop. Therefore, marking and thinning operations will require much care in the field. It is therefore, kept in the discretion of DFO to select the area. However, in one year 1/10th of the total area of this WC will be taken. The prescribed rules for marking officer should be followed properly. Thinning operation will be done only once during the plan period in normal conditions in a particular area. However, if an area needs special attention; it can be revisited in the fifth year after proper deviation is sanctioned prior to working in the area.

2.7.1 Principle of Thinning to be Followed: In order to carry out thinning, the field foresters should have clear idea of trees which are leading in the struggle for existence and are promising from the point of view of future growth, the potential growing capacity of a site and the optimum number of trees that should be retained to make full use of the site. In Irregular crops "**ordinary thinning**" is carried out. In this case felling starts from the lower most canopy or crown classes and progress gradually to higher canopy or crown classes. So, it is called "low thinning" or German thinning or 'thinning from below'. But now the more commonly used term for such thinning is ordinary thinning.

2.7.2 Grades of Ordinary Thinning- In order to prescribe which classes of trees are to be removed in a particular thinning in a crop, it is necessary to differentiate various thinning grades. A thinning grade 'refers to relative extent to which a crop is opened up in thinning. Using the classes of trees to be removed, the following thinning grades are recognized in ordinary thinning:

I. **Light Thinning (A grade)**-This grade of thinning is limited to the removal of dead, dying, diseased and suppressed trees, i.e. classes V, IV, and III. It is of no practical use and is seldom carried out in field, except for comparative research on the effect of thinning on increment.

II. **Moderate Thinning (B grade)**- This grade of thinning is limited to the removal of dead, dying, diseased and suppressed, defective dominated, whip and occasional very defective dominant, i.e. classes V, IV, III, II(b), I(d) and an occasional I(c). Branchy advance growth, which is neither practicable nor desirable to prune or lop, is also removed. This grade is also of little use in ordinary practice as it has very little influence on the growth of the remaining trees.

III. **Heavy Thinning (C grade)** in addition to the removal of all classes of trees of a grade, this grade consists of the removal of remaining dominated and such defective co- dominants as can be removed without making lasting gaps in the canopy, i.e. classes V, IV, III, II, I(b), I(c), and I(d). This is the grade which is ordinarily used for yield table computation. In the gaps created by the removal of the dominant trees some suppressed trees may be left as soil cover if their removal is of no economic or hygienic value.

IV. **Very Heavy Thinning (D grade)**- This grade consists of all tree classes to be removed in C grade as well as some of the good dominants, subject to the condition of not making any permanent gap in the canopy, i.e. classes V, IV, III, II, I, (b), I(c), I(d) and some I(a). The trees selected for retention are

the trees with good boles and crowns, well and evenly distributed over the area, with space on all sides for proper development. In this grade also, some suppressed or dominated trees, whose removal is of no economic or hygienic value, are left as soil cover in the gap created by the removal of the dominant trees.

V. Very Very Heavy Thinning (E grade)- This is about the heaviest thinning that can be done in a crop without making permanent gaps in the canopy. In this grade more of the good dominants are removed as compared to D grade. Formerly this grade was applied chiefly for research purposes but it is now being used in divisional practice also for some species. Some suppressed and dominated trees are left as soil cover in the gaps of the removed dominant trees.

VI. Some times, it may be necessary to carryout thinning heavier than B, C or D grade but less heavier than C, D or E grade respectively and so intermediate grades are recognized. Viz., B/C, C/D and D/E. The thinning a prescribed in this working circle will be followed with the above standards

2.7.3 Tree Classification:Standard tree classification adopted in India Forestry for regular crop is as follows:

i. Dominant trees (class symbol-I; abb.-D): All trees which form the upper most leaf canopy and have their leading shoots free. These may be subdivided according to the position and relative freedom of their crown into:

a. Predominant Trees (abb.-D1): Comprising of all the tallest trees which

b. Co-dominant Trees (abb.-D2): Comprising of the rest of the dominants falling short of d1 and averaging about 5/6 of the average height of D1.

The dominants are further classified according to their vigour and soundness or otherwise into:

1. Trees with normal crown development and good stem form (Class symbol-Ia).

2. Trees with defective stems or crowns (Class symbol –Ib), e.g. (i) trees with crown space cramped by neighbouring trees; (ii) badly spaced old advance growth; (iii) trees with forked leader and similar defects.

3. Trees with very defective stems or crown, i.e. with same defects as in Ib to such an extent that they are of little or no present value or promise. (Class symbol-Ic).

4. Whips, i.e., trees with very thin bole and very constricted crown, incapable of existence without the support of the neighbouring trees. (Class symbol-I d).

ii. Dominated trees (Class symbol-II; abb.-d): Trees which do not form part of the upper most leaf canopy, but the leading shoots of which are not definitely over-topped by the neighboring trees. Their height is about $\frac{3}{4}$ that of the tallest trees. They are classified as: a. Trees with normal crown development and good stem form (class symbol-IIa)

b. Trees with defective crowns or stems (class symbol-IIb)

iii. Suppressed trees (Class symbol-III; abb.-S): Trees which reach only about $\frac{1}{2}$ to $\frac{5}{8}$ of the height of the best trees, with their leading shoots definitely over topped by their neighbours or at least shaded on all sides by them. A small tree of height typical of the suppressed tree standing with its leader free in a chance gap should not be classed as D or d.

iv. Dead and moribund trees (class symbol-IV; abb.-m): This class also includes bent over badly leaning trees usually of the whip type.

v. Diseased trees (Class symbol-V; abb.-k): Trees which are infected with parasites to such an extent that their growth is seriously affected or they are a danger to their neighbours. Abbreviation k is suggestive of canker. They are of:

a. Dominant (Class symbol-ka)

b. Dominated and Suppressed (class symbol-kb)

2.7.4 Definition of trees for salvage felling: Definition of dead, dry, dying, diseased and uprooted trees as given in chapter 4 of 'Maleta Committee' report is as under:

i. Dead Tree: A tree which is physiologically non functional is a dead tree.

ii. Dry Tree: A tree in which physiological activity has completely ended and which has dried completely from root to top of the crown.

iii. Diseased Tree: Trees which are infected with parasites to such an extent that their growth is seriously affected or they are a danger to their neighbors.

iv. Uprooted and Fallen Trees: A tree which cannot stand by its root system. It can be green or dry. Part of the tree broken and separated from the stem will also come under the definition of fallen tree.

2.7.5 Marking Rules for thinning:

- i. Only Hollong bearing areas where abundant hollong trees exist but for want of thinning operation, growth are not satisfactory shall be operated.
- ii. Mark all dead, top dead, wind fallen, diseased, mid broken, top broken and unsound Hollong trees.
- iii. Mark all mal formed or crooked Hollong provided no large gaps are created.
- iv. Mark all stems of inferior species interfering with Hollong.
- v. In case of any doubt regarding removal or otherwise of a tree, decide in favour of retention.
- vi. Only Congested patches of poles are to be thinned out. For guidance of thinning in congested patch following Laurie's Formula.

Laurie's Formula: $S = 1.5 (d + 3)$ {Where S = average spacing in feet in triangular spacing; d = average crop diameter in inches} may also be used for this exercise.

By using this formula, the desired triangular spacing for a given plantation is estimated to work out the number of plants to be retained. This formula is very useful when one does not have the history of past thinning of a plantation. The guiding principle is the number of trees with better crown, stem-form and free from the attack of pests and diseases, to be retained with even spacing. The number of sound trees retained after any thinning should be as per the number worked out by using Laurie's formula. This method of thinning has merits as well as some constraints. It is easy to fix the required distance, more objective, technically standard and reduces the personal error but it demands relatively more skilled human resource for enumeration and measurement especially for identifying stems to be retained with the help of GIS.

- vii. The spacing and desirable number of trees per hectare by diameter (BH) are given in table 2.6.11.a. However, the number of trees to be retained may be increased considering local conditions, threats etc. as found fit by the DFO.

Table 2.7.5a: The designed method for thinning

Diameter	Spacing	Minimum No of trees to be retained/hect	Considering local conditions May be increased upto
10 cm	3.15 m	1170	+ 90
15 cm	4.00 m	725	+ 80
20 cm	5.00 m	460	+ 70
25 cm	5.86 m	340	+ 60
30 cm	6.81 m	250	+ 50
35 cm	7.66 m	195	+ 40
40 cm	8.64 m	155	+ 30
45 cm	9.46 m	129	+ 20
50 cm	10.36 m	108	+ 10

2.7.6 Thinning schedule: Although there were thinning schedule for this species mentioned in the earlier working plans due to the anthropogenic factors there has been changes in the resources like land, associates, nutrient, soil compaction and also there are changes in rainfall, temperature. Additionally, there has been a change in the perception on the forest, now there has been a recognized perception that forest sequesters carbon, therefore to accommodate these, it is advisable to rework the thinning schedule during this working plan period especially for the signature species.

2.7.7 Subsidiary Silvicultural Operation: These will be done in the year following the thinning and consist of: Cutting back of all damaged stems of Hollong and its associate species provided there is over head light and there is, otherwise, hope of obtaining better stems; Climber cutting of exotic species only. Careful disposal of refuse & fire control measures to be ensured. Grazing should be strictly prohibited in the regeneration areas. Pole, firewood etc. derived from thinning operation may be given to the JFMCs on priority basis. The area check of plantation areas and periodical inspection of plantation forms and journals must be maintained for each plantation plots.

2.7.8 Sequence of regeneration proposed (Year-wise Plantation activities in Compartments)

Range_Name	RF Name	Compnt	Hollong Reg WC	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Sadiya	Deopani	1	155	15	15	15	15	15	15	15	15	15	20
Sadiya	Deopani	2	245	25	25	25	25	25	25	25	25	25	20
Sadiya	Deopani	3	105	10	10	10	10	10	10	10	10	10	15
Sadiya	Hollogaon	1	30	10			10					10	
Sadiya	Sadiya Station	1	315	35	30	30	35	30	30	30	35	30	30
Sadiya	Sadiya Station	2	75		25		25		25				
Sadiya	Kundil Kalia	1	40	10				10			10		10
Sadiya	Kundil Kalia	2	80	10	10	10	10	10	10		10	10	
Sadiya	Kundil Kalia	3	70	10	10	10		10	10		10	10	
Sadiya	Kundil Kalia	4	95	10	10	10	10	10	10	15		10	10
Sadiya	Kundil Kalia	5	50	10		10		10			10		10
Sadiya	Kundil Kalia	6	140	15	15	15	10	15	10	15	15	15	15
Sadiya	Kundil Kalia	7	60	10	10		10	10		10	10		
Sadiya	Kundil Kalia	8	230	25	25	25	25	30		25	25	25	25
Sadiya	Kundil Kalia	9	180	20	30	20	20	20	30		20	20	
Sadiya	Kundil Kalia	10	155	15	15	15	15	15	15	15	15	15	20
Sadiya	Kundil Kalia	11	40	10				10			10		10
Sadiya	Kukuramara	1	25		10		15						
Saikhowa	Kumsong	3	20				10				10		
Saikhowa	Kumsong	4	30		10			10					10
Saikhowa	Kumsong	5	90	10	10	10	10	10	10		10	10	10
Saikhowa	Kumsong	6	110	10	15	15	10	10	10	10	10	10	10

Saikhowa	Mechaki	1	100	10	10	10	10	10	10	10	10	10	10
Saikhowa	Mechaki	2	100	10	10	10	10	10	10	10	10	10	10
Saikhowa	Mechaki	3	180	20	30	20	20	20	30		20	20	
Saikhowa	Mechaki	4	120	15	10	10	15	10	15	10	10	10	15
Saikhowa	Hahkhathi	1	340	35	35	35	35	35	35	35	35	35	25
Doomdooma	Hollonghabi	1	-										
Doomdooma	Philobari	1	100	10	10	10	10	10	10	10	10	10	10
Doomdooma	Tokouwani	1	210	20	20	20	20	30	20	20	20	20	20
Doomdooma	Nalani	1	90	10	10	10		10	10	10	10	10	10
Doomdooma	Kakojan	1	20			20							
Doomdooma	Kakojan	2	10				10						
Doomdooma	Kakojan	3	30					10		10			10
Doomdooma	Kakojan	4	40	10	10	10	10						
Doomdooma	Kakojan	5	100	10	10	10	10	10	10	10	10	10	10
Khatangpani	Burhi Dihing	1	265	25	25	25	30	30	25	25	25	25	30
Khatangpani	Burhi Dihing	2	55		25		30						
Khatangpani	Burhi Dihing	3	20			10			10				
Khatangpani	Burhi Dihing	4	70		10	10	10	10	10	10	10		
Khatangpani	Burhi Dihing	5	75	10	10	10	10	10	10	15			
Khatangpani	Duarmara	1	10	10									
Khatangpani	Duarmara	2	35		10		10		15				
Khatangpani	Duarmara	3	55					25		30			
Khatangpani	Duarmara	4	45				25		20				
Khatangpani	Tarani	1	30	10			10				10		
Khatangpani	Tarani	2	75			10	10	10	10	10	10	15	
Khatangpani	Tarani	3	55	25		30							
Khatangpani	Tarani	4	90	10	10	10		10	10	10	10	10	10
Khatangpani	Tarani	5	80		10	10		10	10	10	10	10	10
Khatangpani	Lokhipathar	1	35			10		10		15			
Kakopathar	Dangori	1	15				15						
Kakopathar	Dangori	2	190	20	20	20	20	20	30		20	20	20
Kakopathar	Dangori	3	110	10	10	10	10	15	15	10	10	10	10
Kakopathar	Dumduma	1	220	20	20	20	30	30	20	20	20	20	20
Kakopathar	Dumduma	2	25		10					15			
Kakopathar	Dumduma	3	55	10		10		10		10		15	
Kakopathar	Dumduma	4	10				10						
Kakopathar	Dumduma	5	55					25		30			
Kakopathar	Dumduma	6	90	10	10	10		10	10	10	10	10	10
Kakopathar	Dumduma	7	90	10	10	10		10	10	10	10	10	10
			5635	580	610	590	635	650	565	525	530	495	455

NB: Considering feasibility, existing stock and priority with respect to necessity of restocking immediately to avoid possible encroachment, DFO may allow deviation to an extent of 25% in terms of location/area.

-SSS-

CHAPTER 3

Miscellaneous Plantation Working Circle

3.1 Name of the Working Circle: Miscellaneous Plantation Working Circle.

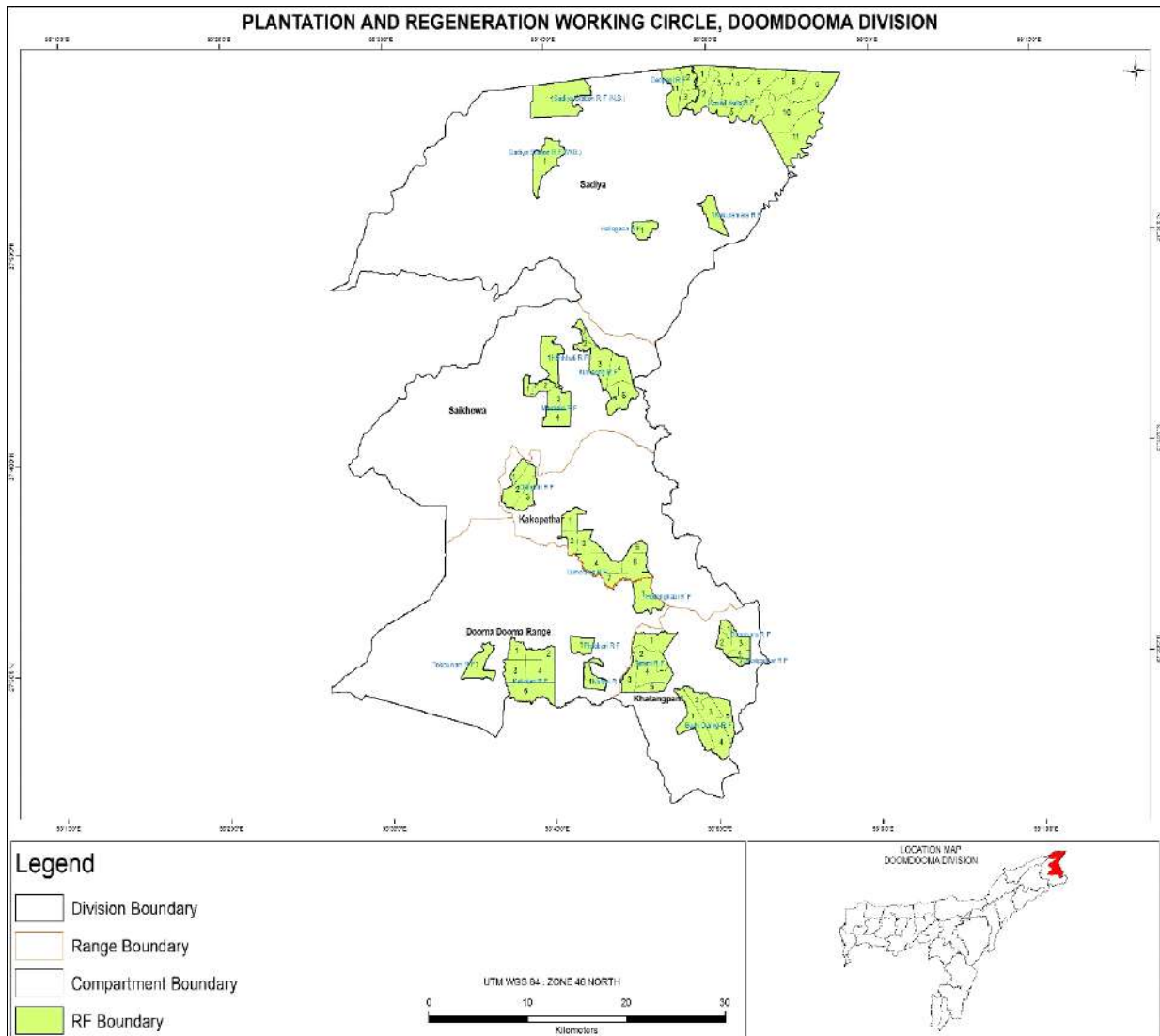


Figure 2: Plantation Working Circle of Doomdooma division.

3.2 General constituents of the Working Circle: This Working Circle has been constituted to cover areas falling South of the Brahmaputra River. This Working Circle includes some of those areas where Hollong is found in considerable numbers mixed with other species. As the outcome of the past systems of management is very discouraging, the pace of regeneration of Hollong is to be accelerated within a reasonable period. The appropriate silvicultural operations shall be followed to improve the health of growing stock. This Working Circle comprises of all commercially important and well stocked forests of Hollong situated on the almost flat floor and along slopes. This Working Circle corresponds to the unmanaged Hollong growing areas.

3.3 General characteristics of the vegetation:

Composition: The forest type of Doomdooma Division is mainly the Assam Valley Tropical Wet Evergreen Forests (1B/C1) of Champion and Seth Classification. Hollong is the dominating species

which is recognized as the 'State Tree' of Assam and is the most 'sought after' plywood species of the region. So, the areas predominant in Hollong and contiguous areas poor in Hollong stocking but suitable for raising the same, deserve to be enriched by aided/assisted natural regeneration and even by regular Plantations of Hollong polypot seedlings. On the other hand, the evergreen character of the crop requires to be maintained by promoting establishment of Hollong associates side by side.

3.4 Blocks and compartment allotment areas: The compartment areas under this circle are given as follows-

Table 2.4: Area allotted to plantation Working Circle

Range Name	Name of RF	Compnt	Area (Ha)	Plantn WC
Sadiya	Deopani	1	571.61	85
Sadiya	Deopani	3	246.58	65
Sadiya	Hollogaon	1	318.08	200
Sadiya	Sadiya Station	1	807.34	200
Sadiya	Sadiya Station	2	1525.94	70
Sadiya	Kundil Kalia	1	231.43	35
Sadiya	Kundil Kalia	2	481.11	135
Sadiya	Kundil Kalia	3	428.24	170
Sadiya	Kundil Kalia	4	672.37	160
Sadiya	Kundil Kalia	5	389.24	115
Sadiya	Kundil Kalia	6	641.44	110
Sadiya	Kundil Kalia	7	613.03	95
Sadiya	Kundil Kalia	8	617.23	195
Sadiya	Kundil Kalia	9	805.79	285
Sadiya	Kundil Kalia	10	1166.47	135
Sadiya	Kundil Kalia	11	1247.12	60
Sadiya	Kukuramara	1	465.10	215
Saikhowa	Kumsong	3	570.72	10
Saikhowa	Kumsong	5	265.38	140
Saikhowa	Kumsong	6	355.33	60
Saikhowa	Mechaki	2	193.53	80
Saikhowa	Mechaki	3	408.37	200
Saikhowa	Mechaki	4	392.03	160
Saikhowa	Hahkhati	1	673.54	230
Doomdooma	Philobari	1	310.47	160
Doomdooma	Tokouwani	1	541.66	280
Doomdooma	Nalani	1	361.71	225
Doomdooma	Kakojan	1	280.03	240
Doomdooma	Kakojan	2	289.89	75
Doomdooma	Kakojan	3	434.61	380
Doomdooma	Kakojan	4	583.14	210
Doomdooma	Kakojan	5	725.83	365
Khatangpani	Burhi Dihing	1	763.76	450
Khatangpani	Burhi Dihing	2	232.96	150
Khatangpani	Burhi Dihing	3	392.39	350
Khatangpani	Burhi Dihing	4	435.52	205
Khatangpani	Burhi Dihing	5	450.19	160
Khatangpani	Duarmara	1	147.86	15
Khatangpani	Duarmara	2	215.97	100
Khatangpani	Duarmara	3	247.64	140

Khatangpani	Duarmara	4	144.25	90
Khatangpani	Tarani	2	401.66	35
Khatangpani	Tarani	3	345.25	260
Khatangpani	Tarani	4	564.72	290
Khatangpani	Tarani	5	216.77	120
Khatangpani	Lokhipathar	1	110.25	15
Kakopathar	Dangori	2	536.74	70
Kakopathar	Dangori	3	329.21	100
Kakopathar	Dumduma	1	306.04	65
Kakopathar	Dumduma	2	246.45	50
Kakopathar	Dumduma	3	387.09	255
Kakopathar	Dumduma	4	615.12	490
Kakopathar	Dumduma	5	145.26	30
Kakopathar	Dumduma	6	417.47	130
Kakopathar	Dumduma	7	374.96	75
				8790

3.5 Objectives of the Working Circle: The broad objective of this working circle is to reclaim the degraded forests of this Division through massive plantation works. Specific objectives are given below –

- a) Plantation immediately after eviction of encroached areas with native species.
- b) Improve the tree cover and density class by plantation in areas presently with less than 10%, 10% - 40% canopy cover.
- c) Assisting natural regeneration especially in 40 – 60% canopy cover areas.
- d) To maintain the terrestrial ecosystem in and around the wildlife habitat areas.
- e) To initiate researches on the growth patterns, carbon sequestration.
- f) Initiate research on tree improvement and genetic resources studies to enhance growth of the forest tree species.

3.6 Strategy: Block plantation will be promoted in open forest areas and assisted natural regeneration shall be promoted in moderately dense forest areas. The regenerative capacity of the endemic species, species that wildlife prefers shall be enhanced. A total ecosystem conservation concept will be adopted for raising the plantations. An effective naturalization plan needs to be devised based on principles for maintaining natural diversity. To enrich the low diversity areas, efforts may 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 may be promoted.

The forest and fringe villages in plantation and regeneration activities to be ensured so that local population Involvement of local communities especially youths, women from participate in maintaining the forest and avoid any illegal activities which can cause further forest degradation. The efforts therefore are 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 programs may be taken up..

March-April to encourage the development of roots and shoots. Large polythene bags are prepared by filling. Some middle aged, clean boled, disease free trees will be retained as mother trees to supply seeds. Such trees will be geo tagged for ready reference. Trees with exploitable dia will be felled allowing the regeneration to come up under the shelter of the trees.

Clearing of weed, undergrowth and preparation of shaded beds of 1 (one) meter width are done at the plantation site before the onset of monsoon. Hollong seeds are collected during March/April, stored under shade and watered during with top soil collected from the Hollong bearing areas and sieved properly to remove debris if any. Seeds with developed roots and shoots are then selected and immediately put into large polythene bags and arranged in the shaded beds prepared already. Sprinkler irrigation or watering is done regularly. The nursing of the seedlings is done up to one year. Care is taken to protect the regenerating areas from grazing and fire.

Poorly stocked sites are selected for artificial planting and only weeds are cleared from the selected sites. Under shelter wood system, tunnels are dug 2mtr apart (called tunnel planting) without disturbing the existing seedlings of hollong and its associated species, so as to allow sunlight and prevent overcrowding. Soil opening by light tilling/ ploughing is done to promote soil aeration and facilitate Aided Natural Regeneration (ANR) in the dry/ degraded Hollong forests. Planting with one year or tall, half year old polypotted seedlings is done from April to May. Removal and disposal of the polythene bags from the area is necessary to negate the chances of accidental suffocation and pollution. Special care is to be taken to prevent cutting of pole size Hollong for use as firewood by the fringe villagers. Intentional fire or damage to seedlings by miscreants, encroachers or wood cutters must be prevented as it kills the regenerating Hollong seedlings. Apart from creation of plantation and site nursery, permanent watch and ward, filling up of vacancies must be undertaken wherever necessary. After the regeneration has come up, the rest of the overwood is removed in one or two operations.

Information on edaphic factors, phenology and stand development processes (regeneration, growth characteristics, soil nutrient requirement, growth allocation, nutrient cycling, stand structure and succession stages) is important for designing scientific forest management of Hollong forests; likewise, knowledge of anthropogenic factors associated with use of Hollong forest is also required for effective implementation such management efforts. Community based forestry in this region emerged in response to the severe degradation of forest resources. Ecological processes indicate good prospects of managing Hollong forest for multiple products. Multiple products can be produced from Hollong forests after litter removal, without adverse effects on tree growth. This may also lead to increased regeneration in terms of quality and quantity, with positive effects on biodiversity.

The objectives underlying such silvicultural operations are three fold: supply of intermittent products, creation of an avenue for intercropping and hygienic operations for the main crop, which may vary depending on the species composition and their importance at the local or regional level, and to have an integrated approach of utilizing the Hollong Plantation Working Circle for multiple Products other than timber.

3.7 Regeneration

Natural Regeneration

Natural regeneration is the process by which juvenile plants and coppice that have established naturally replace plants which have died or have been killed. Over time, following a disturbance, the growth of natural regeneration will reestablish canopy trees. Natural regeneration shall be encouraged in places where it is growing naturally without biotic interference.

- For protection and development of natural regeneration of important species (both seed and coppice origin as well as for management of malformed rooted stock/shoots, tending of NR and rooted stock have to be done properly and in proper time. Plantation Register will be maintained on the lines of AR areas.
- All seedlings and saplings of seed origin of valuable species, more than 60 cm in height as well as healthy coppice shoots would be identified in the first year, which will be nursed as future crop. Spacing operations, if required, would be carried out to leave nearly 400 saplings per hectare at an average of 5.00 mt spacing spacing out operation may be in favour of ecologically valuable species and species rarely found in the area.
- Tending of natural regeneration and coppice shoot management, Cut-back operation (CBO) and artificial regeneration may be carried out in the next year of main felling.
- All treatment type areas will be shown distinctively on the map, including the area suitable for planting, areas having adequate promising natural regeneration and rooted stock and areas prone to soil erosion. For this purpose, grid maps (100m x 100m) with GPS reading should be used.
- As per requirement of site, weeding, soil working should be done after inspection by Zonal CCF/ APCCF. Model estimate for tending of NR to be approved by Zonal CCF/ APCCF.
- The areas poor in natural regeneration should be artificially regenerated by Teak, Miscellaneous species and Bamboo as per actual site condition.
- Involvement of JFMCs, giving benefit to JFMCs from cutback, stump dressing etc. should be considered as per Government guidelines.
- The natural regeneration should be assisted and encouraged by soil working and mulching around them, wherever needed.

Tending of Natural Regeneration

- **First year operation i.e, subsequent to main felling year:** Weeds in one meter diameter saplings of valuable species should be cleared during the first week of July/August. Uprooted weeds, grasses and leaf litter should be mixed in the upper layer of soil as the organic mulch and facilitate loosening and aeration of the soil by worms and insects. One soil working should be carried out in October/ November.
- **Second year operation:** The soil working should be repeated in the following year in the month of October in the seedlings of seed origin. However, one scrap weeding of one meter diameter should be carried out in the first week of August/October around the shoots of seedlings of coppice origin within the rootstock management area.
- **Third year operations:** Singling of coppice shoots, management of damaged and malformed saplings, climber cutting and shrub clearance should be repeated as third year operations.

- **Root stock and Coppice management:** In the areas where there is no sufficient seedlings of seed origin (at least 400 healthy and established saplings) are found, the existing root stock should be managed to increase the density and productivity of the crop. Preference should be given to encourage the ecologically valuable species. Tending of root stock (ecologically valuable species) in the B-1 type may be carried out as follows:
- **Singling of Coppice Shoots:** One healthy and promising coppice shoot shall be retained with the stump and the rest are to be removed. However, coppice shoots interfering with promising saplings of seed origin would be removed. Such coppice shoots should also be close enough to the ground so that it would not topple after gaining volume and weight and would be able to develop root system of its own subsequently.
- **Coppice management of damaged malformed saplings:** The saplings and poles of upto 45 cm gbh having one-third of the stem damaged and malformed should be coppiced by cutting flush to the ground. Such coppicing, however, should not expose the ground causing erosion and leading to soil loss. Poles having at least 2.50 meter of clean bole would not be treated as malformed.
- All such sites selected for tending of natural regeneration and root stock and coppice management should be geo-referenced on digital map of the division by taking GPS reading of at least four corners of the said site, which may be compared later with the satellite imagery of the division for any change of vegetation cover.
- A proper record, in the form of NR Register, should be maintained at Range level as well as division level regarding all activities of Regeneration. Records such as Register, number of seedling identified, cleaned saplings, maps, GPS reading, operations, photographs etc. should be maintained on regular basis.
- All entries should be made in the relevant *Coupe Control Forms and Compartment History Forms*. In case of Artificial Regeneration, proper Plantation registers should be maintained at Range level as well as division levels.
- In case of any deviation from the prescriptions of approved Working Plans, proposal should be submitted and got approved by competent authority in time.

Aided Natural Regeneration

ANR is most applicable in areas with remain-ing trees or patches of natural forest within a wider degraded landscape, as these trees provide propagation material or attract dispersal agents (birds, bats, mammals, etc).

Artificial Regeneration

Artificial regeneration is accomplished by the planting of seedlings (the most common method) or by the direct planting of seeds. Direct seeding is reserved for remote or inaccessible areas where seedling planting is not cost-effective. The most common method is to plant nursery raised saplings in the selected areas. In this division Artificial regeneration shall be undertaken.

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 , 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.

Artificial regeneration: Emphasis is given on artificial planting of 'Root trainer Seedlings' to fill up the vacant areas created by rehabilitation of the encroached areas and gaps created by natural calamities. They are to be filled up immediately by artificial planting of miscellaneous species. The main activity under this Working Circle will be afforestation of 10,000 hectare of area within first two years. Hence, sufficient nursery stocks are to be maintained in 'Site Nurseries' which are to be created at predetermined key locations. Moreover, seed sowing in thalis or even broadcasting will be appropriate in achieving the objectives as the evacuated areas will be fairly free of vegetation. Plantation areas will be developed before hand as tractor and excavators are proposed in the budget.

Source of seeds: Good seed year occurs almost every year; fruits are generally collected from the forest floor, after sweeping/cleaning. Efforts are to be made to collect genetically superior seeds i.e. quality seeds from seed production area (SPA) and plus trees etc. Simultaneously, protection of the plantation areas is to be ensured by engaging more staff/armed Home Guards and, with the help of 'Forest Protection and Regeneration Committees'.

Local species for energy plantaion: The following fast growing species will be raised in nurseries accordingly e.g. Morhal (*Vatica lanceafolia*), Kadam (*Anthocephalas cadamba*), Morolia (*Macaranga dencifolia*), Ghora neem (*Melia azadirach*), Moj (*Albija lucida*), Selleng (*Sapium baccatum*), Bhelu (*Tetrameles nudiflora*), Baji Ou (*Dillenia sps*), Kumbhi (*Carriya arborea*), Sajina (*Moringa plerygosperma*), Karanch (*Pongamia glabra*). Quick growing species such as Hollock etc are recommended. Transplanting with Polypot/Nacked seedlings (at a spacing of 2M X 2M), simultaneously seed sowing (In pits) in the inter space in the evacuated area is recommended to cover the areas quickly and more intensively if the reclamation is successfully done during monsoon. Tractor may be used for ploughing and preparation of land for plantation in evacuated areas to execute the works **on a war footing** as there is every chance of the encroachers coming back. Intercropping with Medicinal and aromatic plants in JFMC areas will be allowed as per convenience. All these activities such as energy plantation and intercropping with MAP are to be confined in the fringe areas of the Reserve Forests. It is expected that the areas other than the JFMC areas will grow

up to excellent 'Wildlife habitat' within no time as per Policy of Bio diversity conservation. Care should be taken not to burn the debris but to allow for its decomposition.

Nursery stock: Sufficient nursery stock of miscellaneous species should be raised annually as per requirement for the subsequent year. The DFO should personally check the nursery stock position as a measure of control.

Scope of Tree Improvement for energy and production of quality seed and planting stock for plantations: With the growing need for protection of natural forest and meeting the increasing demand of energy timber both in local market and outside the state, the need for reliable high quality planting material for these production forests is progressively increasing. The energy plantations created in the region are well established and express considerable variation in terms of identifier traits such as growth, straightness, grain, inter nodal distance etc. Thus, the species is perceived to have a high genetic variability indicating the possibility of huge gains through a genetic improvement programme. Works have already been initiated in this direction by the State Forest Department of Assam as well as the Institute of Rain and Moist Deciduous Forest Research (IRMDFR), Jorhat.

The complete breeding strategy for improvement is a long term exercise and involves right from the provenance trial stage to the establishment of well tested seedlings and clone seed orchards for collection of improved seeds. However, to attain the first level of genetic improvement, interim steps can be taken for supplying seeds of somewhat better generic quality through establishment of Seed Production Areas (SPAs). SPAs have been identified in the nearby Digboi Division by the Silviculture Division, Guwahati for sourcing of genetically superior seeds. Also, seeds should be collected from established superior quality trees in other areas in order to have a wider genetic base in the plantations and thereby increase productivity as a step ahead towards intensive forestry i.e. higher yields in comparatively smaller areas.

The target for plantation in this Working Circle is 10,000 Hectare in two years. The requirement of seedlings is 250.00 Lakh while the recommended spacing is 2m X 2m. Accordingly, 62.5 Ha Nurseries have been proposed to raise the 250.00 Lakh seedlings @4.00 Lakh seedling per Ha Nursery, wherein 10% of the seedlings will comprise of firewood species. Areas to be planted have to be prioritized as per their vulnerability to re-encroachment. Direct planting with seeds may be done in monsoon season after fencing the designated areas, as the seedlings will not attain required heights for planting in the field. Root trainer to develop seedlings should be used as far as practicable. Vermi Compost is to be developed locally. The ratio of 1:1:2 (Sand-top, soil-vermi compost) is to be followed to fill up the Root Trainers. The root trainer seedlings will be ready for plantation after 6 months. This will ensure survival of the seedlings and vigorous growth needed for a successful stand.

Compartment and reserve boundaries should be demarcated and maintained on the ground. Works of proper relaying of reserve boundaries on the ground and fixing up of boundary pillars should be undertaken immediately. The boundary of each plantation plot should be permanently maintained and indicated in the field with proper sign board. Plantation records should be properly maintained. This will greatly help in carrying out the field surveys when this Working Plan becomes due for revision.

Sufficient reliable data will be available from these records for incorporation in the next plan. Moreover, it will be convenient to take up silvicultural measures in the plots meant for NTFP collection.

Fire protection measures depending upon the vulnerability of the area should also be taken for young block and regeneration block. Energy plantation should be carried out on plain areas and foothills. Steep slopes should be avoided for energy plantation.

3.7.1 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.

3.7.2 Method of treatment

Gorjon 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.

3.7.3 Prescriptions: The following prescriptions are recommended for the 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 given below.

3.8 Associate regulation: The plantation should be fenced with 3-4 strand barbed wire or be protected from cattle by engaging Cattle Watchers, and be maintained for at least 5 years which may be extended to 10 years under CAMPA scheme.

3.9 Sequence of regeneration proposed (Year-wise Plantation activities in Compartments)

Range Name	RF Name	Compnt	Plantn WC	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Sadiya	Deopani	1	85	10	10	10	10	10	10	10	15		
Sadiya	Deopani	3	65			10	10	10	10	10			15
Sadiya	Hollogaon	1	200	20	20	20	20	20	20	20	20	20	20
Sadiya	Sadiya Station	1	200	20	20	20	20	20	20	20	20	20	20
Sadiya	Sadiya Station	2	70		10	10	10	10	10	10			
Sadiya	Kundil Kalia	1	35	10	10	15							
Sadiya	Kundil Kalia	2	135	15	10	15	15	15	15	15	10	15	10
Sadiya	Kundil Kalia	3	170	15	15	15	15	15	20	15	20	20	20
Sadiya	Kundil Kalia	4	160	15	15	15	15	15	15	15	20	20	15
Sadiya	Kundil Kalia	5	115	15	10	15	10	15	10	10	10	10	10
Sadiya	Kundil Kalia	6	110	10	10	15	10	15	10	10	10	10	10
Sadiya	Kundil Kalia	7	95	10	10	10	10	10	10	10	15	10	
Sadiya	Kundil Kalia	8	195	20	20	20	20	20	20	20	20	20	15
Sadiya	Kundil Kalia	9	285	25	30	25	30	30	30	30	30	25	30
Sadiya	Kundil Kalia	10	135	15	10	15	15	15	15	15	10	15	10
Sadiya	Kundil Kalia	11	60	10	10	10	10	10	10				
Sadiya	Kukuramara	1	215	25	20	20	20	25	20	20	20	25	20
Saikhowa	Kumsong	3	10	10									
Saikhowa	Kumsong	5	140	15	15	15	15	15	15	15	10	15	10
Saikhowa	Kumsong	6	60					10	10	10	10	10	10
Saikhowa	Mechaki	2	80	10	10	10	10	10	10	10			
Saikhowa	Mechaki	3	200	20	20	20	20	20	20	20	20	20	20
Saikhowa	Mechaki	4	160	15	15	15	15	15	15	15	20	20	15
Saikhowa	Hakhathi	1	230	30	20	25	20	25	20	25	20	25	20
Doomdooma	Philobari	1	160	15	15	15	15	15	15	15	20	20	15
Doomdooma	Tokouwani	1	280	25	30	25	30	25	30	30	30	25	30
Doomdooma	Nalani	1	225	25	20	25	20	25	20	25	20	25	20
Doomdooma	Kakojan	1	240	25	20	25	25	25	20	25	25	25	25
Doomdooma	Kakojan	2	75	15		15		15		15		15	
Doomdooma	Kakojan	3	380	40	40	40	35	40	35	40	35	40	35
Doomdooma	Kakojan	4	210	25	20	20	20	25	20	20	20	20	20
Doomdooma	Kakojan	5	365	35	40	35	40	35	35	35	40	35	35
Khatangpani	Burhi Dihing	1	450	45	45	45	45	45	45	45	45	45	45
Khatangpani	Burhi Dihing	2	150	15	15	15	15	15	15	15	15	15	15
Khatangpani	Burhi Dihing	3	350	35	35	35	35	35	35	35	35	35	35
Khatangpani	Burhi Dihing	4	205	20	20	20	20	25	20	20	20	20	20
Khatangpani	Burhi Dihing	5	160	15	15	15	15	15	15	15	20	20	15
Khatangpani	Duarmara	1	15	15									
Khatangpani	Duarmara	2	100	10	10	10	10	10	10	10	10	10	10
Khatangpani	Duarmara	3	140	10	15	10	15	10	15	15	15	20	15
Khatangpani	Duarmara	4	90	10	10	10	10	10	10	10	10	10	
Khatangpani	Tarani	2	35	10			10			15			
Khatangpani	Tarani	3	260	20	25	25	25	25	25	30	25	30	30
Khatangpani	Tarani	4	290	25	30	30	30	30	30	30	30	25	30
Khatangpani	Tarani	5	120	10	20	10	10	20	10	10	10	10	10
Khatangpani	Lokhipathar	1	15		15								
Kakopathar	Dangori	2	70	10		10	15		15		15		15
Kakopathar	Dangori	3	100	10	10	10	10	10	10	10	10	10	10
Kakopathar	Dumduma	1	65	10	10	10	10	10	15				
Kakopathar	Dumduma	2	50		10	10			10	10			10
Kakopathar	Dumduma	3	255	25	30	25	20	25	20	25	30	25	30
Kakopathar	Dumduma	4	490	50	50	50	45	50	50	50	45	50	50
Kakopathar	Dumduma	5	30				10	10	10				
Kakopathar	Dumduma	6	130	10	10	10	15	10	10	15	15	20	15
Kakopathar	Dumduma	7	75	10		10	15		15		15		10
			8790	905	870	905	885	910	895	890	875	850	815

NB: Considering feasibility, existing stock and priority with respect to necessity of restocking immediately to avoid possible encroachment, DFO may allow deviation to an extent of 25% in terms of location/area.

CHAPTER 4

Joint Forest Management (overlapping) Working Circle

4.1 Name of the Working Circle: Joint Forest Management (Overlapping) Working Circle. The detail map of this Working Circle is shown in Figure 3.1.

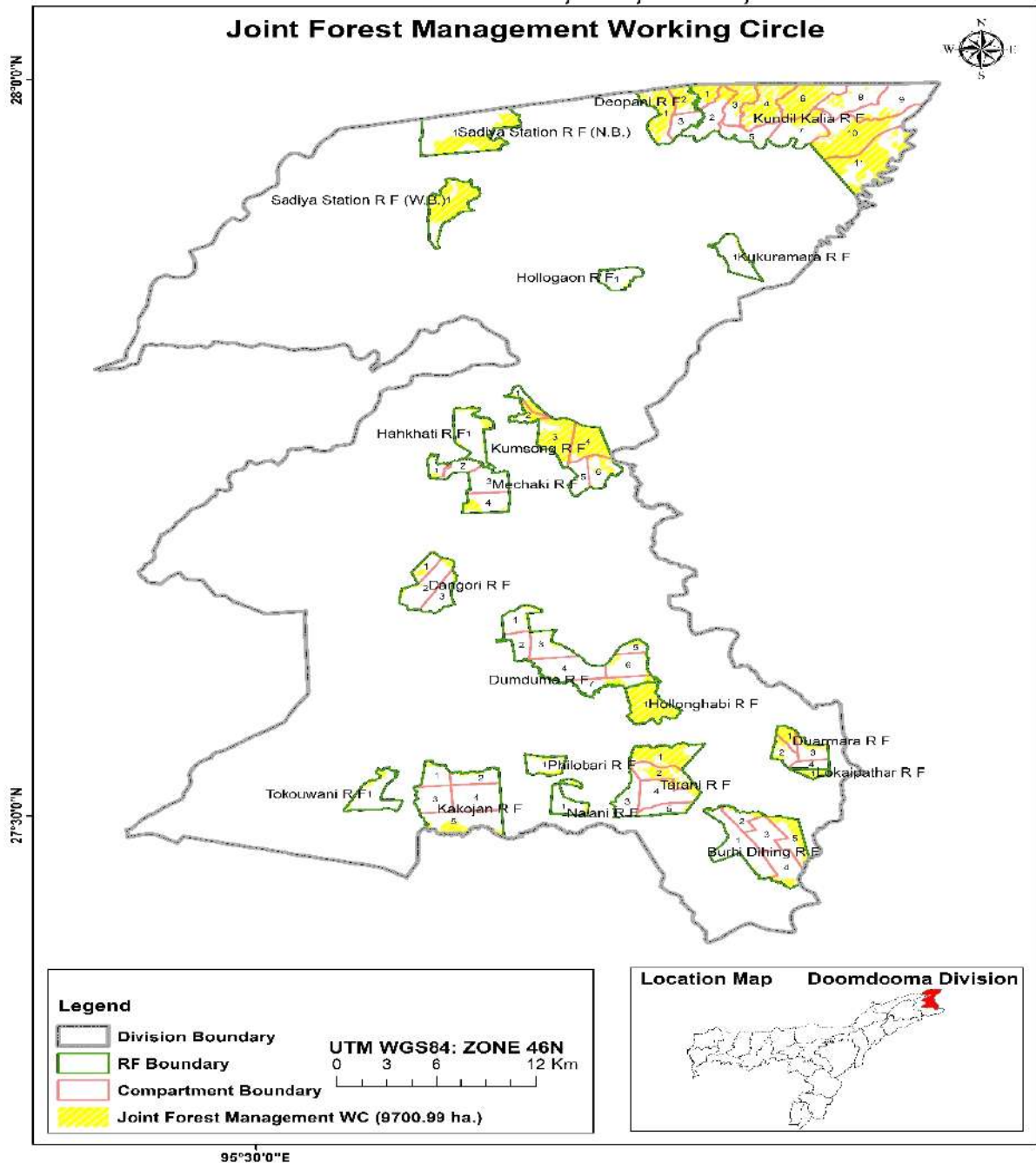


Figure 4.1: JFMC (overlapping) working circle map of Doomdooma division.

4.2 General constituents of the Working Circle: Joint Forest Management or JFM is an approach and programme initiated in the context of the National Forest Policy of 1988 wherein State Forest Department support local forest dwellings and forest fringe communities to protect and manage forests and share the costs and benefits from the forests with them. Communities organize themselves into JFM committee(s) and protect and manage nearby forests guided by locally prepared by-Laws and Micro Plans. The key element in JFM is that committees have the power to manage the use of forests by members; the beneficiaries have the direct access and control on the earning/ sale of most NTFPs and a share in the income from timber. They also get other intangible benefits from local eco system services –like water recharge, pollination, wildlife habitat etc. Thus involvement of communities in conservation of forests and wildlife is of paramount interest.

The socio economic survey will reveal the dependency of villagers on Forests and Forest produce for their livelihood needs; this will help in understanding the eco-system services they derive from the nearby forests. Accordingly, suitable management proposals and strategies will be made for funding for socio economic upliftment of the villagers, who in turn will protect the forests and wildlife. Special thrust will be given for development of tribal, backward community and woman folk. The socio economic survey will reveal the intensity of grazing, dependency on forests, etc.

As Joint Forest Management or JFM is a process of involving local people in forest management and has been introduced as per National Forest Policy, 1988, Assam has formulated and adopted the Joint (Peoples participation) Forestry Management Rules, 1998. According to the said Rule, there will be a Committee with an Elected President and 9 or 11 Executive Members. The aim of such Committee is to safeguard the forest resources by preventing illegalities as defined in the said Rules.

At present there are 35 JFMCs (old-29 numbers and new-6 numbers) in Doomdooma Division. The Micro Plan of each JFMC includes Entry Point Activities, income generating activities including a training component, and creation of Nursery followed by plantation. The JFMCs are formed at the fringe of the Reserve Forests and all members of the JFMCs are locals, including members of the Gram Panchayat. The regeneration and maintenance of open, degraded forests and moderately dense forests and allied development works will be done by the JFMCs within the assigned area. Active participation of the local people will be invited to make the programme a grand success. The local people will be involved in every activity such as preparation of nursery seedlings, plantation, maintenance and protection. As per JFM mechanism, they are authorized to harvest the fruits, flowers, pods, bark etc. from these trees.

The National Forest Policy, 1988 emphasized that domestic requirements of the tribal and other poor people living within and near the forest for fuel wood, fodder, NTFP and construction timber should be the first charge on forest produce and the holders of customary rights and concessions in forest areas should be motivated to identify themselves with the protection and development of forest from which they derive benefits. In short, the JFM system is meant for the protection and rehabilitation of degraded forests. The JFM approach was adopted through the Govt. Resolution No.SIF-1091/199/F-11, dated March 16, 1992, for degraded forest areas of this State and now, new guidelines have been issued vide G.R.No.MSC/2000/C. NO. 143/F-2, dated 25.4.2003.

Generally, the scarcity of forest products such as fuel wood, fodder etc. as a result of degradation of forest on which the local communities depended, forces the people to think of steps for the protection and improvement of degraded forests. The people are usually reluctant to participate in JFM where sufficient forest areas are still available to meet their requirements. On the part of Forest Department, the problems in protecting forest without the help of local people make the Forest Department staff realize the need of JFM. The JFM program succeeds where the initiative comes from the people's side and it usually fails where it is forced from Forest Department side as a Govt. driven and target oriented program. Villagers themselves are required to voluntarily participate in the program. JFMC is to be formed in each village. Each JFMC constitutes a Management Committee consisting of members elected from general body and ex-officio members representing the concerned Govt. Department at village level, and with local forester as the Member Secretary. The Management Committee is responsible for implementation of the decisions of the General Body regarding execution of JFM works, in partnership with Forest Department. A Memorandum of Understanding (MOU) is signed between the Forest Department and the Management committee clearly specifying the duties and responsibilities of both parties. Entitlement of JFMC members to the share in forest produce is subject to the fulfillment of conditions of MoU.

The members of the JFMC will help in protection and development of forests and in return, they will receive a share in the usufructs and products from the forest areas assigned to such committee. The JFM area will be managed according to the micro plans prepared jointly by the Deputy Conservator of Forests and the members of the JFMCs. Micro plans are developed to plan baseline and proposed activities, their estimates and probable convergence of schemes for development of the JFM/ Forest Village, and development of forest. This has to be sustainable and should cater to needs of local communities and the silvicultural requirements of the forest.

Later the Govt. of India also advised the State Govt. to take up JFM in well stocked areas on experimental basis and accordingly, guidelines dated 25th April, 2003 mentioned above have authorized the Assam State forest department in this respect.

There are 35 JFMCs and one more will be formed at a convenient place. 29 JFMCs are old and 6 are new. The Working Circle will cover the fringe areas of 14 RFs as mentioned below.

4.3 General characteristics of Vegetation: The forest type of the 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 the allocated areas were characterized by multistoried layer of canopy. The forest in this working circle is under pressure and the canopy cover is less than 10 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., *Dendrocalamushamiltonii* 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*, *Shoreaassamica*, *Micheliachampaca*, *Mesua*

ferrea, *Magnolia* spp., *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., *Micheniascendens* - 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 exist.

4.4 Special objectives 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, agriculture cash crop, animal husbandry, bee keeping etc. for economic development of rural people. 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.

The broad objective of this working circle is to protect forest and biodiversity along with socio-economic development of fringe forest villagers. Specific objectives include -

- a) To motivate and convince local people about the motto of the forest department to protect the forest and simultaneously to uplift socio-economic condition of the people and thereby ensure involvement of local people for protection, conservation and management of forests.
- b) 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. And 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.
- c) To empower village communities to play a crucial role in forest resource conservation and enable them to resolve their issues and problems. People shall be made aware about the benefits of conserving and improving the quality of their plantations against the backdrop of climate change negotiations, particularly, REDD+.
- d) To reclaim the degraded forests by promoting natural and artificial regeneration (through plantation activity) with active participation of the villagers.
- e) To document the indigenous traditional knowledge and incorporate the same in the micro-plans of the JFMCs.
- f) To assess the possibility of converting these areas into production areas in the long run, as envisaged by the NWPC, 2014.
- g) To associate the people of JFMCs with identification, documentation and implementation of ecotourism activities.

- h) To analyse the past working of JFMC and suggest suitable policy modifications required for more effective functioning of JFMCs.
- i) To win over people so that they become willing partners in protection of forests both within and outside the JFMC areas.
- j) People interested in taking up plantations that are commercially viable in their private lands would be given technical guidance as well as seedling support to raise such plantations.

4.5 Blocks & compartment areas: Blocks, compartment and the area to be covered in this Working Circle is provided in the table below.

Table 3. A.6. Area details under JFMC Working Circle of Doomdooma Division, Assam

Range Name	Name of RF	Compnt	Area (Ha)	JFMC WC
Sadiya	Deopani	1	571.61	330
Sadiya	Deopani	2	270.56	150
Sadiya	Deopani	3	246.58	100
Sadiya	Hollogaon	1	318.08	80
Sadiya	Sadiya Station	1	807.34	250
Sadiya	Sadiya Station	2	1525.94	670
Sadiya	Kundil Kalia	1	231.43	180
Sadiya	Kundil Kalia	2	481.11	90
Sadiya	Kundil Kalia	3	428.24	200
Sadiya	Kundil Kalia	4	672.37	400
Sadiya	Kundil Kalia	5	389.24	-
Sadiya	Kundil Kalia	6	641.44	400
Sadiya	Kundil Kalia	7	613.03	250
Sadiya	Kundil Kalia	8	617.23	120
Sadiya	Kundil Kalia	9	805.79	200
Sadiya	Kundil Kalia	10	1166.47	800
Sadiya	Kundil Kalia	11	1247.12	800
Sadiya	Kukuramara	1	465.10	150
Saikhowa	Kumsong	1	148.95	100
Saikhowa	Kumsong	2	147.49	140
Saikhowa	Kumsong	3	570.72	480
Saikhowa	Kumsong	4	498.04	450
Saikhowa	Kumsong	5	265.38	30
Saikhowa	Kumsong	6	355.33	150
Saikhowa	Mechaki	1	148.25	20
Saikhowa	Mechaki	2	193.53	-
Saikhowa	Mechaki	3	408.37	20
Saikhowa	Mechaki	4	392.03	100
Saikhowa	Hahkhathi	1	673.54	110
Doomdooma	Hollonghabi	1	647.83	645
Doomdooma	Philobari	1	310.47	85
Doomdooma	Tokouwani	1	541.66	75
Doomdooma	Nalani	1	361.71	70
Doomdooma	Kakojan	1	280.03	30
Doomdooma	Kakojan	2	289.89	150
Doomdooma	Kakojan	3	434.61	-
Doomdooma	Kakojan	4	583.14	-
Doomdooma	Kakojan	5	725.83	200
Khatangpani	Burhi Dihing	1	763.76	30
Khatangpani	Burhi Dihing	2	232.96	40
Khatangpani	Burhi Dihing	3	392.39	20
Khatangpani	Burhi Dihing	4	435.52	150
Khatangpani	Burhi Dihing	5	450.19	220
Khatangpani	Duarmara	1	147.86	110

Khatangpani	Duarmara	2	215.97	75
Khatangpani	Duarmara	3	247.64	70
Khatangpani	Duarmara	4	144.25	-
Khatangpani	Tarani	1	568.78	445
Khatangpani	Tarani	2	401.66	200
Khatangpani	Tarani	3	345.25	30
Khatangpani	Tarani	4	564.72	170
Khatangpani	Tarani	5	216.77	15
Khatangpani	Lokhipathar	1	110.25	75
Kakopathar	Dangori	1	187.82	155
Kakopathar	Dangori	2	536.74	200
Kakopathar	Dangori	3	329.21	120
Kakopathar	Dumduma	1	306.04	50
Kakopathar	Dumduma	2	246.45	50
Kakopathar	Dumduma	3	387.09	40
Kakopathar	Dumduma	4	615.12	50
Kakopathar	Dumduma	5	145.26	40
Kakopathar	Dumduma	6	417.47	150
Kakopathar	Dumduma	7	374.96	100
				10630

4.6 Number of JFM Committees and area protected by them

Name of Range	SI No	Name of JFMCs	Name of RF	Area Protected	Area earmarked for plantation
Sadiya	1	Deopani	Deopani	370	100
	2	Lakhimipathar	Deopani	350	100
Saikhowa	3	Hakhati	Hakhati	365	100
	4	Mesaki	Mesaki	350	100
	5	Kumsong	Kumsong	365	100
	6	Dirak F.V.	Kumsang	365	100
	7	North Mesaki	Mesaki	365	100
Kakopathar	8	Doomdooma	Dum Duma	365	100
	9	Dangori	Dangori	350	100
	10	Rongpur	Dum Duma	350	100
	11	Litong	Dum Duma	350	100
Doomdooma	12	Kakojan(NZT)	Kakojan	345	100
	13	Kakojan(Duar)	Kakojan	345	100
	14	Phillobari	Phillobari	345	100
	15	Tokawani	Tokawani	360	100
	16	Noloni	Noloni	370	100
Khatangpani	17	Buridehing	Buridehing	380	100
	18	Tarani	Tarani	385	100
	19	Mihaliritu	Buridehing	355	100
New JFMC under APFBC (fuelwood purpose)					
Kakopathar	20	Udito Suraj	Dangori	360	100
	21	Kachijan	Dum Duma	350	100
	22	Namhollong	Dum Duma	375	100
Doomdooma	23	Kakojan	Kakojan	345	100
Saikhowa	24	Luit Eco-Tourism & Cultural Hub	Mesaki & Hakhhati	380	100
Sadiya	25	Dikrang	Sadiya Stn (WB)	350	100
	26	Lakhimijan	Deopani	335	100
	27	Nahorbari	Sadiya Stn (NB)	365	100
Khatangpani	28	Kariajan Gaon	Buridehing	565	100
	29	Nabudoy	Tarani	375	100
				10630	2900

4.7 JFMCs in Doomdooma Division:

4.7.1 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 cannot 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.

4.7.2 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.

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

4.7.4 Status of JFM: In Doomdooma Forest Division the JFM was started in 2002-03 The details of JFM implementation are given in the table 8.1 (part-I)

4.7.5 Details of villages under JFM in Doomdooma Forest Division: Number of JFM committees in Division is 29. Area allotted for protection Plantation area 395 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 in this area hardly utilize 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 managementRule-1998” shall be followed. At present out of 30 committees constituted in the Division, forest area of 395 hectare 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.

4.7.6 Compartments and felling series: Implementation of the prescriptions under this WC is completely voluntary and it is based on willingness of the villagers, therefore neither compartments are allotted nor felling series are formed. It is an overlapping WC which encompasses a good forest area of the Division. 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.

4.7.7 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.

4.8 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 Doomdooma Division shall prepare Microplans for the area to be assigned to concerned JFM Committee as provided in the The Assam Joint (Peoples Participation) Forestry managementRule-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.

4.8.1 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.

4.8.2 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 visits to successful areas shall be arranged to explain about the protection of forests and achievements in other villages. A comprehensive fire 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.

4.8.3 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.

4.8.4 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 byJFMC
- c) Share in proportion to the period of management in high forests managed byJFMC
- d) 50% of net revenues to be reinvested in forestry works - a step towards sustainability of JFMCs.

4.8.5 Proposed activities under JFMC working circle:

1. Raising of grafted fruit plants in forest areas, nearby fringe villages.
2. Raising of fast growing timber yielding species such as Azar, Titasopa, Kadam, Bandordima, Hatipoliya, etc. endemic to the division.
3. Raising of firewood species - Kadam, Simalu.
4. Development of nurseries for local forest species with technical guidance from the forest department.
5. Training on bamboo and cane based skill development training for providing employment opportunities.
6. Developing participatory catchment area treatment plans in area under Doomdooma Division along the catchment of those rivers. 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.
7. Developing medicinal plants saplings and its plantation on their homesteads.
8. As entry point activities promotion of improved cooking mechanism - biogas, improved chullas, solar lamps etc.
9. Eco-tourism activities shall be developed in the Eco-tourism spots mentioned in Para 8.6 (Part-I).

4.8.6 Additional Prescriptions under JFMC workingcircle:

- i) Forest department staffs with active participation of JFMC conduct PRA exercises and develop microplans for the socioeconomic 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 leastquarterly.
- iii) NTFPs to be collected and sustainably harvested from forest fringe areas under the JFMC and shall be sold by the concernedJFMC.
- iv) Continuous efforts should be made to create and sustain the JFMC movement by creating required awareness among the people and the staff through trainingprogrammes.
- 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 becultivated.
- vi) JFMC areas to practice minimum tillage, organicformulations.
- 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 microplans.
- viii) System of rice intensification ensures higher productivity with optimum utilizing the resources, may be promoted in JFMC cultivated paddy fields to increaseproductivity.
- ix) Establishment of biogas plant as an entry point activity based on themicroplans.
- x) JFMC plantation assistance will be released as per the standard government norms, funder norms based on the survival of theplants.
- 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 followedstrictly.
- 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 landresources.
- xiv) JFMC members may be consulted in choosing the species to be planted, keeping due regard to the biodiversity of the area and silviculturalsuitability.
- 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 thisprocess.

- 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.

4.9 Proposed additional activities under JFMC Working Circle:

1. JFMC plantation: Large scale plantations mainly with fruit bearing species such as Kathal, Outenga, Kordoi, Jamun, Jalphai, Silikha, Bhomora, Amlakhi, Guava, Thekera, Moringa (Sajina) and medicinal plants mainly Bhatghila, Hoguni Lata, Sarpagandha, Arjun, Neem, Amora, Monishal will be planted. Fruits will be collected by the members of Joint Forest Management Committees. For collection of Simul, simul cotton will be planted. Medium sized factories may be

established to process/preserve various juices, (Aloe vera, Jack fruit, Orange, Jamun, Amlakhi, Lemon etc), pulp, oil, powders (Elephant apple, Trifolia) etc. Marketing will be done by the JFMC in order to collect revenue which will generate large scale employment. *Vatica lanceaefolia* (locally called Morhal) whose flowers are highly aromatic and which is a 'Globally Critically Endangered plant', will be planted. Kukuramora RF is famous for natural regeneration of Morhal. This species during the flowering time (Monsoon) will provide substantial support to Apiculture. Hence, large scale plantation of Morhal will be carried out in the RFs by the JFMCs. An industry can be established to process Morhal flowers for extraction and packaging of its aroma. Moreover, Sericulture plants such as Keseru, Nuni, Som, Mesangkori, Era will be planted to encourage the traditional culture in the villages. Borhomthuri plants to be planted which can be marketed as 'Cosmetics'. Similarly, Sindur planting (Fruiting time early Monsoon) can be done to extract Vermilion. This will also earn a substantial amount of revenue. At present, there are 29 JFMCs, out of which 10 are new. A provision has been kept to constitute one more JFMC if the situation demands. The Micro Plans will be prepared in the Second Year (2017-18) and an amount of Rs. 1.50 Lakh is earmarked for PRA and writing the individual Micro Plans. A total of Rs.45.00 has been earmarked for the said item of works. Each JFMC is expected to be funded with at least Rs.25.00 Lakh. Timber yielding species such as Titachap, Sam, Azar, Urium, Nahor, and fast growing trees like Kadam, Simul will be planted. Simul cotton will be collected by the JFM members to earn their livelihood. The plantations will be carried out @10 Hectares per JFMC per year. Thus 300 Hectares plantation will be carried out by the 30 JFMCs in a year. Out of 10 Hectares, every JFMC will dedicate at least 1 Hectare area for development of Bamboo/Cane/Patidoi. Workshop will be arranged to impart the required training to craftsmen. Jati and Bholuka Bamboo will be mainly planted.

2. Planting will be done with locally available species as per approved Micro Plan and Shelterwood System will be followed.
3. Seedlings will be raised in the Root Trainer Nurseries and Vermi Compost will be produced which will be maintained throughout the Plan period. 12 Lakh seedlings will be raised by the 30 nos of JFMC @4.00 Lakh seedlings per Nursery. This will be followed by creation of Plantation of fruits, MAP and small timber. 300 Ha plantations will be created by the 30 JFMCs @10 Ha per JFMC. A total of 2700 Ha area will be planted during the Plan period. Similarly, High Tech Nursery for cultivation of Medicinal Plants has been proposed at two locations.
4. 20 Ha of NTFP plantations were raised during 2013-14 (AWP 2012-13) in the Sadiya Range and 390 Ha were raised departmentally during 2014-15 (AWP 2013-14) under APFBC Scheme in Doomdooma Range (70 Ha), Kakopathar Range (100 Ha), Saikhowa Range (100 Ha), Khatangpani Range (80 Ha) and Sadiya Range (40 Ha). Species planted were Hilikha, Bhomora, Amlakhi, Simul, Jalphai, Monishal
5. Similarly, 500 Ha of Fuel wood plantations were carried out during 2015-16 in different locations as below:
 - (i) Dikrong JFMC, Sadiya Range 50 Ha,
 - (ii) Naharbarie JFMC, Sadiya Range 50 Ha,

- (iii) Lakhimijan JFMC, Sadiya Range 50 Ha,
- (iv) Luit Eco Tourism and Cultural Hub JFMC 50 Ha,
- (v) Udit Suruj JFMC, Kakopathar Range 50 Ha, Uvota Centre
- (vi) Kachijan JFMC, Kakopathar Range 50 Ha,
- (vii) Namholong JFMC, Kakopathar Range 50 Ha,
- (viii) Kakojan JFMC, Doomdooma Range 50 Ha,
- (ix) Koriajan JFMC, Khatangpani Range 50 Ha,
- (x) Nabudoy JFMC, Khatangpani Range 50 Ha.

6. It is seen from the above list though a total of 410 Ha area was brought under NTFP since 2013-14, the plants are in different stages of growth and are partially mature to yield fruits. Generally, the trees start fruiting from the 6/7 th year of planting (Seedling origin). The Non Timber Forest Produces are ready for harvesting from 20% of the designated areas (82 Ha) in the fringes of RFs. It is expected that they will prepare 'Trifola' by grinding and mixing the fruits of Silikha, Bhomora, Amlakhi which have very high medicinal value and demand in the market. The product will be certified as per Rule and branded as a product of Doomdooma FDA. Marketing will be done by inviting tenders (Also E-Tender). The financial transaction will be cashless and the Income Tax will be calculated and deposited as per Rule. The relevant Rules under the Assam Financial Rules will be followed strictly. Similarly, every attempt will be made for Value-addition by collecting and selling Simul cotton and Monishal seeds. Hair shampoo will be prepared from the Monishal seeds and will be marketed after processing and packaging. Half of the revenue earned by the JFMC will be utilized for raising new plantations. The balance amount will be distributed among the members of the JFMC under the Chairmanship of the CEO of the Doomdooma FDA cum DFO. All the plantations (Annually 300 Ha by the Doomdooma FDA) will be planned accordingly in the Micro Plan and will be executed for the welfare of the local people. A temporary Accountant and an Assistant Accountant (Preferably retired person) will be engaged on monthly basis for smooth functioning of the FDA.

A) Harvesting regime of Firewood: Similarly, the Fuel wood raised by the JFMCs (Total 500 ha) will be ready for felling after 2 (2021-22) years. The same may be harvested @ 20% per year in a sustainable manner and felled area reforested by JFMC from the revenue collected by selling firewood from remaining 400 firewood trees to be felled as below and balance amount to be divided among the JFMC members.

Year	Harvesting of firewood @20% per year out of 500 Ha created by 10 JFMC during 2015-16 @50 Ha per JFMC. Felling cycle: 5 Years	Market value to be Collected by the JFMCs of Doomdooma Dvsn	Remarks
2021-22	100 Ha to be felled and reforested	Considering 1.00 Lakh trees surviving Per 100 Ha. = 300-350 lakh per year	Proportunate distribution of usufructs among the JFMCs. 50% net revenue to be reinvested in reforestation on a sustainable basis.
2022-23	100 Ha to be felled and reforested		
2023-24	100 Ha to be felled and reforested		
2024-25	100 Ha to be felled and reforested		
2025-26	100 Ha to be felled and reforested		

7. Developing medicinal plants saplings and their plantations in homesteads.
8. During 2015-16, 500 Ha Fuel wood plantation carried out by 10 JFMCs now ready for harvesting. Harvesting recommended @100 Ha per year from 6/7 th year- (20% of 500 Ha) on a sustainable basis = 100 Ha X 2500 trees per Ha=2.5 Lakh trees.
9. **Meeting the demand of small timber:** The local people collect small timber from the dead, dying trees, and also illegally by felling green trees - but such collection is very negligible. The evergrowing demand will be formally met from the plantations which will be raised by the JFMC members during the Plan period.

4.10 Additional Prescriptions under JFMC Working Circle:

- Forest department staffs with active participation of JFMC conduct PRA exercises and develop microplans for the socioeconomic upliftment and livelihoods development of the local people. These microplans need to be submitted to DFO for assessing their technical feasibility for final approval as per the available government schemes and any other funders norms. Before implementing the project, Government orders and any relevant amendments are to be strictly followed.
- There should be monthly review meeting of the JFMCs under the Chairmanship of JFMC presidents. Range Forest Officer should attend meeting at least quarterly.
- NTFPs to be sustainably harvested from forest fringe areas under the JFMC and are to be sold by the concerned JFMC.
- Continuous efforts should be made to create and sustain the JFMC movement by creating required awareness among local people and the staff through training programmes.
- 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.
- JFMC areas to practice minimum tillage, organic formulations.
- Formation of Forest/ Protection Regeneration Committee, Entry point activities, infrastructural development, welfare programmes with special reference to woman folk and girl child, JFM plantation and nurseries etc. are proposed in the Budget and most of them will be maintained during and beyond the Plan period.

4.11 Other activities to be involved under this Working Circle

(a) Formation of FOREST PROTECTION AND REGENERATION COMMITTEE

The Forest Protection and Regeneration Committee (FPRC) will be formed under every JFMC by involving at least 20 (Twenty) young and energetic local people. The FPRC will be renewed as per procedure laid down in the Assam Joint (People's Participation) Forestry Management Rules, 1998. The said Committee will be responsible for regeneration (Creation of Nursery and Plantation) and protection of the forests and wildlife in the vicinity. They will further assist the Forest Department in preventing trespass in to the Reserve Forests/ Protected Area and take effective action against encroachment. Under the said Assam Joint (People's Participation) Forestry Management Rules, 1998, the members of the **FPRC** area authorized to prevent poaching of wild animals, smuggling and

even to make effective arrests of such wrongdoers. In one sense, the FPRC will be mobilized in such a way that they become the '**Green Brigade**' or the '**Seuj Sainik**' of the Doomdooma Division. It will be necessary to impart training to the Green Brigade centrally and the modus operandi will be laid down in the Micro Plan. A total of 600 (20 member's X 30 FPRC) thoroughly motivated and inspired youth under the Brigade with another 260 members (From 13 EDCs) will be readily available to regenerate and protect the forests and the wildlife. Thus the 'Green Brigade' will assist the Forest Staff in protecting the forest and wildlife, in preventing smuggling of forest produce, in mitigating man-animal conflict, in rescue of wildlife and in rehabilitation, etc. The members of the Green Brigade will not be paid any salary but will be allowed to draw a monthly allowance @Rs. 4,000/- per Member and retain the following:

- Income from 'Intercropping with medicinal plants practiced inside the Reserve Forests'- 10 Hectare area under every JFMC,
- Income by marketing/value addition from NTFP,
- Income from the Cultural Hub cum Restaurant serving Ethnic Cuisine

Besides, following measures will be adopted by the JFMCs in order to achieve sustainable maintainance

- Establishment of biogas plant as an entry point activity based on the microplans.
- JFMC plantation assistance will be released as per the standard government norms, funder norms based on the survival of the plants.
- 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.
- 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.
- 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.
- JFMC members may be consulted in choosing the species to be planted, keeping due regard to the biodiversity of the area and silvicultural suitability.
- 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.
- 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.

- Soil and land development works may be undertaken in forest areas. Water harvesting structures may be constructed for soil and water conservation and fisheries.
- 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.
- Whereas, demand of planting trees on private land is increasing, the JFMC members may be allowed Social Forestry benefits on their individual land.
- 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.
- 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.
- The JFMC members should have a meeting place. A community hall may be constructed for use of the JFMC members.
- 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 inconformity with National Forest Policy and Forest Conservation Act.
- 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 super ceded the Working Plan of that area to that extent.

- **Income generating activities under JFMCs:**

Development of Apiculture: 100 number of Honey Bee boxes with the Bees and the Queen will be procured at the cost of Rs. 10,000/- per set and interested Bee Keepers will be invited from the 30 JFMCs. The required 'Basic Training' will be imparted within the said amount. Another 400 number of Boxes will be supplied to the beneficiaries in the next four years. Floriculture will be practiced at 10 locations with Sun flower, Mustard, Morhal, Rajanigandha, Radhachura, Krishnachura, Chrysanthemum, etc. The processing of honey, packaging etc. will be done in the Small Scale Industry which is proposed separately @Rs. 15.00 Lakh. Edible Oil will be extracted from Sun Flower, Mustard etc. The seeds will be processed in the said small scale industry and will be packaged and marketed accordingly.

CERTIFICATION OF PRODUCT:

(1) The Directorate of Marketing and Inspection, Government of India is a 'Certifying agency' affective since 1937 (amended in 1986) for category of Agricultural products and AGMARK is the certification mark employed on agricultural products in India, assuming that they conform to a set of standards approved by the Directorate of Marketing and Inspection, an Agency of Government of

India. The AGMARK is legally enforced in India by the Agricultural Produce (Grading and Marketing) Act, 1937 and Amended in 1986. The present AGMARK standards cover quality Guidelines for 213 different commodities spanning a variety of pulses, cereals, essential oils, vegetable oils, fruits and vegetables and semi processed products like vermicelli.

(2) The Food Safety and Standards Authority of India is another Government of India Agency under the Ministry of Health and Family Welfare with Head Quarters at New Delhi. The Food Safety and Standards Authority of India (FSSAI) is an autonomous Body and was established under the Food Safety and Standards Act, 2006 which is a consolidating statute related to food safety Regulation in India. The FSSAI is responsible for protecting and promoting public health through the Regulation and supervision of food safety. The Authority has a Regional Office at Guwahati. Standards framed by FSSAI are prescribed under Food Safety and Standards (Food Product Standards and Food Additives) regulation, 2011, Food Safety and Standards (Packaging and Labelling) Regulation, 2011 and Food safety and Standards (Contaminants, Toxins and Residues) regulation, 2011. The FSSAI has prescribed standards for following food products:

- (a) Dairy products and analogous,
- (b) Fats, oils and fat emulsions.
- (c) Fruits and vegetable products,
- (d) Cereal and cereal products,
- (e) Meat and meat products,
- (f) Fish and fish products,
- (g) Sweet and Confectionary
- (h) Sweetening agents including honey,
- (h) Salt, spices, condiments and related products,
- (i) Beverages (other than dairy and fruits and vegetables based)
- (j) Other food products and ingredients,
- (k) Proprietary food,
- (l) Irradiation/exposure to radiation in microwave of food.

The development of a standard is a dynamic process based on the latest development in food science, food consumption pattern, new food products and additives, changes in the processing technology leading to changed specification, advancements in food analytical methods and identification of new risks or other regulatory options.

xviii) **Development of Community Fishery/Existing Wetland, introduction to Bioflock technology:** It is very important to put an end to the dependency of the local people on the wetlands existing inside the Reserve Forests. Large number of birds (both migratory and resident) forages over these wetlands including the highly endangered White Winged Wood Duck and many of them breed in such wetlands. The wetlands are exposed to 'light to medium grazing pressure', seasonal agriculture, unauthorized fishing, removal of edible fruits/herbs/shrubs and NTFP, etc. It is to be noted that the period from February/March to May/June is the pairing and breeding time of the endangered White Winged Wood Duck and such man induced disturbance is very harmful to the very existence of the bird. Removal of the nesting tree and other timber yielding species has very seriously depleted the Wood Duck population. Occasional poisoning is disastrous to all living forms. Gradual conversion of these wetlands to agriculture field coupled with population explosion of human and their cattle has

resulted in very serious shrinkage of the quality wetlands leading to loss of bio diversity at a serious pace. Therefore, provision has been made to develop the existing wetlands inside the forests after stopping all the prevailing nuisance and to provide alternative ways to the local people by creating 'Community Fishery' in a most scientific way. Rs. 10.00 Lakh has been proposed to develop every existing wetland and to create new Community Fishery. Such programmes will be taken up in five places from Second year to the fifth year and a total of Rs. 200.00 Lakh has been earmarked for the said programme. The recently developed Bioflock technology of fishery may be adopted at convenient places.

xix) Development of community centres:

Community Centres in every JFMC have been proposed where regular Workshops on Satriya, Bihu Dance and other cultural programmes will be organised. The village level meetings/discussions also can be hold in these Community Centres.

xx) Public health:

Safe drinking water, (Including Irrigation) Deep Bore well with Solar Pump for lifting water, water filter, Rain water harvesting, procurement of Ambulance with life saving facilities, free medicine, health check up and family planning are proposed.

xxi) Games and sports:

Development of play ground, supply of sports goods and Annual Sport meet is proposed to develop sports in the area.

xxii) Awareness and motivation:

Regular (Weekly) awareness and Motivation camps including materials for publicity review meeting will be hold covering all 30 JFMCs.

xxiii) Education:

Repairing of Educational Institutes, supply of Books to Library and subscription to Magazines and News Paper are proposed in this Working Circle.

xxiv) Recognition and accolades:

Award to the best JFMC/EDC and to 5 best Lady JFMC workers is proposed.

4.12 The concept of Eco Development Committees:

They are the committees formed around a Sanctuary or a National Park to help the PA Manager in management of wildlife and tourism. In short, they are termed as EDC. The committees function like that of a JFMC and is governed by the Rules as laid down in the Assam Joint (Peoples' Participation) Forestry Management Rules, 1998. In the Indian context, the development of a PA is not possible due to human dominated landscape in and around them. Adopting a participatory management strategy of PA, EDC aims at conserving the bio diversity by addressing both the impact of local people on the PA and the impact of the PA on the local people. In response to the changed paradigm of partnership, EDCs emerged around many PAs.

4.12.1 Funding of the Eco Development Committees:

13 (Thirteen) number of EDCs are proposed to carry out Research, Monitoring and Conservation of the endangered species of flora and fauna in Doomdooma Division, and to carry out Eco tourism activities for livelihood generation. Each EDC will be funded with at least 25.00 lakh INR to pursue the above activities. The EDCs will be constituted under the Doomdooma FDA and will be registered in

the Office of the Conservator of Forests, Eastern Assam Circle, Jorhat, under Society's Act and will get its own Micro Plan approved by the Forest Department for necessary funding and execution of works related to conservation of flora and fauna. Each EDC will be made independent in due course of time out of its own income but till then, necessary financial support has to be extended for their sustenance.

4.12.2 Exposure visit and training of the members of EDC:

The EDC and JFMC members will be sent for exposure visits and training on Eco Tourism and to learn different activities of JFMCs, to different places like Sikkim, Darjeeling, Meghalaya, Nagaland, Kaziranga, Gibbon Sanctuary etc. The knowledge, skill and experience which the member of EDCs will gain during their training and exposure visit will be transferred to the field. They will be given freedom to develop their ideas while implementing the programmes in the practically.

Every attempt will be made to improve the performance of the EDC members so that the tourists pay due honour to our tradition and culture, and appreciate our bio diversity and conservation efforts.

Member of EDCs who implement, participate in and market ecotourism activities will adopt the following ecotourism principles:

- a. Minimize physical, social, behavioral, and psychological impacts.
- b. Build environmental and cultural awareness and respect.
- c. Provide positive experiences for both visitors and hosts.
- d. Provide direct financial benefits for conservation.
- e. Generate financial benefits for both local people and private industry.
- f. Deliver memorable interpretative experiences to visitors that help raise sensitivity to host countries' political, environmental, and social milieu.
- g. Design, construct and operate low-impact facilities.
- h. Recognize the rights and spiritual beliefs of the Indigenous People in our community and work in partnership with them to create empowerment.

4.13 Prospect and promotion of Eco Tourism: Ecotourism is a form of tourism involving visiting fragile, pristine, and relatively undisturbed natural areas, intended as a low-impact and often small scale alternative to standard commercial (mass) tourism. Eco tourism is directed towards exotic natural environments, intended to support conservation efforts and observe wildlife which will bring economic benefit to the local people without involving any middle man. This form of tourism is based further on traditional, cultural and ethnic value of the locality. Therefore, Eco Tourism is a form of 'Sustainable Tourism' as these values alongwith natural values are depicted and highlighted to the tourists. Ecotourism provides effective economic incentives for conserving and enhancing bio-cultural diversity and helps protect the natural and cultural heritage of our beautiful planet. Ecotourism is now defined as "responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education".

4.13.2 Aim of Eco Tourism: To increase local capacity building and create employment opportunities, ecotourism is an effective vehicle for empowering local communities around the world to fight against poverty and to achieve sustainable development without harming the environment of the area.

4.13.3 Area and its scope: Eco tourism need to cover the entire Tinsukia District . Eco tourism or nature based tourism is one of the largest in the world. In Eco tourism, the money spent by tourists reach the villagers of remote villages and the local artisans who make different crafts, or local Guides who lead tours. Therefore, most of the benefit goes to the local, native and indigenous people. Eco tourism allows the visitor to develop a much closer understanding and relationship with the places and people that they come to visit. Therefore, Eco tourism activities should be conducted with a greater level of care and attention. Eco tourists are in fact inquisitive tourists who wish to learn more about rare and exotic places through first hand experience and often out of respect for those places. Eco tourism has to be an area over much bigger and wider landscape having assemblage of diverse people, their culture, their food and unique cuisine, scenic beauty, rare flora and fauna etc. Thus the tourists cannot be confined to the Tinsukia District alone but they will be guided to visit remote areas as well.

4.13.4 The special objectives for the management of Eco tourism are mentioned as follows:

1. To promote greater understanding and appreciation of nature over a larger area and landscape,
2. To form local Eco Development Committees (EDC in short) who will lead to conservation of nature and the natural resources.
3. To manage the entire landscape including part of Arunachal Pradesh through responsible tourism.
4. To impart training to the EDC members on Eco Tourism and Landscape Management including exposure visits to the nature, wildlife, historical areas.
5. The educated and unemployed youth will be given top most priority to create self employment and generate livelihood. However, few eminent persons having proficiency on the relevant fields will be enrolled as members for benefit of the EDCs.
6. There will be a number of EDCs (not more than 5 nos) based on special purposes which will have a major thrust to promote Eco Tourism and Landscape Management within their activities. There will be avenues to conserve nature and natural resources and each member of the Committees will be bound to assist in forest protection and regeneration activities. They are the committees formed around a Sanctuary or a National Park to help the PA Manager in management of wildlife and tourism. In short, they are termed as EDC. The committees function like that of a JFMC and is governed by the Rules as laid down in the Assam Joint (Peoples' Participation) Forestry Management Rules, 1998. In Indian context, the development of a PA is not possible due to human dominated landscape in and around them. A participatory management strategy of PA, EDC aims at conserving the bio diversity by addressing both the impact of local people on the PA and the impact of the PA on the local people. In response to the changed paradigm of partnership, EDCs emerged around many PAs.

4.13.5 Location of the Eco Development Committees

The proposed Eco Development Committees and their locations are:

1. The Luit Eco-tourism and Cultural Hub Eco Development Committee (already registered as JFMC) at Zero Point, Dhola,
2. Dibang Valley Eco Development Committee at Amarpur under Sadiya
3. Mahseer Monitoring and Conservation Eco Development Committee at Rupai,

4. Hollogaon-Kukuramora Eco Development Committee at Hollogaon, Sadiya,
 5. Doomdooma-Dangori Eco Development Committee at Dangori,
 6. Wood Duck Monitoring and Conservation Eco Development Committee at Kakopathar,
 7. Florican Monitoring and Conservation Eco Development Committee at North Amarpur,
 8. Gibbon Monitoring and Conservation Eco Development Committee at Kakopathar,
 9. Dolphin Monitoring and Conservation Eco Development Committee at Laopani,
 10. Elephant Monitoring and Conservation Eco Development Committee at Nazirating,
 11. Big Cat Monitoring and Conservation Eco Development Committee at Nazirating,
 12. Vulture Monitoring and Conservation Eco Development Committee at Kakopathar,
 13. Animal Health, Rescue and Rehabilitation Eco Development Committee at Kakopathar/Nazirating.
- These EDCs will be motivated to monitor, conserve, rescue and rehabilitate the wild animals in distress.

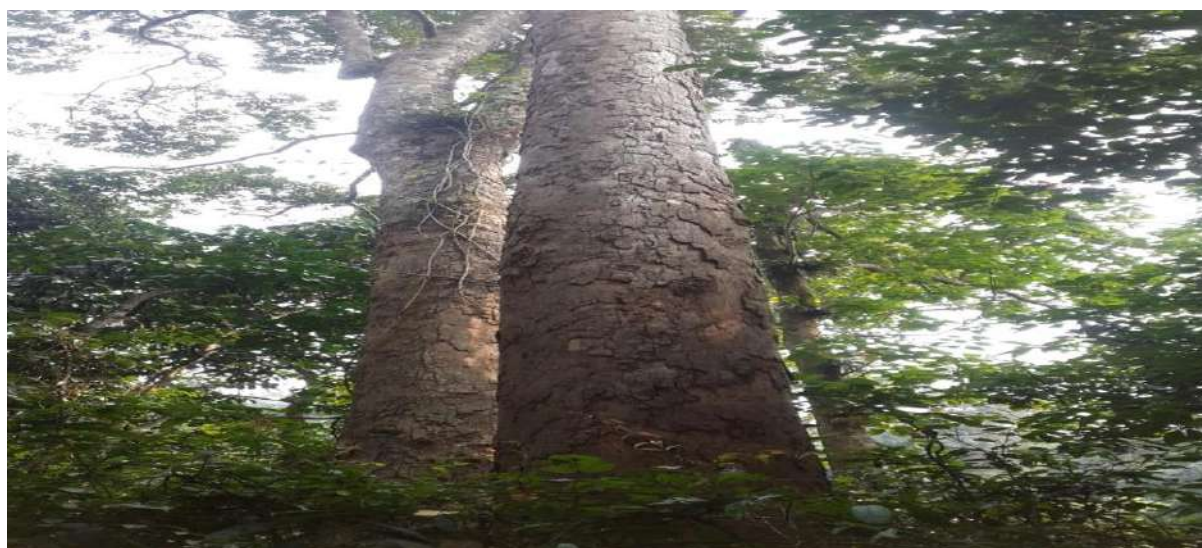
4.13.6 Funding of the Eco Development Committees: 13 (Thirteen) number of EDCs are proposed to carry out Research, Monitoring and Conservation of the endangered species of flora and fauna in Doomdooma Division and to carry out Eco tourism activities to earn their livelihood. Each EDC will be funded with at least 25.00 lakh INR to pursue the above activities. The EDCs will be constituted under the Doomdooma FDA and will be registered in the Office of the Conservator of Forests, Eastern Assam Circle, Jorhat under Society's Act and to get its own Micro Plan approved by the Forest Department for necessary funding and execution of works related to conservation of flora and fauna. Each EDC will be made to be independent in due course of time out of its own income but till then; necessary financial support has to be extended for their sustenance.

4.13.7 Exposure visit and training of the members of EDC: The EDC and JFMC members will be sent for exposure visit and training on Eco Tourism and to learn activities to different places like Sikkim, Darjeeling, Meghalaya, Nagaland, Kaziranga, Gibbon Sanctuary etc. The knowledge, skill and experience which the member of EDCs will gain during their training and exposure visit will be transferred to the field. They will be given freedom to develop their ideas while implementing the programmes in the practical life. Every attempt will be made to improve the performance of the EDC members so that the tourists pay due honour to our tradition and culture and appreciate our bio diversity and conservation efforts. Member of EDCs who implement, participate in and market ecotourism activities will adopt the following ecotourism principles:

- a. Minimize physical, social, behavioral, and psychological impacts.
- b. Build environmental and cultural awareness and respect.
- c. Provide positive experiences for both visitors and hosts.
- d. Provide direct financial benefits for conservation.
- e. Generate financial benefits for both local people and private industry.
- f. Deliver memorable interpretative experiences to visitors that help raise sensitivity to host countries' political, environmental, and social climates.
- g. Design, construct and operate low-impact facilities.
- h. Recognize the rights and spiritual beliefs of the Indigenous People in our community and work in partnership with them to create empowerment.

Year-wise plantation to be done in JFMC areas

Name of Range	SI No	Name of JFMCs	Name of RF	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Sadiya	1	Deopani	Deopani	10	10	10	10	10	10	10	10	10	10
	2	Lakhimipathar	Deopani	10	10	10	10	10	10	10	10	10	10
Saikhowa	3	Hakhati	Hakhati	10	10	10	10	10	10	10	10	10	10
	4	Mesaki	Mesaki	10	10	10	10	10	10	10	10	10	10
	5	Kumsong	Kumsong	10	10	10	10	10	10	10	10	10	10
	6	Dirak F.V.	Kumsang	10	10	10	10	10	10	10	10	10	10
	7	North Mesaki	Mesaki	10	10	10	10	10	10	10	10	10	10
Kakopathar	8	Doomdooma	Dum Duma	10	10	10	10	10	10	10	10	10	10
	9	Dangori	Dangori	10	10	10	10	10	10	10	10	10	10
	10	Rongpur	Dum Duma	10	10	10	10	10	10	10	10	10	10
	11	Litong	Dum Duma	10	10	10	10	10	10	10	10	10	10
Doomdooma	12	Kakojan(NZT)	Kakojan	10	10	10	10	10	10	10	10	10	10
	13	Kakojan(Duar)	Kakojan	10	10	10	10	10	10	10	10	10	10
	14	Phillobari	Phillobari	10	10	10	10	10	10	10	10	10	10
	15	Tokawani	Tokawani	10	10	10	10	10	10	10	10	10	10
	16	Noloni	Noloni	10	10	10	10	10	10	10	10	10	10
Khatangpani	17	Buridehing	Buridehing	10	10	10	10	10	10	10	10	10	10
	18	Tarani	Tarani	10	10	10	10	10	10	10	10	10	10
	19	Mihaliritu	Buridehing	10	10	10	10	10	10	10	10	10	10
Kakopathar	20	Udito Suraj	Dangori	10	10	10	10	10	10	10	10	10	10
	21	Kachijan	Dum Duma	10	10	10	10	10	10	10	10	10	10
	22	Namhollong	Dum Duma	10	10	10	10	10	10	10	10	10	10
Doomdooma	23	Kakojan	Kakojan	10	10	10	10	10	10	10	10	10	10
Saikhowa	24	Luit Eco-Tourism & Cultural Hub	Mesaki & Hakhati	10	10	10	10	10	10	10	10	10	10
Sadiya	25	Dikrang	Sadiya Stn-1	10	10	10	10	10	10	10	10	10	10
	26	Lakhimijan	Deopani	10	10	10	10	10	10	10	10	10	10
	27	Nahorbari	Sadiya Stn-2	10	10	10	10	10	10	10	10	10	10
Khatangpani	28	Kariajan Gaon	Buridehing	10	10	10	10	10	10	10	10	10	10
	29	Nabudoy	Torani	10	10	10	10	10	10	10	10	10	10
				290	290	290	290	290	290	290	290	290	290



Mekai -*Shorea assamica*

Grows on higher elevation(note the characteristic bark)

-SSS-

CHAPTER 5

Non Timber Forest Produce (Overlapping) and Bamboo 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 Plate 5.1.

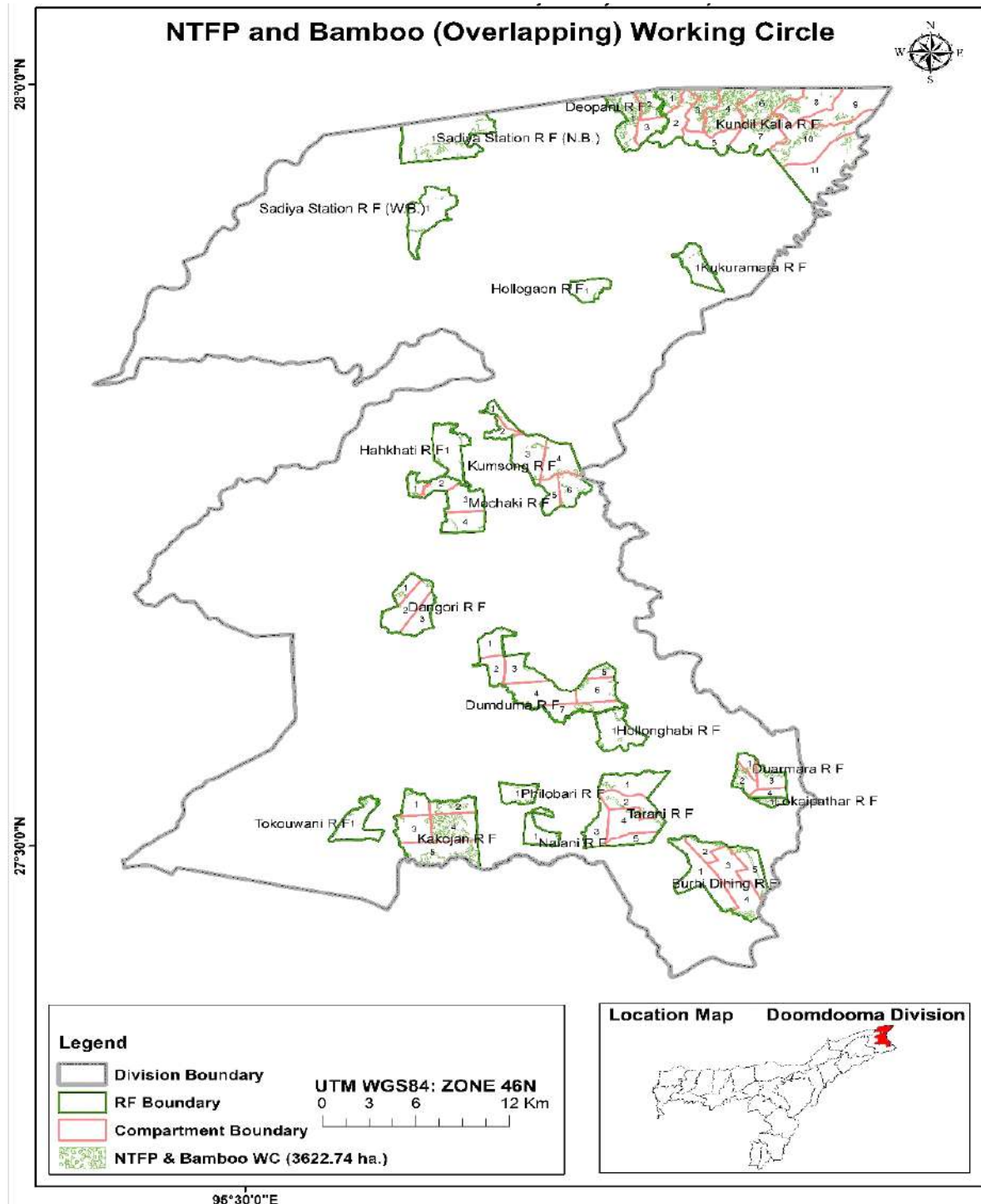


Figure 5.1: NTFP and Bamboo (overlapping) working circle map

5.2 General constituents of the Working Circle: The NTFP Working Circle shall comprise largely of fringe forest areas or similar areas which are fit for extraction of a particular NTFP and bamboo containing areas at a sustainable rate. This further does not lead to the long term decline of the biological diversity and helps 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 and Bamboos 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 Objectives of the Working Circle: The broad objective of this Working Circle is to improve the stocks of the forest of this Division by regeneration and plantation. Specific objectives are given below:

- Sustained use of forests through sustainable collection, harvesting of NTFP and Bamboo adopting sound silvicultural principles.
- To involve the local communities living in and around forest areas, in the management of resources.
- To motivate and train the forest dependent communities in protection, improvement, harvesting and disposal of NTFPs and Bamboos including non-destructive collection, processing value addition and marketing of products.
- To increase the extent of minor forest produce plantations and
- To increase the yield of NTFPs and Bamboo by encouraging regeneration and supplementing with artificial regeneration by intensive cultivation.
- To identify and conserve locally available medicinal and aromatic plants and raise endangered/threatened medicinal and aromatic species on a large scale by involving village forest committees and research organisations.

5.4 General condition of vegetation: The areas suitable for planting non-timber broad-leaved species in the fringe of Reserve Forests, Secondary bamboos all over the Division and those which were planted by JFMCs have been allotted to this Working Circle. The forests have Hollong trees, poor and medium stocked miscellaneous forests, parts of encroached areas, and blanks areas. Therefore, part of NTFP plantations created by JFMC (20% of 2700 Ha=540 HA) will be selected for collection of NTFP. Suitable species are to be selected and planted accordingly. For this purpose, 410 Ha area under NTFP which were created during 2013-14 and 2014-15 under APFBC in Five Ranges of Doomdooma Division are also included in this Working Circle. Similarly, the naturally grown Secondary bamboo-403.64 Ha and Bamboos raised by 10 number of JFMCs (520 Ha) during 2006-07 to 2013-14 are also included in this Working Circle.

Due to heavy pressure of encroachment and illegal felling in the past, these well-stocked natural forests have been reduced into poorly stocked forests and large open areas. Rehabilitation of these forests by planting locally suitable quick growing non-timber local species by the JFMCs is a major

objective undertaken in this Working Circle. Non Timber Forest Produces (NTFP) are non-wood, minor and secondary forest produce which are useful substances, materials and commodities obtained from forests that do not require logging of trees. They include nuts, seeds, fruits, flowers, mushrooms, oils, foliage, medicinal plants or parts, fuelwood, spices, forage, lac, resin, saps, bark, leaf, fibre, for eg. cinnamon, ginseng, honey etc. Therefore, NTFP is biological resource found in woodlands except timber.

The Working Circle includes poorly stocked miscellaneous evergreen and semi-evergreen forests and Bamboos of the Division. The R.Fs having sparse tree growth and open blanks, encroached or otherwise degraded areas are also suitable for raising NTFP and Bamboo plantations through this Working Circle. To avoid promotion of monoculture and the slopes where such plantations may result into deterioration of soil etc., natural forests have been excluded from the scope of this Working Circle for preservation of biological diversity. A detailed description regarding the composition of these formations has already been discussed in Part – I of this Working Plan.

The effort of creating NTFP and Bamboo plantation involves people living in forest villages and fringe areas of the Reserve Forests, through Joint Forest Management programme in regeneration and protection of these forests. Restoration of the encroached areas and creation of a forest cover anew is a problem, which needs undivided attention of all concerned. Research on NTFP and Bamboos has focussed on their extraction and marketing for rural income, as an expression of traditional knowledge or as a livelihood option for rural household needs, and, as a key component of ‘Sustainable Forest Management’ and conservation strategies. These biological resources have great value to the locals and communities but were overlooked in the wake of forest management priorities. In recent decades, interests have grown in using NTFPs and Bamboos as alternatives or supplements to forest management practices. Forests can be managed to increase NTFP and Bamboo diversity and potentially economic diversity.

5.5 Blocks & Compartment allotment of Areas for NTFPS

Blocks, compartment and the area to be covered under NTFP in this Working Circle is provided in the table below.

Table 5.5 Area details under the Working Circle of Doomdooma Division, Assam

Range_Name	Name of RF	Compnt	Area (Hect)	NTFP WC (hect)
Sadiya	Deopani	1	571.61	60
Sadiya	Deopani	2	270.56	70
Sadiya	Deopani	3	246.58	-
Sadiya	Hollogaon	1	318.08	15
Sadiya	Sadiya Station	1	807.34	50
Sadiya	Sadiya Station	2	1525.94	80
Sadiya	Kundil Kalia	1	231.43	120
Sadiya	Kundil Kalia	2	481.11	40
Sadiya	Kundil Kalia	3	428.24	140
Sadiya	Kundil Kalia	4	672.37	130
Sadiya	Kundil Kalia	5	389.24	-
Sadiya	Kundil Kalia	6	641.44	140
Sadiya	Kundil Kalia	7	613.03	90
Sadiya	Kundil Kalia	8	617.23	50
Sadiya	Kundil Kalia	9	805.79	30
Sadiya	Kundil Kalia	10	1166.47	40

Sadiya	Kundil Kalia	11	1247.12	100
Sadiya	Kukuramara	1	465.10	20
Saikhowa	Kumsong	1	148.95	20
Saikhowa	Kumsong	2	147.49	10
Saikhowa	Kumsong	3	570.72	50
Saikhowa	Kumsong	4	498.04	60
Saikhowa	Kumsong	5	265.38	-
Saikhowa	Kumsong	6	355.33	40
Saikhowa	Mechaki	1	148.25	10
Saikhowa	Mechaki	2	193.53	-
Saikhowa	Mechaki	3	408.37	-
Saikhowa	Mechaki	4	392.03	20
Saikhowa	Hahkhathi	1	673.54	50
Doomdooma	Hollonghabi	1	647.83	10
Doomdooma	Philobari	1	310.47	60
Doomdooma	Tokouwani	1	541.66	50
Doomdooma	Nalani	1	361.71	50
Doomdooma	Kakojan	1	280.03	20
Doomdooma	Kakojan	2	289.89	80
Doomdooma	Kakojan	3	434.61	10
Doomdooma	Kakojan	4	583.14	60
Doomdooma	Kakojan	5	725.83	120
Khatangpani	Burhi Dihing	1	763.76	20
Khatangpani	Burhi Dihing	2	232.96	30
Khatangpani	Burhi Dihing	3	392.39	-
Khatangpani	Burhi Dihing	4	435.52	40
Khatangpani	Burhi Dihing	5	450.19	90
Khatangpani	Duarmara	1	147.86	-
Khatangpani	Duarmara	2	215.97	40
Khatangpani	Duarmara	3	247.64	50
Khatangpani	Duarmara	4	144.25	-
Khatangpani	Tarani	1	568.78	50
Khatangpani	Tarani	2	401.66	50
Khatangpani	Tarani	3	345.25	-
Khatangpani	Tarani	4	564.72	30
Khatangpani	Tarani	5	216.77	10
Khatangpani	Lokhipathar	1	110.25	30
Kakopathar	Dangori	1	187.82	30
Kakopathar	Dangori	2	536.74	40
Kakopathar	Dangori	3	329.21	10
Kakopathar	Dumduma	1	306.04	30
Kakopathar	Dumduma	2	246.45	-
Kakopathar	Dumduma	3	387.09	20
Kakopathar	Dumduma	4	615.12	-
Kakopathar	Dumduma	5	145.26	20
Kakopathar	Dumduma	6	417.47	40
Kakopathar	Dumduma	7	374.96	40
				2565

5.6 Bamboo cultivation and harvesting: Bamboo has been brought together with NTFP Working Circle will cover Kakojan RF, Nalani RF, Buri Dehing RF, Torani RF, with an aim to provide complete protection by not prescribing any commercial removal of bamboo, which is already declared as a part of the Dehing Patkai Elephant Reserve, in order to improve the elephant habitat in the aforesaid areas. No commercial utilization or removal of bamboos will be prescribed from the Reserve Forests namely Sadiya Station RF (North and West Block), Kundil Kolia RF and Deopani RF under Sadiya Range. Kukuramara RF and Hollogaon RF are excellent habitats of the White Winged Wood Duck

and Eastern Hoolock Gibbons. Harvesting of 2/3 culms per clump may be allowed for benefit the JFMC members. Bamboos occupy the areas where the density of tree stocking is poor. The common species of bamboos found are Kako, Bojal and Dolou. For bamboos, cuttings, rhizome multiplication method should be used to raise qualitative seedlings. In the past, 520 Ha areas were brought under Bamboo plantation created through 10 number of JFMCs. The name of the JFMCs are:

Table 5.6a: Bamboo plantation carried out by JFMCs till 2005-2006.

SI No	Name of the JFMC	Area under NBM (ha)
1	Hahkati	20
2	Mesaki	80
3	Kumsong	80
4	Doomdooma	20
5	Rongpur	50
6	Litong	30
7	Kakojan NZT	50
8	Kakojan Duar	50
9	Philobari	30
10	Nalani	20
11	Buridehing	70

These areas were extended to 520 Ha in the subsequent years is shown in table 5.6b.

Table 5.6b: Bamboo plantation carried out by JFMCs from 2006-2007 to 2013-2014.

Year	RFs	Area in Hectare
2006-2007	Kumsong	80
2007-2008	Mesaki	80
2008-2009	Hakhati	40
2010-2011	Nalani	20
2012-2013	Buridehing	200
2013-2014	Doomdooma	100
	TOTAL	520

The other bamboo bearing areas are Kundil Kolia RF, Deopani RF and Kukuramora RF under Sadiya Range. Bajal bamboo dominates these RFs. But the bamboo clumps are sparsely distributed. Exploitation of bamboos from these RFs will disturb the Eastern Hoolock Gibbon population (except Deopani RF), hence only planting of bamboo is recommended. Wild elephants, though less in number, forage these areas regularly except Kukuramora and Hollogaon RF. The objectives of the Assam Bamboo and Rattan Policy is promotion, protection and preservation of bamboo and rattan. Villagers collect Jengu leaf, Tokoupat, Canes and bamboos including rhizomes, ferns, bhatghila etc., though such collection is illegal. These RFs are to be brought under extensive plantation, particularly of fruit species for the Primates, birds, and distribution of the surplus usufructs as per provision of Assam Joint (People's participation) Forestry Management Rules, 1998. The members of the JFMCs will be allowed to harvest 20% of the matured bamboo from these 520 ha area as per laid down felling procedure but in no case they will be allowed to harvest bamboo from the Secondary Forests (403.64 Ha). The areas under wet Evergreen Forest (Dipterocarpus) and Secondary moist Bamboo brakes of Doomdooma Division are as follows:

Forest Type	Area in hectares
1B/C1 Assam Valley Tropical wet Evergreen Forest (Dipterocarpus)	16454.18
2/2S1 Secondary Moist Bamboo Brakes	403.64

Forest composition and distribution according to the Champion and Seth's classification

Forest type	Code
WET BAMBOO BRAKE	1/1/F3
MOIST BAMBOO BRAKE	1/2/F2

5.6.1: Protection of ecology and environment (as per State Bamboo Policy, 2003): Environment and ecology should be protected and preserved and existing imbalance due to inappropriate land use, over exploitation of natural resources beyond carrying capacity shall be checked and prevented. Bamboo forests shall be afforded protection to ensure environmental security (protection of catchment, regulation of water flow, recharge of water table, conservation of flora and fauna, and protection of development infrastructure). All variety of native bamboo species, ecotypes should be protected and germplasm preserved. Efforts shall be made to conserve germplasm in in-situ and ex-situ. Bamboo in notified forests shall be managed as per approved Management Plan keeping in view sustainable forest management principles.

5.6.2 Bamboo species: Secondary Bamboos occupy the areas where the density of tree and stocking is poor. The common species of the bamboos found are Kako, Bojal and *Neohouzeana dulooa*(Dolou). Sometimes, there occurs a third storey in the high forests occupied by *Dendracalamus hemiltonii*-(Kako), *Bamboosa pallida* (Bajal, Hill jati), *Livingstonia jenkinsonii*, *Melocana baccifera*(Muli) etc.

5.6.3 Silviculture of Bamboo: The local practice of harvesting of bamboo is selection of the best 2/3 culm(s) per clump followed by cleaning and tending. Clump is the unit of management. The matured culms will be extracted by selection. The main objection is to extract the mature culms without effecting the vigor of the clump and to sustain the productivity. It is preferred that no large trees are present except those that come outside the planting area. If trees are to be retained, it would be a good idea to leave an area adjacent to the canopy around it free of bamboo. Once the land is prepared for plantation after leveling and weeding, the next step is to align and place stakes to mark spots for taking the pits. Depending on the spacing chosen and modifications made to avoid large trees and earth formations if any, wooden or bamboo stakes are driven into the ground to mark the centre of the square or round pits (in case augers are used). This will help avoid mis-alignment of pits when unskilled labour or machinery is used for pitting, particularly when planting is to be done along contours on undulating sites in hilly areas. A North–South orientation is ideal for aligning the rows to get the best benefit of sunlight. Larger pits of 60cm X60cm X60 cm or even larger (1m x 1m x 1m) can be considered. Bigger pits will also benefit the larger bamboo species in establishing well. In lowlying areas as system of bunds can be considered. A trench is dug and the soil used to make a bund of about 1m width and 0.5 m height along the length of the plot. The spacing between the trenches depends on the species (see below). In smaller plantations and in homesteads pits can be dug manually. For larger areas this activity can be efficiently done with hand operated or tractor mounted powered augers or small earth movers, if found economical in the locality. Large trenches is an option, it facilitates the use of large earth movers and does away with the need for individual pits. Choice of Species should be based on availability of the following species or planting material. Following species of Bamboo is available in entire state of Assam.

5.6.4 Bamboo cultivation: The bamboo plantations efforts are constrained due to non – availability of planting stock or the seeds as most of the economically important bamboo species shows considerably long seeding cycles viz. 30-60 years. Seedling production is the simplest and cheapest method of producing planting stock. Vegetatively bamboo can be propagated through rhizomes, offsets, layering, culm cutting, branch cutting etc.

(A) Offset planting: An offset is the basal portion of a single culm with the rhizome axis and roots attached to it. For offset planting, preferably one to two year old culms from the peripheral portion of a clump are cut in a slanting manner in such a way that two nodes are left at the base. The major limitation of this method is that the offsets are bulky and extraction and transportation are labour intensive and hence the method is not feasible for raising large scale plantations.

(B) Rhizome cuttings: Rhizome cuttings are sections of fresh living rhizomes with at least a bud of the preceding year along with a portion of the culm (about 15 to 30 cm long). If transportation is involved the rhizome s should be protected from drying as in offset. This technique is mainly suitable for monopodial bamboos with runner type of rhizome.

5.6.5 Felling series: Three felling series have been proposed. This will cover all the bamboo plantations carried out in JFMC areas from 2005-2006 to 2013-2014.

- Old Bamboo Plantation (Existing) Felling Series 1
- Old Bamboo Plantation (Existing) Felling Series 2
- New Bamboo Plantation (Proposed) Felling Series 3

Table 5.6.5a: Statement showing Old Bamboo Plantation (Existing) Felling Series 1 and felling cycle.

Sl No	JFMC name	Yr of creation	Area (ha)	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025	Length of felling cycle
1	Hahkati	2005-2006	20	4	4	4	4	4	5 years.
2	Mesaki	2005-2006	80	32	32	32	32	32	
3	Kumsong	2005-2006	80	32	32	32	32	32	
4	Doomdooma	2005-2006	20	4	4	4	4	4	
5	Rongpur	2005-2006	50	20	20	20	20	20	
6	Litong	2005-2006	30	12	12	12	12	12	
7	Kakojan NZT	2005-2006	50	20	20	20	20	20	
8	Kakojan Duar	2005-2006	50	20	20	20	20	20	
9	Philobari	2005-2006	30	12	12	12	12	12	
10	Nalani	2005-2006	20	4	4	4	4	4	
11	Buridehing	2005-2006	70	14	14	14	14	14	

Table 5.6.5b: Statement showing Old Bamboo Plantation (Existing) Felling Series 2 and felling cycle.

S.No	RFs	Yr of creation	Area (ha)	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025	Length of felling cycle
1	Kumsong	2006-2007	80	32	32	32	32	32	5 years.
2	Mesaki	2007-2008	80	32	32	32	32	32	
3	Hahkati	2008-2009	40	16	16	16	16	16	
4	Nalani	2010-2011	20	4	4	4	4	4	
5	Buridehing	2012-2013	200	80	80	80	80	80	
6	Doomdooma	2013-2014	100	40	40	40	40	40	

Best performing JFMC will be selected for additional allotment of area for bamboo plantation for the below mentioned creation of bamboo plantation. In case of the new bamboo plantations to be carried

out during 2020-2021, the rotation is fixed after 5 years i.e. the crops will be ready to be harvested during 2025-2026. Only 20% of the matured bamboo will be harvested annually. The rhizomes that be left out for new bamboo shoots to sprout.

Table 5.6.5c: Statement showing New Bamboo Plantation (Proposed) Felling Series 3 and felling cycle.

Sl No	Yr of creation	Area (ha)	2025-26	2026-27	2027-28	2028-29	2029-30	Length of felling cycle
1	2020-2021	50	10	10	10	10	10	5 years.
2	2021-2022	60	12	12	12	12	12	
3	2022-2023	60	12	12	12	12	12	
4	2023-2024	50	10	10	10	10	10	
5	2024-2025	50	10	10	10	10	10	
6	2025-2026	50	10	10	10	10	10	
7	2026-2027	50	10	10	10	10	10	
8	2027-2028	50	10	10	10	10	10	
9	2028-2029	50	10	10	10	10	10	
10	2029-2030	50	10	10	10	10	10	

5.6.7 Year wise allotted area for Bamboo Plantation: Total 520 Ha of Bamboo plantation is envisaged and creation of plantation would start from 2020-2025 and followed by harvesting of Bamboo from 5th Year onwards. Harvesting of the earlier bamboo plantations raised by JFMC will start from 2020-2021. Annually on a sustainable basis 20% of the plantation area i.e. 104 Ha. will be harvested by JFMC members. 10% of the harvested bamboo will be used for meeting their households demands and 85% of the bamboo harvested will be sold in the market @Rs.130-150 per bamboo (Bholuka, Jati). The remaining 5% of the harvested bamboo will be used for making handicrafts by the trained craftsman. The details of year wise area allotted for Bamboo Plantation is as given in Table 5.6.7.

Table 5.6.7: Year wise allotted area for Plantation of Bamboo

Working Circle	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
Bamboo plantation	50	60	60	50	50	50	50	50	50	50

5.6.8 Fire Protection: Fires cause extensive damage to the new shoots of bamboos and, therefore, these areas will be completely protected from fire.

5.6.9 Grazing Control: These areas should be protected from grazing especially after flowering and in the rainy seasons in which the recruitment of new culms will takes place.

Norms proposed for implementation of 1Ha of bamboo plantation (wage rate @ Rs250/-) with an 10* increase in wage rate anticipated every year.

S.No	Patern of Works	No.of Units	Labour	Amount (Rs) per Hect
A. Advance works				
1	Site clearance & planting	30		7500
2	Fencing (LS)	LS		25000
3	Planting materials- 625 Rhizomes/Ha @ Rs. 20/Rhizome			12500
B. Creation (First year)				
1	Planting	49		12250
2	First rain weeding			
3	2nd rain weeding			
4	3rd weeding			

5	4th weeding		
Sub Total			57250
C. First Year			
1	First weeding	18	4500
2	2nd weeding		
3	3rd weeding		
4	4th weeding		
5	Fire watching etc.		
D. Second Year			
1	First weeding	18	4500
2	2nd weeding		
3	3rd weeding		
4	4th weeding		
5	Fire watching etc.		
D. Third Year			
1	First weeding	18	4500
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

5.6.10 Felling rules of Bamboo:

The following rules are prescribed for felling of bamboos-

- No felling of bamboos are allowed during monsoon as this is the period of formation of new culms.
- No clump is considered matured for exploitation unless it contains more than eight matured culms (more than one season old).
- In a matured clump, the following types of culms are to be retained-
 - (a) All current season culms i.e. less than one year
 - (b) From the rest, equal the number of current season culms or eight whichever is more.
 - (c) The remaining culms are considered available for exploitation.
 - (d) The older and deteriorating culms to be cut and removed first.
 - (e) In flowering clumps, cutting should be deferred till flowering is completed.
 - (f) The following are strictly prohibited:
 - (i) Digging of rhizomes,
 - (ii) Cutting of tops of bamboo for fodder, and
 - (iii) Use of tender bamboo.

5.6.11 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. Climbercutting, thinning etc, should be done at regular intervals to have better yield.

CHAPTER 6

WILDLIFE PROTECTION (OVERLAPPING) WORKING CIRCLE

6.1 Name of the Working Circle: Wildlife Protection (Overlapping) Working Circle. This Working Circle shall comprise entire 35,154.75 hect. area of the Division.

6.2 General constituents of the Working Circle: This circle is proposed as Overlapping Working Circle as the animals stray and traverse into many compartments/ranges of Doomdooma Division. The Doomdooma Division is bordering with Dibang Sanctuary (area 4,149.00 sq.km) and Mouling National Park of Arunachal Pradesh (Dibang Biosphere Reserve declared by UNESCO during 1988) lying to the North while the Dibru Saikhowa National Park to the west. Similarly, the Changlang District (Mishmi Hills-known for diverse avian species and butterflies) of Arunachal Pradesh is lying to the East and very rich wildlife areas of Digboi Division to the South. Herds of wild Elephant do migrate in between Dibru Saikhowa National Park and Dibang Sanctuary through the Dibang Valley Proposed Reserve Forests (Amarpur area of Sadiya Sub Division) and travel to Tengapani River bordering of Arunachal Pradesh. This PRF is a very important habitat of the highly endangered Bengal Florican. Other wildlife is Barking Deer, Wild Boar, Wild Buffalo etc. Habitat improvement for elephant is to be particularly taken care by developing salt lick and water bodies etc of in this Overlapping Working Circle with restocking by fodder species in the corridor and adjoining areas, carefully avoiding the fringe villages so as to guide the elephant movement into the RF areas.

6.2.1 General Characteristics: This Working Circle strives to conserve and protect the wildlife straying out of its adjoining wildlife hotspots to improve the habitat, strengthen/protect the wildlife corridors and reduce man animal conflict with trained staff and improved measures like Solar fencing, elephant proof trenches etc. The human-elephant conflict is more during the paddy harvesting in the winter months, when the elephant herds enter/raid the villages. To prevent the entry of elephants, forewarning system is established by villagers by employing local young who watch elephant movement from the tree huts / watch towers and alarm/forewarns the local villagers of the elephant herd's entry or movement. After entry (or) to avoid entry crackers are busted by the local villagers/squad personnel/frontline staff and blank fire using DBBL guns and the recently introduced pump action guns were of good use to drive away the elephants. As the elephant proof trenches, give some additional time to the villagers to get alert or run to safety by delaying/barricading the movement of elephant herd the elephant proof trench seems to be more useful in controlling the human-elephant conflict. As the Doomdooma Divisional areas are in close proximity to the wildlife hotspots, straying of Elephants, Buffalo, Leopards etc. into the Doomdooma Division is more common & these animals frequent the terrain so much that there is always imminent possibilities of human-animal conflict. Due to encroachment the animals stray into the human habitations for raiding on dwelling huts (or) harvestable agricultural crops that sometimes tranquilizing (or) trapping the animal becomes very essential. However, the lack of tranquilizing gun/trained manpower to handle the gun or mix the chemical and prepare the dosage for testing is not available in Doomdooma. In this Plan, proposal has been made for establishing Animal Health, Rescue and Rehabilitation EDC with tranquilizing gun and for stationing trained personnel for handling the chemical & to handle the tranquilizing gun under Saikhowa Range of Doomdooma Division, Doomdooma.

6.3 Objectives of the Working Circle: This proposed Overlapping Working Circle aims to ensure wildlife habitat conservation, improvement and maintenance of corridors for movement of elephants and their protection, formulate management options for reducing man-animal conflict, and conservation and preservation of biodiversity. The specific objectives of this Working Circle are elaborated below.

1. To ensure preservation of the rich bio diversity of the Doomdooma Division through human-induced actions.
2. To take up approved works necessary for protection, conservation and improvement of wildlife habitat ensuring survival of all forms of animals and plants including the endangered, threatened and rare species.
3. To prevent degradation of natural eco-systems and to contribute in 'Arresting climate change' as per Agenda no. 13 and 'Creation of Sanctruay and protection of terrestrial eco-system' as per Agenda 15 of the 'Sustainable Development Goals, 2030' of the United Nations, for the present and future generations. Similarly, to protect the river, the aquatic eco system and bio diversity as per Agenda 14 by creating a Sanctuary in the name of 'Luit Dolphin Sanctuary'. Similarly, to take appropriate action for creation of Doomdooma-Dangori White Winged Wood Duck Sanctuary and Hologaon-Kukuramora, Mirichapori Conservation/Community Reserve.
4. To maintain all forms of eco-systems in and around the Reserve Forests of the Doomdooma Division.
5. To carryout and promote research and documentation of the floral and faunal diversity of the Division for better understanding and management of the wild life and their habitat.
6. To take up adequate publicity measures locally to generate mass public support in conservation of nature and natural resources; to take up collaborative projects with local Educational Institutes, Academic bodies and Research Organizations.
7. Consistent with the above, to conserve soil and water to provide proper habitat for preservation of wildlife.

6.4 General condition of fauna:

6.4.1 Fauna and their habitats: The Doomdooma town is famous as "Chai Nagar", meaning "abode of Tea Gardens" as sprawl of such gardens surround the Division. 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 Mahseer, Rohu, Bahu etc. The Brahmaputra River is an excellent habitat of Gangetic Dolphin (Hihi), a critically endangered mammalian species whose world population is only 2200. There is a great potential to constitute a Sanctuary from the eastern boundary of the Dibru Saikhowa National Park to the Tengapani River (Border of Assam-Arunachal) to secure the survival of this critically endangered mammal. The distance from the Dibru Saikhowa National Park to the inter-state border is about 30 kms and considering 10 km width of the Brahmaputra River, this 250-300 sq. km. stretch of riverine habitat is waiting for such a recognition. Navigation on the Brahmaputra River can be regulated once this stretch is declared as a 'Sanctuary'. Further, sporadic incidences like poisoning,

blasting, electrocution, netting, etc. to catch fish can be legally dealt with. The existing Fish Mahals (leased out by the Revenue Department) can be gradually withdrawn considering the immense value of the River Eco System. The Sadiya-Dhola bridge named after the legendary Dr. Bhupen Hazarika was opened for public use during April, 2017. Boats operated by local people can be used for eco-tourism purposes and overnight stays. This will give a respite to the Dolphin population as soon as the disturbance from such mechanized boats is gradually phased out. As per recent information, the population of Gangetic Dolphin is on the rise. Employment to several hundred people, thus, will be generated who will in turn protect the bio diversity of the area. Motivating the fishing community and otherwise providing engagement to the boatman and their families will be of great help in nature conservation. Navigation (Regulated) itself is a means of surveillance and an item like “Dolphin show” can be introduced which will be of first kind in the State. Across the River Brahmaputra, lies the Hollogaon Reserve Forests. As the name indicates, this is an abode of the Hollou-the Hoolock Gibbon. The area of the Reserve Forests is only 3.71 sq.km. and its adjoining areas (Village) was an excellent habitat of Hoolock Gibbon once from which the name “Hollogaon” was possibly derived (The Assamese name of Hoolock Gibbon is Hollou). But very unfortunately, only 7(Seven) numbers of this endangered species of primates are now surviving in this Reserve Forests. This species is a different one called Eastern Hoolock (*Binopithecus leuconedes*) while the southern population is the Western Hoolock (*Binopithecus hoolock hoolock*). Similarly, the Eastern Hoolock is available in Kukuramora RF (3.65 sq.km) but with 25 Gibbons and with 100 Gibbons in Kundilkalia RF (72.87 sq. km). These habitats are extremely fragmented, hence vulnerable, and possibly these small populations will become locally extinct due to heavy biotic pressure and other reasons such as non-availability of food bearing species, encroachment, felling of trees, cultivation, grazing, poaching, fishing etc. Eventually, this will further lead to the extinction of a distinct species (Eastern Hoolock) from Assam. Thus it becomes our primary duty to bring these RFs under the Wildlife Protection Overlapping Working Circle, declare them as Conservation Reserve and by planting fruit species to link Hollogaon RF and Kukuramora RF through the villages lying in between (Community Reserve). The distance between these two RFs is 7 kms and the Community Reserve as prescribed by the Wildlife (Protection) Act can be created by motivating the local people. Such meetings and survey is already in the field and 'No Objection Certificate' already obtained from Revenue Department and Gram Panchayat.

6.4.2 Dehing Patkai Elephant Reserve:

- The Dehing Patkai Elephant Reserve (Hence forth ER) was notified on 17.04.2003 with an area of 937 sq. km covering Doomdooma, Sivasagar and Tinsukia District of Assam. The Forest Divisions involved are Doomdooma, Digboi, Doomdooma, Sivasagar and Jorhat.
- The ER extends up to Aruanchal Pradesh border. The Reserve Forests of Doomdooma Division that fall under the ER are Kakojan, Tokawani, Nalani, Torani, Philobari, Duarmora and Buridehing. The elephant habitat over these areas is highly fragmented. The isolated Reserve Forests surrounded by tea gardens and paddy fields facilitate movement of the pachyderms.
- The Kakojan Reserve Forests has excellent forests and uninterrupted movement of elephants has been taking place through Buidehing RF and Upper Dehing RF (East Block) of Digboi

Division from centuries. The Kakojan and Upper Dehing (East Block) RFs are already a part of the Dehing Patkai Elephant Reserve.

Illegal felling and cultivation has cropped up gradually in these RFs like Tokawani, Nalani, Torani, Philobari, Duarmora, Buridehing except Kakojan. The RFs need to be reclaimed immediately and adequate protection measures must be provided to the elephants and their habitat. There is a small water body inside the Kakojan RF developed due to excavation of earth for establishing a mining well by Oil India Limited. The elephants are observed enjoying their bath for a considerable period in this water body which is to be enlarged by artificial means for giving a natural look. Presently, the mining well is not under operation.

6.4.3 Threats and challenges to wildlife: The flagship species of the Doomdooma Division is the highly endangered White Winged Wood Duck (*Cairina scutulata*), the State Bird of Assam, both the Western and Eastern Hoolock gibbon (*Binopithecus hoolock hoolock* and *Binopithecus leuconedes*), the only Western Ape found in India. All three are Schedule-I species of 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). The Gibbon population which was about a lakh 40-50 years back in North East region, now reduced to only 5000 in number. This is also the prime habitat of Asiatic Elephant and part of Dehing Patkai Elephant Reserve. During recent estimation carried out in 2017-18 the population of elephants was found to be 200 nos. in Digboi Division and almost all of them visit different Reserve Forests of Doomdooma Division periodically. The elephant population goes up to 100-150 in areas North of Brahmaputra River. Few loners visit the RFs of Sadiya Sub Division from the nearby Dibru Saikhowa National Park.

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 Belied Heron, Lesser Adjutant Stork, Slender Billed Vulture, etc. Moreover, it is a breeding ground of different species of reptiles and invertebrates. The Forests of Doomdooma Division is classified as *Assam Valley Tropical Wet Evergreen Forests, Semi Evergreen and Moist Deciduous Forests*. They provide a safe and secured home to all living forms. The top canopy is formed by *Dipterocarpus retusus* and *Shorea assamica* forests.

Butterflies and moths were found to be the easy victims during oil mining but such mining in Kakojan RF is non operational at this moment. The Mining Contract Areas for mining Minor Minerals outside the RFs are not monitored. The new National Highway (bypass) from Borhapan to Dhola and further to Sadiya and the traffic to and from Arunachal Pradesh will certainly disturb the movement of the wild elephants. The elephants do not cross the Tinsukia-Dhola Railway line and hence not a threat. On the other hand, the Tea Gardens around sometime become the possible threat as elephants have died due to consumption of chemicals stored in the Gardens. Electrocutation case was recorded in nearby Digboi Division and such accident may happen in Doomdooma Division also due to sagging of high voltage wire. Recently, few hoolock gibbons got electrocuted at Barekuri village, (near Makum) as

they are fond of swinging. Poisoning, blasting and electrocution by generator are the major cases of killing dolphins, fishes, reptiles, amphibians, mammals and migratory/resident birds. Navigation in the Brahmaputra River has disturbed the breeding of the endangered Dolphin and this could be regulated once the Luit Dolphin Sanctuary is declared. Navigation by 250 mechanized boats at Dhola considerably polluted the Brahmaputra River and this hazard has been withdrawn now. Encroachment in chapories (river island) is also a major threat to wildlife. These areas are to be brought under JFMC/EDC. Similarly, Govt. approved Fisheries are to be gradually withdrawn once the area is brought under Protected Area category. Burning of grassland for agriculture in Dibang Valley PRF (Amarpur and North of it) up to Arunachal Pradesh border has seriously depleted the habitat of Bengal florican and made the shelters of elephant to disappear. Trampling of the florican habitat and collection of eggs have affected the population of the highly endangered floricans. There is a 'Stagging ground of Common Crane', North of Amarpur bordering Arunachal Pradesh. The Cranes flock in thousands before finally departing to Siberia and this Stagging Ground is to be protected at any cost. Sporadic poaching of wild animals for meat, trapping of birds, accidental poisoning of vultures, felling of nesting trees are recorded. Illegal grazing inside forests also disturbs the wildlife and reduces their fodder. Reduction of food and fodder of elephants has increased the man-elephant conflict. Continuous bank erosion, particularly by River Brahmaputra is a major threat for reducing prime habitats of wild life and production forestry. High flood also sometimes leads to destruction of habitat as well as leads to mortality of wildlife. Illegal/legal/wind fallen trees and Fishing incidences in wetlands inside the RFs have disturbed the White Winged Wood Duck and gibbon population considerably. The Eastern hoolock gibbon in Hollogaon, Kukuramara and Kundil Kolia RFs are very badly affected by unabated encroachment and conversion of forests and wetlands in to agriculture and habitation. This will make the gibbons disappear permanently and will lead to extinction of the Eastern Hoolock from Assam.

6.5 General care should be taken:

1. To avoid any activity that breaks / fragments the continuity of animal corridor.
2. Removal of encroachments and self rehabilitation/ejection is to be carried out in areas which are more prone to animal attack so as to save humanlife and animal.
3. Shrinkage of habitat or habitat degradation is to be avoided by maintaining/planting fodder grasses and tree species which are palatable to animals.
4. While more emphasis needs to be given on endemic flora and the palatable grasses/legumes and the fruit bearing trees species like Ficus, Amlakhi, Jamun, Bogori etc., mono-cropping with non palatable species like Energy plantation is to be avoided near the animal visitation/frequenting areas adjoining the Dibru Saikhowa National Park and the Digboi Division.
5. As water is available all around the year, monitoring the animals for diseases/infection of viral, bacterial, protozoan origin should be done to avoid spread of communicable diseases.
6. Vaccination of cattle near the fringe village of both the Dibru Saikhowa National Park, Digboi Division needs to be done regularly and awareness camp and animal health camps needs to be conducted with the help of Veterinary/WTI doctors regularly.
7. Elephant depredation hot spots need to be identified.
8. JFMC's (or) EDC's needs to be activated and awareness to be given on protection to wildlife.

9. Nabbing of poachers and keeping track of the poacher movement and pursuing of their arrest is very essential.
10. Provision of funds to public for construction of stone wall/solar electric fencing around their agricultural fields will help to reduce the human-animal conflict.
11. For timely release of remuneration for human injury, crop damage and ex-gratia payments to victims of animal depredation, the Range Officers are required to inspect, verify the casualty areas and conduct spot enquiry and submit reports to the higher authority for quick release of the claims, which will reduce the vengeance killing of animals by the affected villagers.
12. Construction of watch towers and posting of staff on 24 hours' duty during most vulnerable periods.
13. The services of members of the JFMCs and EDCs should be utilized in animal conflict mitigation. 20 educated and young members of each such Committees are to be selected and paid to form the Forest Protection and Regeneration Committee and may be conveniently called as the Green Brigade.
14. Care should be taken to prevent livestock grazing, fodder extraction, timber extraction, NTFP collection & establishment of new roads (or) pathways, encroachments/dwelling huts/ new clearing of lands for cultivation which may lead to shrinking of prey base/habitat degradation (or) corridor for augmentation.
15. A detailed elephant track/movement plan needs to be made covering the entire elephant movement area within the Doomdooma Division and specifically covering the conflict boundary areas where elephant proof trenches/solar electric fencing is required to control the elephant from moving rampantly into the human habitation areas.

6.6 Proposed wildlife management prescriptions: The main issues are conflicts with human, illegal felling, encroachment, grazing, and livestock disease.

6.6.1 Illegal felling: Sporadic felling sometimes has been sighted in the Division. 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. Illegal felling to be stopped and persons involved arrested as per the rules. Any felling equipment to be seized according to the rules.

6.6.2 Degradation of wildlife habitat: 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., *Guava* spp., *Artocarpus* spp., *Mangifera* spp., *Tamarindus* spp., *Embllica* spp. *Eugenia* spp., etc. in wildlife area; plantation of fodder species like *Musa* spp. *Bambusa* spp. *Bauhinia* spp., *Andropogon* spp., *Bauhamia* spp., *Cassia* spp., *Croton* spp., *Dioscorea* spp., *Eragrostis* spp., *Eugenia* spp., *Ficus* spp., *Lagerstroemia* spp., *Saccharum* spp. These species are favoured by elephants.
- **Development of Nesting Sites:** Especial emphasis should be given to improve and maintain the characteristic waterbodies. 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. Two dead trees per hectare is to be left out for wildlife habitat.
- No new village or new dweller should be permitted to come out in future in close proximity of such important wildlife habitats.

- **Protection of Fauna:**

The following measures are to be immediately taken up:

- Creation of Conservation Reserve by covering Hollogaon, Kukuramara RF and creation of Community Reserve connecting the Hollogaon, Kukuramara RF and by planting food species of the gibbons is of utmost importance.
- By taking mass awareness programmes and developing eco-tourism in these areas.
- By creating the Luit Sanctuary over Brahmaputra River in between the Dibru-Saikhowa National Park and Arunachal Pradesh (Tengapani area) and also by prompting Arunachal Pradesh authority to declare a part of the Tengapani River as such. Further, the Dibang River also can be included in the Sanctuary for protecting the diverse flora and fauna of the river and along its bank.
- Creation of a Sanctuary by covering few compartments of Doomdooma and the entire Dangori RF to save the few surviving White Winged Wood Duck.

6.6.3 Development of Infrastructure and other paraphernalia : Fixation of boundary, Office, Staff Quarters and Camps, Engagement of Armed Home Guards, Research projects and Fellowship Award in the name of noted Naturalists and Forest Officers, Eco Tourism, Eco Development works in villages, Involvement of local youth in protection and regeneration of forests and wildlife, Generation of livelihood, Elevation of socio condition of local people, Capacity building, Promotion of ethnic culture, Public health, Communication, Development of Veterinary are some of the items proposed in the budget which will be executed during the Plan period. The above activities require lot of pursuanc and support to the Forest Department at the Division level. Hence, a 'Team of Consultants' on payment of Monthly Honorarium is proposed.

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CHAPTER 7

Miscellaneous Regulations

7.1 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 alongwith 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	Control book, name, form, No. page	Reference to Working Plan		Nature of deviation requiring sanction
		Paragraph	Nature of Prescription	

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.

7.2 Construction of Roads/Link roads: As envisaged in Sec-2 of Forest (Conservation) Act, 1980, no construction of roads/link roads passing through the forests except those which are required for

forestry activity including patrolling path etc. shall be allowed without prior approval of MoEF&CC, Government of India.

7.3 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.

7.3.1 Construction of raised Eco friendly Barracks/ Guard Camps: It is proposed to construct twenty number of Raised Eco friendly Barracks/Guard Camp in the Second year so that sufficient number of Armed Home Guards/Forest Guards can be accommodated ensuring protection of the forests and wildlife. There is every possibility that the encroachers might come back after their rehabilitation/ejection from the Reserve Forests. Therefore, strict vigil round the clock is extremely necessary to reinforce the security measures. There will be two types of Guard Camps-temporary in the First year and Permanent in the Second year. Construction of 10 nos Temporary Barracks with Bamboo Tarza-one inch cement plastr on both sides, white washing, Tin roof, bamboo cceiling, Beds/Camp cots etc with Tube well and Running Water from over head tank, water filter, Toilets, and Solar energized electric power, live hedge, barricade are proposed to house the Armed Home Guards and Forest Guards @ Rs. 6.00 Lakh per Temporary Barrack. The Raised Permanent Barracks (20 nos-One in each RF) will be constructed during 2022-23 (Second year) @Rs. 50.00 Lakh per Barrack. At least one such Barrack/Guard Camp will be constructed in each Reserve Forests.

7.3.2 Procurement of vehicles: Procurement of Tractor with Trailer and plow, harrow, truck, excavator, Scorpio, Bolero, Innova car, construction of shed etc are proposed under this head of item. The services of the tractors, trucks will be required for soil working in creating nurseries and plantations. The trailers will be helpful in carrying seeds, seedlings, equipments, cow dung, sand, manure, building materials, movement of Armed Force etc. from place to place. The excavators will be required to create and maintain Wet lands, demolish houses during ejection, maintenance of road network etc.

7.4 Eviction and rehabilitation of encroachers

7.4.1 Status of encroachment: During early sixties, the anthropogenic pressure on the Division in terms of encroachment, illegal felling and illegal firewood collection, illegal grazing started gradually and most of the people settled in the RF areas and some with permanent houses before 1980. Eventually, all PRFs and the Hollonghabi RF went in to the hands of the encroachers. Reserve Forest and Proposed Reserve Forest lands are susceptible to both stray and organized encroachments. A detailed study of the encroachment problem, immediate follow up action and consolidation of the notified boundaries of all Reserve Forests/Proposed Reserve Forests in the Division, is the call of the hour. The present Working Plan of the Doomdooma Division, through sustainable management of tree cover and treatments in the form of regeneration, proposes to control such illegal occupation by rehabilitating the encroachers within the first two years in a humanitarian way. Further, an economic package has been made for every encroacher family in between Rs.1.00 Lakh to Rs. 20.00 Lakh. The total forest area of the Division under encroachment is 13,709.99 Ha (RF + PRF) which is 39.00% of the total RF and PRF area which were notified in Assam Gazette. The most serious issue is that none of the RF is encroachment free ; the Hollonghabi RF and all PRFs are fully encroached. The R.F. wise encroached area statement is given in table 2.4.1a of part I.

7.4.2 Objectives of Self Rehabilitation: The objectives of the Chapter on Rehabilitation are

- To motivate every encroacher family to vacate the illegally occupied RF/PRF areas in lieu of an economic package.
- To remove all manmade devastation like encroachment which have stood as impediments in regeneration and reclamation of the forest areas.
- To create large scale plantations on the vacant land so created.
- To en-role the members of the Encroacher family in JFMC/EDCs and in management of the NTFPs, Eco-tourism etc with an aim to create livelihood opportunities.
- To survey the boundaries of RF/PRFs in order to consolidate them by fixing permanent boundary pillars.

7.4.3 Consolidation of boundaries of RF/PRF: The consolidation works are to be carried out in the entire Plan period. The practice will continue in apprehension of removal of some posts by the encroachers who may try to re-encroach the RF area.

7.4.4 Survey of Encroachers: It is apprehended that that encroachers will try to re-encroach the RF/PRF lands. Hence, the survey and monitoring will continue till the fifth Year.

7.4.5 Joint Survey: The 'Joint Survey' with Assam Survey/Survey of India/Arunachal Government may be carried out along the Assam-Arunachal interstate border if such an order is passed by the Hon'ble Supreme Court of India. An amount of Rs. 10.00 lakh each is proposed during the 1st and 2nd year for the Joint Survey.

7.4.6 Boundary demarcation: Erection of boundary pillars, surveillance and attempt to rehabilitate the encroachers will be continued simultaneously. The rehabilitation process will be done purely on humanitarian ground without any violation of the 'Human Right'.

7.4.7 Grant of Economic Package: It is observed that there are many built up areas within the Reserve Forests/Proposed Reserve Forests in addition to unauthorized cultivation. The grant of such package is a sort of 'Agreement' by the Forest Department with the unauthorized occupants and the dealing is more of a 'Humanitarian approach'.

As per record, encroachment in Sadiya Station RF (North Block) started during 1964-65 and still half of the area is under cultivation with some built up. Encroachment in some other RFs such as Hullunghabi, Mesaki, Kumsong, Phillobari, Doomdooma, Kundil kolia, Deopani, Lokaipathar, Torani, Tokowani also started prior to 1980. The act of unauthorized occupation continued till recent time to the extent of 39 percent which is already mentioned. It is apprehended that forceful ejection at this stage may not be successful because of the prevailing socio-economic condition and above mentioned constrains and there is every chance of coming back of the encroachers and damage of the plantation leading to waste of money, energy and time. Therefore, the second option which is the 'Rehabilitation by way of granting economic package' and proper assessment of the extent of cultivation and infrastructure such as House etc. by an 'Authorized Committee' seems to be more appropriate and promising. The package will depend on such assessment on the ground and the financial grant will be determined as per 'Compensation' laid down in the Assam Land and Revenue

Regulation, 1886. It is to be noted that no alternate land will be provided to the encroachers and they have to take away their properties such as building materials and remove the crops of their own.

7.4.8 Eviction of encroached land: After ejection of encroachers during October to December, 2021, 'Economic Package' will be offered to 2309 Encroacher Families @Rs.1.00 Lakh to 20.00 Lakh per family in the initial two years for their self rehabilitation. No alternate land will be provided to them as the package will be purely 'Self rehabilitation'. It will be purely an 'Economic Package' and each Encroacher family has to vacate the RF/PRF land immediately and remove all the cultivation and structures built by them. If the family does not vacate the RF land, the family as well as unauthorized cultivation, building etc. will be ejected from that piece of RF land under Section 72 (C) of the Assam Forest Regulation, 1891. Further, the family will not be considered eligible for the economic package. An amount of Rs. 25,000 Lakh (Maximum) will be required to rehabilitate 2309 families with an economic package. Incentive of 20% of the sanctioned amount may be granted to every family for co-operating in the process of self- rehabilitation.

7.4.9 One-time cashless financial assistance: Each effected encroacher family (2309 Nos) having dwelling house and cultivation, will be entitled to be awarded with "One-time cashless financial assistance" of an amount as the District Level Assessment Committee for Awarding Economic Package proposed as below decides which will be of minimum Rs.1.00 Lakh and maximum Rs.20.00 Lakh per family. The said District Level Assessment Committee for Awarding Economic Package is required to be approved and notified by the State Government in due course of time, preferably within 2 months.

7.4.10 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 are to 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.

7.5 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 month of 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.

7.6 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.

7.7 Preservation Plot: It is proposed to preserve 3.00 ha area of endemic species Hollong - Mekai - Naharas the permanent preservation plot to study the increment of these species in the area and its further prospects. Artificial protection measures around this forest patch shall be taken. 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 plots is any will be maintained.

7.8 Nurseries: To meet the needs of plantation in the area, new nursery for raising tree species, medicinal plants, fruit species shall be created. 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.

7.9 Seasoning and Treatment of Timber: Increasing longevity of wood/timber helps in Carbon sequestration. As a measure for Carbon sequestration, all wind fallen harvested trees, and seized timbers shall be sent to Govt. Timber Treatment and Seasoning Plant, Makum for the purpose of treatment, seasoning and conversion. Treated sawn timber will be sold by DFO. Govt. TT&S Plant Division, Makum and royalty realized will be deposited to State exchequer.

7.10 Stone Mahals: All stone mahals should be geotagged. Mining operation shall be done under strict supervision of forest officer following all rules and regulations stipulated in Assam Minor Mineral Concession Rules. It should be ensured that no environmental and ecosystem degradation takes place.

7.11 Sand Mahals: All sand mahals should be geotagged. Mining operation shall be done under strict supervision of forest officer following all rules and regulations stipulated in Assam Minor Mineral Concession Rules. It should be ensured that no environmental and ecosystem degradation takes place.

7.12 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.

7.13 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 from 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.

7.14 Engagement of Armed Home Guards: It is to be noted that only 20 number of Armed Assam Forest Protection Force (AFPF) personnel are posted in three locations in the Doomdooma Division to protect the vast forest areas and wildlife therein. The said strength is highly inadequate to provide security to the enormous forest wealth and resources. Though the Assam Forest Department is raising the Second Battalion of the AFPF, yet the deployment will not be as per requirement to protect the 20 number of Reserve Forests and the Proposed Sanctuaries/Kakojan National Park. Hence, the services of the Armed Home Guards (120 numbers or 10 Sections) will be highly essential to guard the existing forests, plantations and prevent the evacuated forest areas from getting re-encroached. The 'Monthly payment' will be made as per latest rate approved by the State Government. It is also proposed to engage the members of Forest Protection and Regeneration Committee members in 'Protection duty' who will be able to back the Home Guards in need. The 'Increment of Pay' to Home Guards and 'Monthly allowance' to the Members of FPRG will be paid in future by adjusting the annual budget or from income of JFMC/EDC.

7.15 Engagement of Consulting Team: An Expert on Forest/Wildlife management/Eco Tourism or the Working Plan Officer of Doomdooma Division, retired Forest Ranger, Deputy Ranger and Forester, Guard having proficiency, an Engineer, Veterinarian, Horticulturist, Accountant, Account Assistant will be engaged as 'Consulting Team' during preparation of 'Detail Project Report' and during execution of the proposed items in the field in the entire plan period of Ten Years. They will be appointed by the team constituted by the PCCF & HoFF, Assam Forest department.

7.16 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.

7.17 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.

7.18 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.

7.19 Convergence with other Departments:

With a view to achieving the goal of the Working Plan, socio-economic condition of communities residing 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. DeenDayal 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 FasalBima 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 SamagraGramyaUnnayan 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

7.20 Soil and Water (Moisture Conservation or SMC measures:

Purpose:

- To control surface run off
- To prevent soil erosion
- To reduce soil compaction
- To improve soil fertility
- To improve soil permeability
- To regulate flow of water

- To irrigate crop land and forest nursery/plantation
- To harvest access water

Classification of Soil and Water (Moisture) Conservation or (SMC)measures:

The SMC measures can be broadly grouped in to three categories-

- Physical or Mechanical means with stone or earth terrace, bunds, check dams, contour ditches, reservoir, pits etc.
- Biological or vegetative means and
- Agronomic or Agro forestry

These measures are often used in combination for sustainable resource management and most of them are based on traditional knowledge.

7.21 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 Manual and shall be be dutiful to protect and develop the forests.

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CHAPTER 8

Monitoring, Assessment and Reporting

8.1 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:

8.1.1. Bamboo Harvesting Control Form: For cutting bamboo identified for felling and bamboo left out, the Control Form 1 shall be used.

8.1.2 Silvicultural Control Form: For control of all silvicultural operations such as subsidiary cultural operations, cleanings, burnings etc., Form No. 2 shall be used.

8.1.3 NTFP Control Form: For controlling and maintaining a record of all NTFP harvest so as to make the removal/harvesting of NTFP sustainable, Form No. 3 shall be used.

8.1.4 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.

8.1.5 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).

8.2 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 maintain 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.

8.3 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

8.3.1 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.

8.3.2 Plantation forms and journals: 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 is to be recorded. Instructions of the PCCF/APCCF on checking of plantations issued from time to time should also be followed.

8.3.3 Nursery register: For each nursery, separate registers need to be maintained. It shall have monthly detail of operations and expenditure incurred, seedling raised, species etc. shall also be recorded in the register. A copy of the nursery statement showing details of species wise nursery stock should be sent to the Divisional office monthly.

8.3.4 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 geocoordinates 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) Labour 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.

8.3.5 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.

8.3.6 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.

8.3.7 Beat Books: Each beat Officer 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

8.3.8 Registers and Records: The following updated (till previous 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 humanwildlife 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.

8.3.9 Annual Inspection: Annual inspection of DFO territorial office by CF/CCFand Range office by DFO territorial is mandatory within three months ofcompletion of financial year to have checks on annual statements in controlforms and deviation statements and maintenance of registers and records.

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CHAPTER 9

SUMMARY OF PRESCRIPTIONS

The brief summaries of prescription against each Working Circle are presented in table 9.

Table 9: Summary of prescriptions for each Working Circle.

Chapter No.	Name of the Working Circle	Prescribed activity	Physical target over a period of ten years/ Remarks
Part 2 Chapter 2	Hollong Regeneration Working Circle	Working Circle restricted to South of the Brahmaputra River,	5635 Hect of Forest area shall be
		Reclamation of Hollong in the division	5635 Hect of Forest area shall be reclaimed with Hollong species.
		No felling of trees is prescribed during the Plan period except thinning	No felling prescription.
Part 2 Chapter 3	.Miscellaneous Plantation Working Circle	8790 Ha area to be planted in the Plan period	8790 Ha area to be planted in the Plan period
		Identification of good seed bearers and collect information on seed year.	Database and geo tagged location of good seed bearing trees.
		Select mother trees and marking those.	Ensure adequate number of mother trees of endemic species. Geo tagging required
		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.
		Transplantation of naturally regenerated seedlings which are 45 cm to 55 cm and six to eight months old.	Ensure survival of naturally regenerated seedlings.
		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.
		All areas that are having gaps is to be planted with native tree species.	The planting schedule as prescribed should be followed
		Planting schedule to be followed	Adherence to the strategies and prescription
		No felling of trees is prescribed during the Plan period.	Emphasize mainly on the replenishment of the area
		Reclamation and plantation of evacuated areas	Rehabilitation of the encroached RF areas and planting locally suitable quick growing species
		Assisted natural regeneration as per the prevailing norms may be adopted in the regenerated areas (<i>100 seedlings per hectare</i>).	Ensure survival of naturally regenerated seedlings.
Part 2 Chapter 4	A. Joint Forest Management (overlapping) Working Circle	10630 hect area shall be protected by 29 JFMCs	10630 hect area shall be protected by 29 JFMCs
		JFMC Plantation with various species = 2900 hect.	JFMC Plantation with various species = 2900 hect.
		Forest department staffs with active participation of JFMC conduct PRA exercises and develop microplans for the socioeconomic upliftment and livelihoods development of the local people. These microplans	Government orders and any relevant amendments are to be strictly followed before implementing the project,

		need to be submitted to DFO for assessing their technical feasibility for final approval as per the available government schemes and any other funders norms. Before implementing the project, Government orders and any relevant amendments are to be strictly followed.	
		There should be monthly review meeting of the JFMCs under the Chairmanship of JFMC president. Range Forest Officer should attend meeting at least quarterly.	Ensure functionality of the JFMC.
		NTFPs to be collected and sustainably harvested from areas from JFMC area and shall be sold by the concerned JFMC.	Sustainable NTFP harvesting.
		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.
		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.	Enhanced crop yield to meet people's requirement.
		JFMC areas to practice minimum tillage, organic formulations	Maintenance of ecology of the area
		Formation of Forest/ Protection Regeneration Committee, Entry point activities, infrastructural development, welfare programmes with special reference to woman folk and girl child, JFM plantation and nurseries etc. are proposed in the Budget and most of them will be maintained during and beyond the Plan period.	Ensure enhancement of forest cover through people's participation. Improvement of livelihoods of local population.
Part 2 Chapter 5	Non timber forest produce and bamboo (overlapping) Working Circle	2565 hect area is earmarked for NTFP plantation	2565 hect area is earmarked for NTFP plantation
		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.
		Collection of bark of any tree is strictly prohibited.	Ensure survival of threatened species.
		Only flowers, leaves, fruit and nuts are permitted to collect.	Enhance survival of NTFP species.
		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.
		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.
		20% of the JFMC plantation will comprise of NTFP	To meet the demands of local people
		Harvesting regime has been prepared	Ensure harvesttion and sustained yield
		Small scale industries and necessary steps have been proposed for grinding, packaging,	Value addition of NTFP and maintain transparency and Ensure benefit to the needy JFMC

		certification and marketing of the products	members
		Bamboo plantation @10 Ha to be carried out by every JFMC. Harvesting allowed on sustainable manner from 104 Ha (Out of 520 Ha) created by JFMC	No harvesting allowed in Secondary Bamboo Forests.
Part 2 Chapter 6	Wildlife protection (Overlapping) Working Circle	Creation of water holes Fruit and fodder plantation Development of nesting sites	Improve degraded wildlife habitats
		No new villages or new dwellers should be permitted to come out in future in close proximity of such important wildlife habitats.	Protect forest land and biodiversity
		Protection of Fauna	Protect wildlife biodiversity

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