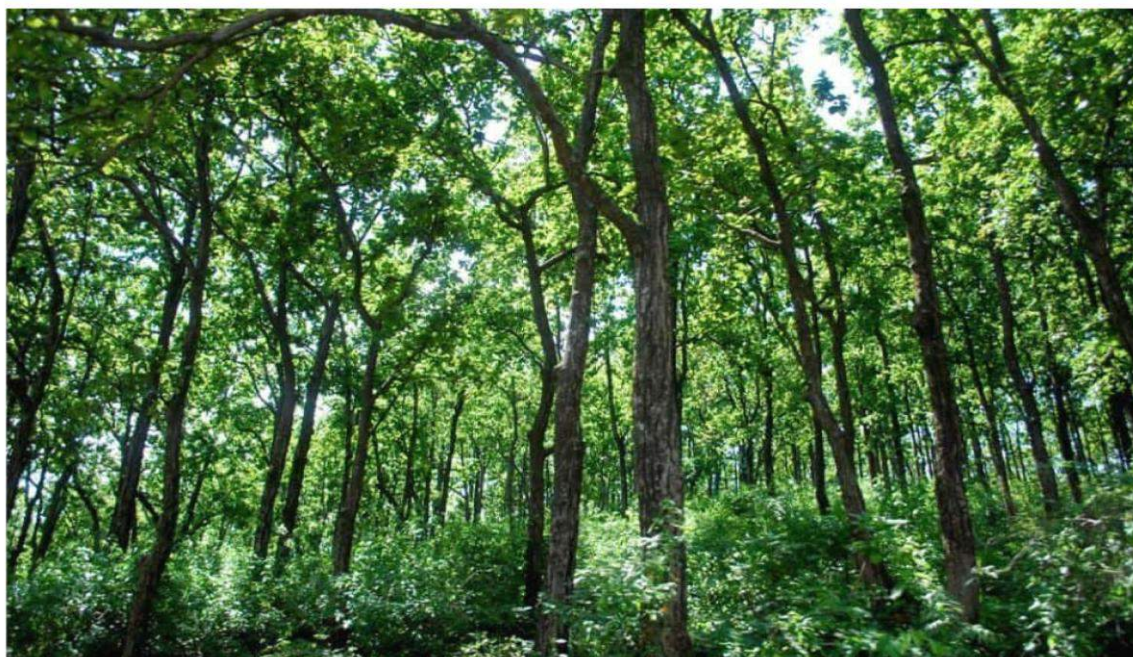




REVISED WORKING PLAN OF RAIRAKHOL FOREST DIVISION



FOR THE PERIOD 2021-22 TO 2030-31

BY

SRI PRADIPTA KUMAR SAHOO, IFS

DIVISIONAL FOREST OFFICER, RAIRAKHOL DIVISION.

(VOLUME-I)



No. 8(31)37/2016-FCE

15th July, 2022

To

The Addl. Chief Secretary,
Forest & Environment Department,
Govt. of Odisha,
Bhubaneswar.

Sub: Approval of draft Revised Working Plan of Rairakhol Forest Division for the period from 2021-22 to 2030-31 - reg.

Ref: The PCCF & HoFF, Odisha letter No. 12885/11F (SFM) 224/2014 dated 04.08.2021 and Letter No. 9413/11F (SFM) 24/2014 dated 04.05.2022.

Madam,

I am directed to inform that the revised draft Working Plan of Rairakhol Forest Division for the period 2021-22 to 2030-31 submitted by the PCCF, Odisha has been examined and accordingly, the Central Government (MoEF&CC) with the powers vested under Forest (Conservation) Act, 1980, has accorded conditional approval of the working plan of Rairakhol Forest Division for the year 2021-22 vide this office letter of even number dated 24.01.2022 and its further extension is subject to receipt of the observations made by this office. The reply to the observations made by IRO, Bhubaneswar has been received from PCCF, Odisha vide letter No. 9413/11F (SFM) 24/2014 dated 04.05.2022 & No.11263/11F(SFM)-24/2014 dated 02.06.2022 and examined by this office. Accordingly, the approval of the Central Govt. is hereby accorded to the Revised Draft Working Plan of Rairakhol Forest Division for further period of 2022-23 to 2030-31, subject to the following General & Specific Conditions:

The formal endorsement/ approval from the State Govt. may also be obtained.

General Conditions:

1. The orders of Hon'ble Supreme Court of India in the matter of W.P. No. 202/95 Godaverman Therumulkpad Vs Union of India and related Interlocutory applications shall be strictly complied with. Any prescription or operation at variance with the order of Hon'ble Apex Court shall be kept in abeyance till such order is in force or otherwise not modified.
2. Further, in strict compliance with Hon'ble Supreme Court's order dated 22.09.2000, the State Government of Odisha shall ensure that regeneration of forest is commensurate with fellings, if any, to be carried out under the present working plan.
3. Consequently, no felling should be carried out without making allocation of requisite funds for undertaking regeneration operation in order to ensure regeneration to be commensurate with fellings. In case of failure of regeneration or any shortfall in achieving the target of regeneration, further harvesting shall remain suspended till backlog/ shortfall in regeneration is made up and subsequent formal approval from the Integrated Regional Office is to be obtained. **No felling shall be carried out without an approved Annual Timber Operation by the competent authority.**
4. This working plan is approved for the year **2022-23 to 2030-31.**
5. Standing snags/dead or dying trees should not be removed and shall be preserved for wildlife habitat/shelter. In site specific coupes / sections having unduly large no. of such trees needing removal, the State Forest Department may take special permission from Integrated Regional

6. Deviation statement along with the prescribed documents shall be reported and got endorsed from the competent authority by the end of the year of operation. Accordingly a summary of the report/certificate shall be submitted along with the Annual Action Taken Report to the IRO, MoEF&CC, Bhubaneswar for information and record.
7. No new road shall be constructed and no fresh forest area shall be broken for widening / reconstruction of existing roads without obtaining prior approval under Forest (Conservation) Act, 1980.
8. Approval of the working plan does not permit to carry out any non-forestry work including construction of building, for which necessary permission under F(C) Act shall be obtained, as may be required.
9. CF (T) shall submit to the CCF (WP) / PCCF the yearly action taken report against the physical & financial targets of felling & regeneration against each working circle of this W.P. by the end of the year of operation.
10. Immediate action may be taken for repairing of old pillars, if any. Prescriptions may be provided for revisiting all pillars every five years for purpose of maintenance and appropriate action be taken depending on condition of boundary pillars. Staff in charge of beat will verify physically the boundary pillars and shall give a certificate annually to the DFO with copy to the CCF, Working Plan confirming that no fresh encroachments have taken place. Vulnerable areas will be verified by the Range Officers.
11. The detail copy of the PF/RF Notification, if any, may be compiled and a copy of each shall be kept with the DFO/Working Plan Officer and CCF, Working Plan for reference.
12. State Forest Department shall initiate the process for the preservation of old available maps.

Specific Conditions:

The prescriptions under the proposed working circles are approved with observations stated above and with specific condition that:

1. Sporadic, wind fallen / uprooted trees, if any, shall also be allowed to be harvested in addition to the approved working scheme prescriptions for the year 2021-22 after its special approval of the list of enumerated trees by the CF (T) / RCCF (T) forwarding a copy to Integrated Regional Office, Bhubaneswar. In case of large scale wind fallen, damaged and epidemic outbreak, special permission for tree felling may be obtained from the Regional Office of MoEF&CC, Bhubaneswar. The volume extracted out of wind fallen/ uprooted trees shall be deducted out of the total volume of yield as calculated and permission for felling is allowed for balance volume only.
2. A mid-term evaluation of the implementation of working plan prescriptions and its impact on the forests may be done after the end of initial five years for which reasonable number of benchmark / sample plots may be maintained.
3. After recording the GPS and checking the records of each planting site DFO to certify that plantation is not taken up in the existing old plantation sites, without the prescribed action required prior to replanting.
4. Plantation details along with current status (conditions of plantation and survival) may also be included along with GPS surveyed boundary locations shown on a map, so that chances of mismanagement, confusion, encroachment and problem of identification of the site are reduced.
5. The Department should prepare a programme for DGPS survey of forest boundaries and prepare geo-referenced maps with important administrative and management details, if not done earlier.
6. Prescriptions must be provided for demarcation of un-demarcated balance forest area. The area details of un-demarcated forest area, number of pillars and funds required to demarcate it and

7. No forest, bearing naturally grown trees shall be clear felled for any purpose what so ever,
8. The prescriptions are to enable necessary co-existence of development with nature, and to ensure implementation strictly adhering to the provisions of Indian Forest Act, 1927, Wildlife (Protection) Act, 1972, Forest (Conservation) Act, 1980, Panchayats (Extension to the Scheduled Areas) Act, 1996 (PESA), Biological Diversity Act, 2002, and Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.
9. Implementation of People Biodiversity Register (PBR) formulation as well as Access of Benefit sharing Regulation has to be implemented and monitored.
10. Listed wetland, defined under the Wetland (Conservation & Management) Rules, 2017 situated in and outside forest to be restored and sustainable managed. Annual target along with riparian restoration will be done strictly in accordance under the provision of aforesaid Rules.
11. Raising of genetically improved seedlings/clonal propagation needs emphasis for timber productivity enhancement for future. Accordingly, year-wise raising of clonal seedlings will be fixed in proportion in the Division.
12. No permanent structure for Eco-Tourism purpose should be allowed. Ecotourism should be focused with identification of sites, traditions, community practice and future management involving local communities. Benefit accrued from eco-tourism to be plowed back to local communities. Number of visitors shall be fixed as per the carrying capacity study. Safety audit to be carried out in all the eco-tourism sites.
13. Abstract of plan prescription in prescribed format and works prescribed during the plan period in tabular form along with annual target shall be provided in the draft Working Plan.

Central Govt. reserves the right to review, modify or withdraw this approval at any time, if any, of the conditions of approval are not implemented or relevant modifications in the Working Plan, if any, is required so as to keep it in conformity with the orders, circulars and guidelines issued by the Central Govt. under Forest (Conservation) Act, 1980 or any other statute and National Forest Policy.

Yours faithfully,

Padma Mahanti
(Padma Mahanti)

Dy. Inspector General of Forests (C)

Copy to:

1. The Addl. Director General of Forests (FC), Ministry of Environment, Forest & Climate Change, Indira Paryavaran Bhawan, Agni Wing, Aliganj, Jorbagh Road, New Delhi-110 003 for kind information.
2. The Principal Chief Conservator of Forests, Forest Department, Govt. of Odisha, Aranya Bhawan, Chandrasekharpur, Bhubaneswar for kind information and necessary action.
3. The Addl. PCCF (P&SM), Forest Department, Govt. of Odisha, Aranya Bhawan, Chandrasekharpur, Bhubaneswar for kind information and necessary action.
4. The Managing Director, Odisha Forest Development Corporation Limited, Bhubaneswar for kind information.
5. Guard File.

/
Dy. Inspector General of Forests (C)



No.8(31)37/2016-FCE

Date: 24th January, 2022

To

The Addl. Chief Secretary,
Forest & Environment Department,
Govt. of Odisha,
Bhubaneswar.

Sub: Approval of draft Revised Working Plan of Rairakhol Forest Division for the period from 2021-22 to 2030-31 - reg.

Ref: The PCCF & HoFF, Odisha letter No.12885/11F (SFM) 24/2014 dated 04.08.2021

Sir,

The revised draft Working Plan of Rairakhol Forest Division for the period 2021-22 to 2030-31 submitted by the PCCF, Odisha has been examined and accordingly, the Central Government (MoEF&CC) with the powers vested under Forest (Conservation) Act, 1980, has decided to accord approval of the working plan of Rairakhol Forest Division for the period 2021-22, subject to the following General and Specific conditions:

The formal endorsement / approval from the State Govt. may also be obtained.

General Conditions:

1. The orders of Hon'ble Supreme Court of India in the matter of W.P. No. 202/95 Godaverman Therumulkpad Vs Union of India and related Interlocutory applications shall be strictly complied with. Any prescription or operation at variance with the order of Hon'ble Apex Court shall be kept in abeyance till such order is in force or otherwise not modified.
2. Further, in strict compliance with Hon'ble Supreme Court's order dated 22.09.2000, the State Government of Odisha shall ensure that regeneration of forest is commensurate with fellings, if any, to be carried out under the present working plan.
3. Consequently, no felling should be carried out without making allocation of requisite funds for undertaking regeneration operation in order to ensure regeneration to be commensurate with fellings. In case of failure of regeneration or any shortfall in achieving the target of regeneration, further harvesting shall remain suspended till backlog/ shortfall in regeneration is made up and subsequent formal approval from the Eastern Regional Office is to be obtained. **No felling shall be carried out without an approved Annual Timber Operation by the competent authority.**
4. This working plan is approved for the year 2021-22.
5. Standing snags/dead or dying trees should not be removed and shall be preserved for wildlife habitat/shelter. In site specific coupes / sections having unduly large no. of such trees needing removal, the State Forest Department may take special permission from Integrated Regional Office, MoEF&CC, Bhubaneswar.

6. Deviation statement along with the prescribed documents shall be reported and got endorsed from the competent authority by the end of the year of operation. Accordingly a summary of the report/certificate shall be submitted along with the Annual Action Taken Report to the IRO, MoEF&CC, Bhubaneswar for information and record.
7. No new road shall be constructed and no fresh forest area shall be broken for widening / reconstruction of existing roads without obtaining prior approval under Forest (Conservation) Act, 1980.
8. Approval of the working plan does not permit to carry out any non-forestry work including construction of building, for which necessary permission under F(C) Act shall be obtained, as may be required.
9. CF (T) shall submit to the CCF (WP) / PCCF the yearly action taken report against the physical & financial targets of felling & regeneration against each working circle of this W.P. by the end of the year of operation.
10. Immediate action may be taken for repairing of old pillars, if any. Prescriptions may be provided for revisiting all pillars every five years for purpose of maintenance and appropriate action be taken depending on condition of boundary pillars. Staff in charge of beat will verify physically the boundary pillars and shall give a certificate annually to the DFO with copy to the CCF, Working Plan confirming that no fresh encroachments have taken place. Vulnerable areas will be verified by the Range Officers.
11. The detail copy of the PF/RF Notification, if any, may be compiled and a copy of each shall be kept with the DFO/Working Plan Officer and CCF, Working Plan for reference.
12. State Forest Department shall initiate the process for the preservation of old available maps.

Specific Conditions:

The prescriptions under the proposed working circles are approved with observations stated above and with specific condition that:

1. Sporadic, wind fallen / uprooted trees, if any, shall also be allowed to be harvested in addition to the approved working scheme prescriptions for the year 2021-22 after its special approval of the list of enumerated trees by the CF (T) / RCCF (T) forwarding a copy to Integrated Regional Office, Bhubaneswar. In case of large scale wind fallen, damaged and epidemic outbreak, special permission for tree felling may be obtained from the Regional Office of MoEF&CC, Bhubaneswar. The volume extracted out of wind fallen/ uprooted trees shall be deducted out of the total volume of yield as calculated and permission for felling is allowed for balance volume only.
2. A mid-term evaluation of the implementation of working plan prescriptions and its impact on the forests may be done after the end of initial five years for which reasonable number of benchmark / sample plots may be maintained.
3. After recording the GPS and checking the records of each planting site DFO to certify that plantation is not taken up in the existing old plantation sites, without the prescribed action required prior to replanting.
4. Plantation details along with current status (conditions of plantation and survival) may also be included along with GPS surveyed boundary locations shown on a map, so that chances of mismanagement, confusion, encroachment and problem of identification of the site are reduced.

5. The Department should prepare a programme for DGPS survey of forest boundaries and prepare geo-referenced maps with important administrative and management details, if not done earlier.
6. Prescriptions must be provided for demarcation of un-demarcated balance forest area. The area details of un-demarcated forest area, number of pillars and funds required to demarcate it and year wise plan for demarcation so as to complete it at the earliest should be provided.
7. No forest, bearing naturally grown trees shall be clear felled for any purpose what so ever.
8. The prescriptions are to enable necessary co-existence of development with nature, and to ensure implementation strictly adhering to the provisions of Indian Forest Act, 1927, Wildlife (Protection) Act, 1972, Forest (Conservation) Act, 1980, Panchayats (Extension to the Scheduled Areas) Act, 1996 (PESA), Biological Diversity Act, 2002, and Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006.
9. Implementation of People Biodiversity Register (PBR) formulation as well as Access of Benefit sharing Regulation has to be implemented and monitored.
10. Listed wetland, defined under the Wetland (Conservation & Management) Rules, 2017 situated in and outside forest to be restored and sustainable managed. Annual target along with riparian restoration will be done strictly in accordance under the provision of aforesaid Rules.
11. Raising of genetically improved seedlings/clonal propagation needs emphasis for timber productivity enhancement for future. Accordingly, year-wise raising of clonal seedlings will be fixed in proportion in the Division.
12. No permanent structure for Eco-Tourism purpose should be allowed. Ecotourism should be focused with identification of sites, traditions, community practice and future management involving local communities. Benefit accrued from eco-tourism to be plowed back to local communities. Number of visitors shall be fixed as per the carrying capacity study. Safety audit to be carried out in all the eco-tourism sites.

Central Govt. reserves the right to review, modify or withdraw this approval at any time, if any, of the conditions of approval are not implemented or relevant modifications in the Working Plan, if any, is required so as to keep it in conformity with the orders, circulars and guidelines issued by the Central Govt. under Forest (Conservation) Act, 1980 or any other statute and National Forest Policy.

The Draft Revised Working Plan of Rairakhol Forest Division for the period from 2021-22 to 2030-31 is conditionally approved for the year 2021-22 and its further extension is subject to receipt of the following information before the expiry of the approval of the Working Plan.

A: Detailed needed under National Working Plan Code, 2014:

- a) SWOT analysis, Abstract of Plan prescription in prescribed format and Works prescribed during the plan period in tabular form along with annual target shall be provided in the Working Plan.
- b) The reason for deviation in actual area worked in Working Circle wise of previous Working Plan and proposed in present Working Plan.
- c) Area (range wise/ beat wise) diverted under FCA, FRA and non-forest and/ degraded forest given for compensatory Afforestation under FCA, encroachments, etc. during previous working plan shall be provided.

- d) Raising genetically improved seedling through tissue culture/clonal propagation : Year wise raising of clonal saplings for quality production shall be provided.
- e) Stock maps, administrative map, vegetation cover map, Climatic parameter GIS map, distribution of different types of forest GIS map, Analysis of the crop (stock prepared by NRSC) map, division map indicating fire prone areas and areas affected by forest fire shall be provided.
- f) As per Supreme Court order dated 22.09.2000, year wise details of regeneration and felling shall be provided.
- g) A separate list of rare, endangered & threatened (RET) flora and fauna species listed in the IUCN Red data book found in the division shall be included in the draft plan.
- h) Land use, land use change and forestry (LULUCF): ToF in Change Matrix not mentioned & analysis may be made for fresh encroachment and eviction since December, 2005 onwards in forest areas by GIS based change analysis shall be provided.
- i) Status of regeneration: As per the base year assessment, the data on population dynamics of seedlings, saplings and young trees should be collected to monitor the status periodically and find out the conditions in which a species regenerates best. Depending upon the status of regeneration, research plots for regeneration study may be provided in the prescription under chapter "Science and Research". Data shall be provided.
- j) Area affected by forest fire, Fire-protection plan, improvement in communication, interface activities, amenities to staff, etc., area damaged by natural calamities & susceptible to these calamities, area treated under soil and water & water conservation measures along with year data and map shall be provided.
- k) Status of existing of logging practices during fodder/NTFPs collection extent of damage to the affected species data shall be provided.
- l) Details of forest area infested by different invasive species, Plantation (AR/ANR) area free from weed, measures to mitigate & pollution of soil & water and extent of cultural/sacred groves shall be provided.
- m) Wet lands in forest areas, Restoration and management of wetlands as prescribed under the clonal sapling for quality production needs inclusion in this paragraph shall be provided.
- n) Number of clumps and clump size is maintained or increased with respect to base year data shall be provided.
- o) People's Biodiversity Register formulation, Access benefit sharing regulation and detailed mechanism should be explicitly included in the plan.
- p) Past management data as well as current data of Carbon stock, sequestration and mitigation data may be provided.
- q) Growing Stock of wood : Export and Import of wood products, recorded removal of timber, fuel wood, fodder & locally important NTFPs and details of dependency of local people on NTFPs shall be provided.
- r) Number of JFM committees, area (s) protected by them, Status of empowerment of JFMCs, details of welfare measures along with direct employment in forestry activities, list of individual & communities to whom Forest Right has been recognized under FR Act, Other Rights & Concession, if all in practice shall be (since it is mentioned that no other rights & concessions admitted for the public).

- s) The area protected from grazing, season and area of grazing, migration route, transition camps, etc. need to be recorded and accounted for in the working plan.
- t) Status of compliance for sustainable management of forests, Forest Resource Accounting : Progressive and positive efforts should be made to quantify intangible benefits and the details may be provided.
- u) Existence of monitoring, assessment and reporting mechanism: details shall be provided.
- v) The figures in relation to requirement of daily wage/contractual man power and the rates of past and present wages shall be provided.
- w) Statistics of growth and yield shall be provided.
- x) The details on instances of man-animal conflicts and action taken for diffusing the conflicts and Rescuing/relocating the wild animals shall be provided.

B. Non-Compliances of observations of Standing Consultative Committee (SCC):

- a) Compartment History file of updated revised Working Plan data. Map representation of water bodies, salt lick etc., harvesting of old plantation and replanting data entire plan i.e. 10 years and a Separate Chapter Water Resource Management and Rail fall pattern and its impact forest and Wildlife data not provided. So the observation of SCC shall be complied.
- b) Record of Import & Export of wood and wood products to this division during last five years shall be provided.
- c) Wildlife Corridor or Wildlife movement area data not provided.
- d) Protection activities under miscellaneous regulation with prescriptions for communication network like VHF, Mobile phone etc. along with engagement of protection squad, anti poaching squad & fire protection squad etc data not provided

Yours faithfully,

Padma Mahanti

(Padma Mahanti)

Dy. Inspector General of Forests (C)

Copy to:

1. The Addl. Director General of Forests (FC), Ministry of Environment, Forest & Climate Change, Indira Paryavaran Bhawan, Agni Wing, Aliganj, Jorbagh Road, New Delhi-110 003 for kind information.
2. The Principal Chief Conservator of Forests, Forest Department, Govt. of Odisha, Aranya Bhawan, Chandrasekharapur, Bhubaneswar for kind information and necessary action.
3. The Addl. PCCF (P&SM), Forest Department, Govt. of Odisha, Aranya Bhawan, Chandrasekharapur, Bhubaneswar for kind information and necessary action.
4. The Managing Director, Odisha Forest Development Corporation Limited, Bhubaneswar for kind information.
5. Guard File.

Padma Mahanti

Dy. Inspector General of Forests (C)



FOREWORD

The Revised Working Plan of Rairakhol Forest Division has been approved by Govt. of India Ministry of Environment, Forest & Climate Change, Integrated Regional Office, Bhubaneswar vide Letter No. 8 (31) 37/2016-FCE dated 24th January, 2022 for the year 2021-22 and vide Letter No. 8 (31) 37/2016-FCE dated 15th July, 2022 for 2022-23 to 2030-31. This is the 1st Revised Working Plan of Rairakhol Forest Division for the period from 2021-22 to 2030-31 after reorganization of Rairakhol Forest Division during 2010.

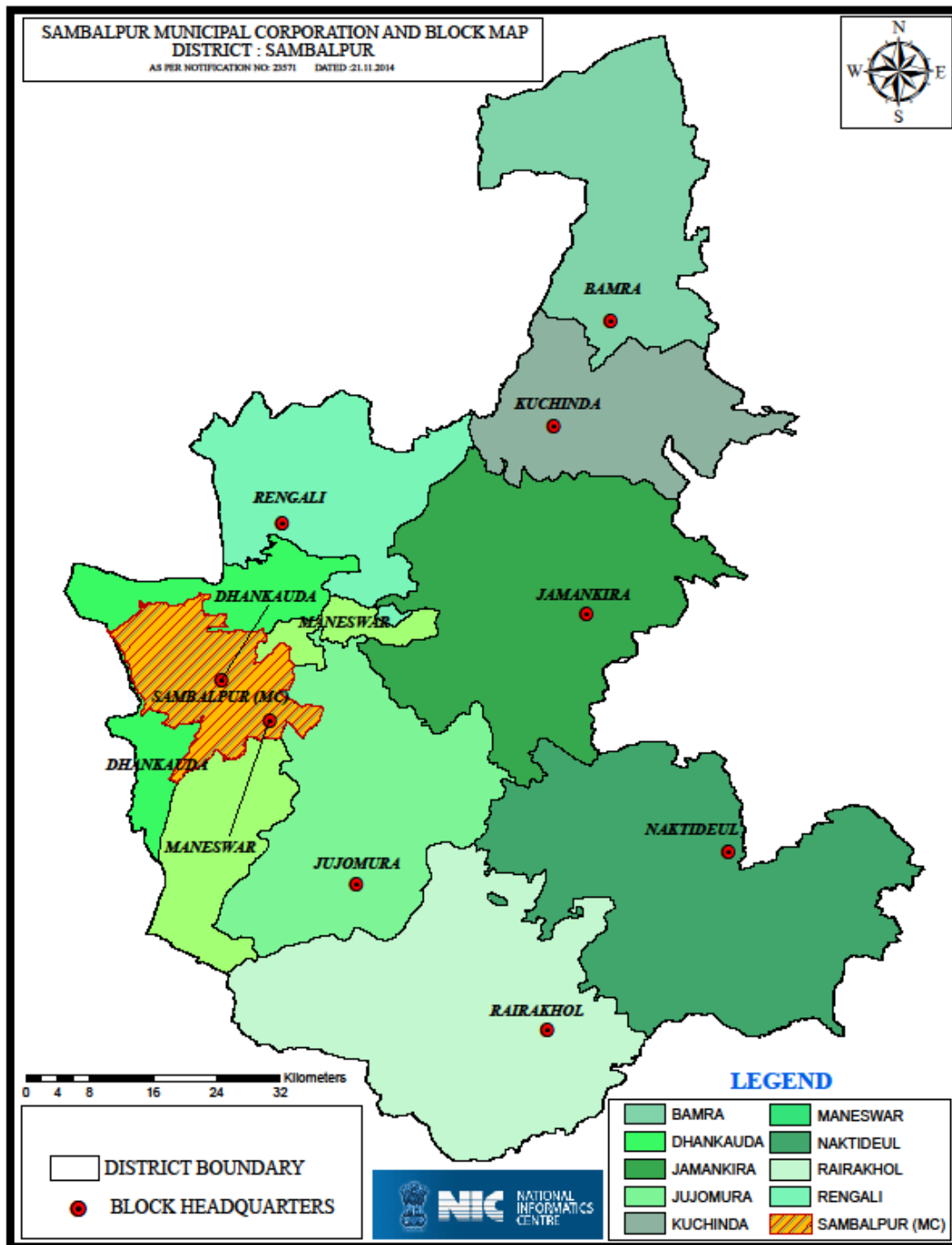
Eight Working Circles, both exclusive & overlapping, are prescribed in this Working Plan covering a total area 1, 01,857.4315 ha. Rairakhol Forest Division bears a very good Sal forest with ideal growing Stock distribution over all age classes. Adequate measures have been prescribed for good regeneration and subsequent establishment of Sal crop. It will help in checking degradation of forests as well as better wildlife management. Harvesting mechanism for Village Forests has been elaborately discussed in this approved plan. It will meet the aspiration of VFC associated in creation, protection & management of Village Forests. Management of Water Resource and Climate Change has been incorporated for better appreciation of Climate Change of the locality. Management of Sacred Groves in Joint Participatory Mode has been prescribed for enhancing bio diversity of the area.

Sri Pradipta Kumar Sahoo, IFS; DFO, Rairakhol Division under the guidance of Sri Chittaranjan Mishra, IFS, Regional Chief Conservator of Forests, Sambalpur Circle has carried out an outstanding job in preparing the Revised Working Plan for Rairakhol Forest Division to meet the challenging circumstances linked to modern forest management. I congratulate both the Officers and hope this plan will serve as a technical and scientific document to achieve its stated objectives and improve the Socio-economic Status of people especially the Tribal.


(Debidutta Biswal, IFS)

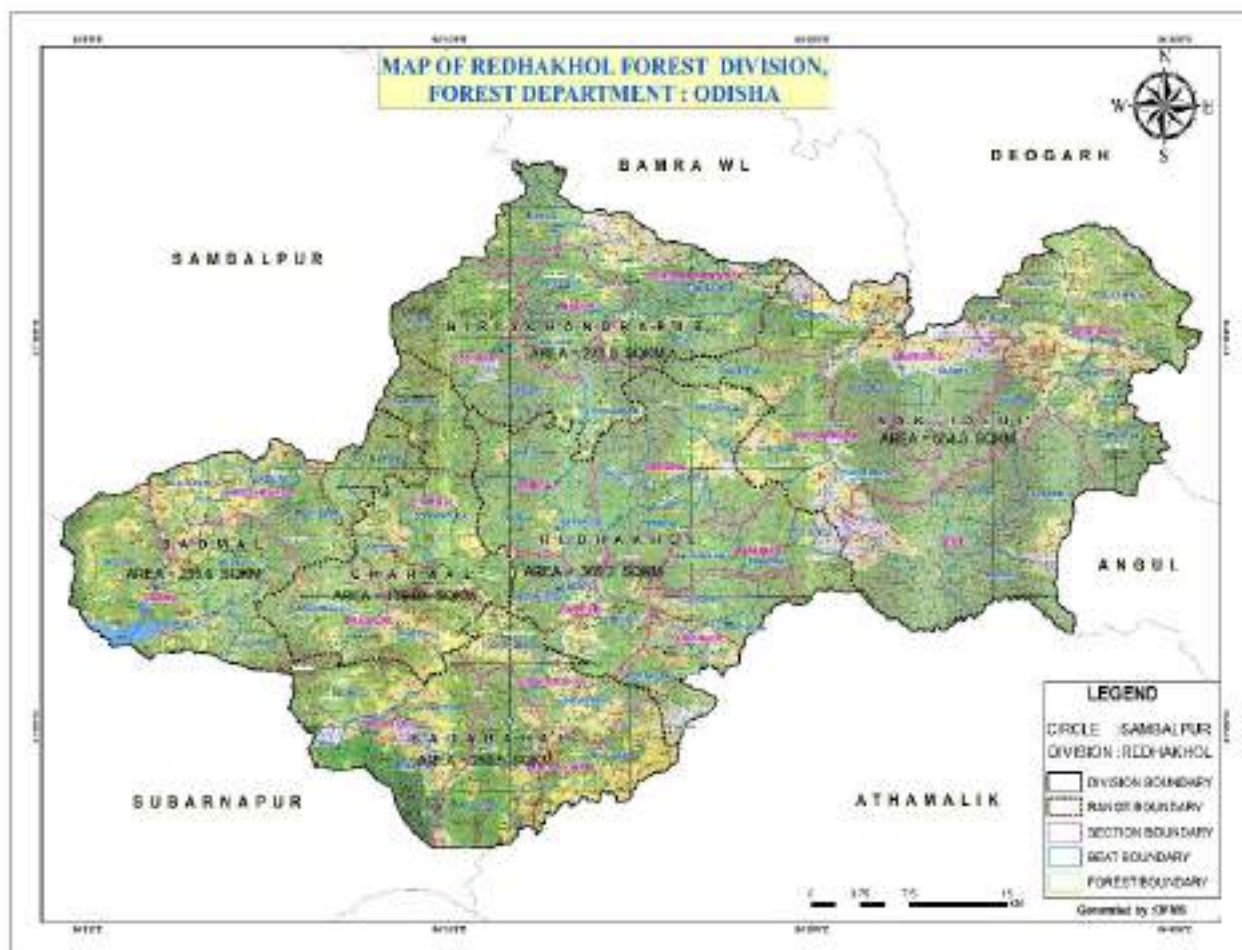


Revised working plan of Rairakhol Division (2021-22 to 2030-31)





Revised working plan of Rairakhol Division (2021-22 to 2030-31)





Preface

Rairakhol Forest Division is an old division functioning since 1948 with headquarters at Rairakhol, district Sambalpur. Consequent upon re-organization of Forest Department vide Government of Odisha Notification No. No.13228 / F & E dt.08.8.2003 the erstwhile Rairakhol Forest Division was bifurcated and a portion i.e. Khalasuni Sanctuary transferred from Rairakhol Division to Bamra Wildlife Division. The division has also under gone further reorganization during 2009-10. During the second reorganization Subalaya & Hatlimunda section of Rairakhol & Mochibahal Range respectively have been transferred to newly Constituted Subarnapur Division with effect from 20.01.2010 vide notification No.17803/ F & E dt.27.10.2009 of Govt. of Odisha, F&E Department

After reorganization, the Rairakhol Division is limited to Rairakhol Sub Division of Sambalpur District except Khalasuni Wildlife Sanctuary which has been transferred to administrative control of Bamra Wildlife Division. The previous Ranges have also reorganized and name of Ranges have been changed.

The outgoing working plan was by Sri Sankarsan Behera, OFS-I (SB) and was valid up to 2016-17. The Preliminary Working Plan Report was prepared by the then Regional Chief Conservator of Forests, Sambalpur Circle Late Lalit Kumar Tiwari, IFS in accordance with the National Working Plan Code, 2014.

The present plan for the period 2021-22 to 2030-31 is prepared by utilizing the benefits of Modern techniques, Satellite imagery interpretation, GIS facilities of Forest Head quarters with the support of many individuals, organizations directly or indirectly. It is a great privilege and opportunity on my part to write the **Revised Working Plan** of this Division after its reorganization basing on the National Working Plan Code 2014. The ORSAC and the NRSA, Hyderabad have played a crucial & vital role using the Remote sensing techniques for selecting sample points, collections of primary data from sample points and its analysis for calculating the growing stock and preparation of Maps. Due to their extensive help and co-operation, it could be possible to write the plan within a small span of time.

In preparation of this plan, I owe my sincere thanks to Late Lalit Kumar Tiwari, IFS who had prepared the PWPR and led the path and guided us for preparation of this Plan.

I am indebted to Sri Chittaranjan Mishra Regional Chief Conservator of Forests, Sambalpur Circle who has guided throughout the plan preparation.



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

I am very much thankful to Sri Sandeep Tripathy, IFS, Principal Chief Conservator of Forests & HoFF, Odisha, Sri AK Jaiswal, IFS Conservator Forest (Working Plan) for their inspiration and valuable guidance from time to time in drafting the working plan.

I extend my sincere thanks to my predecessors Sri Sangram Keshari Behera, IFS for his contribution for preparation of this Plan. I also sincerely thank Sri Bhimasen Maharana, Dy. Conservator of Forests (Rtd) and staffs of Chandanam, Cuttack, a Forest & Wildlife Consulting House for their suggestion in drafting of the plan and providing relevant guidance to field staffs for compilation of data for preparation of this working Plan.

The Asst. Conservator of Forests of Rairakhol Division Sri Debiprasad Rout, OFS-I (JB) who has contributed in preparation of this Plan. I extend my thanks to him. I also thank Range Officers, office staffs and DEO of the Division; those have taken pains in compilation of data collected from field level.

I hope, this Plan will lead to a sustainable management of Forest and act in direction of checking the global Climate Change being faced. It will provide vital guidance to field staffs, managers, planners, readers, Research scholars working in the field of Forestry & Wildlife.

At the end, once again I extend my heartfelt thanks and appreciation to all for their cooperation.

(PK SAHOO, IFS)

Divisional Forest Officer.

Rairakhol Forest Division.



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1. Abbreviations used

AFOLU	Agriculture, Forestry and Other Land Use
AJY	Aam Jungal Yojana
BBFS	Bidhyabasini Felling Series
BFS	Badmal Felling Series
BGL	Below Ground Level
BKFS	Balikiari Felling Series
BRS	Badmal Rehabilitation Series
BTOF	Badbahal- Charmal TOF Series
CA	Compensatory Afforestation
CCF	Chief Conservator of Forests
CD	Community Development
CFS	Charmal Felling Series
CGWB	Central Ground Water Board
COP	Conference of the Parties
CRS	Charmal Rehabilitation Series
DFO	Divisional Forest Officer
DFS	Daincha Felling Series
DGPS	Differential Global Positioning System
DLC	District Level Committee
DPF	Demarcated Protected Forest
EDC	Eco- Development Committee
EES	Encroachment Eviction Series
ERS	Elephant Reserves
FDA	Forest Development Agency
FRH	Forest Rest House
FSI	Forest Survey of India
FW	Fire Wood
GBH	Girth at Breast Height
GBH	Girth at Breast Height
GCFS	GC Pur Felling Series
GFC	Green Climate Fund
GHG	Green House Gases



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GIS	Geographic Information System
GPS	Global Positing System
GTOF	GCPur TOF Series
HCS	Hatidhara Cutting Series
HFS	Hatidhara Felling Series
INDC	Intended Nationally Determined Contribution
JFM	Joint Forest Management
JFS	Jarasingha Felling Series
KCS	Kholgarh Cutting Series (KCS)
KHFS	Kholgarh Felling Series
KL	Kendu Leaf
LFS	Landakot Felling Series
LIDAR	Light Detection & Ranging
LMFS	Landimal Felling Series
LUFS	Luhabir Felling Series
MAP	Medicinal & Aromatic Plants
MAP	Medicinal & Aromatic Plants
MFP	Minor Forest Produce
MoEF & CC	Ministry of Environment , Forest and Climate Change
NAC	Notified Area Council
NAP	National Afforestation Program
NDCs	Nationally Determined Contributions
NFS	Naktideul Felling Series
NGRS	Naktideul- GCPur Rehabilitation Series
NRS	Naktideul Rehabilitation Series
NRSC	National Remote Sensing Centre, Hyderabad
NSFC	Non Sal Forest Cover
NTFP	Non Timber Forest Produce
NTOF	Naktideul TOF Series
OFA	Odisha Forest Act
ORSAC	Odisha Space Application Center , Bhubaneswar
PCCF	Principal Chief Conservator of Forests
PI	Performance Indicators



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PLWC	Plantation Working Circle
PR.WC	Protection Working Circle
PRF	Protected Forest
PSU	Public Sector Unit
RAS	Rairakhol Avenue Series
RCCF	Regional Chief Conservator of Forests
RCS	Rahan Cutting Series
REDD+	Reduce Emissions From Deforestation And Forest Degradation
RFS	Rahan Felling Series
RKM	Row Kilometer
RLFS	Rail Felling Series
RO	Range Officer
RPS	Rairakhol Planting Series
RRS	Rairakhol – Badbahal Rehabilitation Series
RTOF	Redhakhol Badbahal TOF Series
RTS	Rairakhol Thinning Series
RWC	Rehabilitation Working Circle
SCS	Sagmalia Cutting Series
SDGs	Sustainable Development Goals
SFC	Sal Forest Cover
SFP.	Social Forestry Project
SFS	Sagmalia Felling Series
SSO	Simultaneous Silvicultural Operation
SU	Sale Unit
SWC	Selection Working Circle
TOF	Tree outside the Forest
TOF	Tree Outside the forest
UNFCCC	United Nations Framework Convention on Climate Change
UTP	Urban Tree Plantation
VF	Village Forest
VFC	Village Forest Committee
VFC	Village Forest Committee
VHF	Very High Frequency
VSS	Vana Surakshya Samiti



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VSS	Vana Surakshya Samiti
WHS	Water Harvesting Structure
WPA	Wildlife (Protection) Act

2. List of Flora:

Name	Scientific Name	Family
Trees		
Acacia	<i>Acacia auriculoformis</i>	<i>Fabaceae</i>
Achhu	<i>Morinda tinctoria</i>	<i>Rubiaceae</i>
Agasti	<i>Sesbania grandiflora</i>	<i>Fabaceae</i>
Agnisikha	<i>Gloriosa superba</i>	<i>Colchicaceae</i>
Amba	<i>Mangifera Indica</i>	<i>Anacardiaceae</i>
Ambada	<i>Spondias pinnata</i>	<i>Anacardiaceae</i>
Ambta	<i>Bauhinia racemosa</i>	<i>Fabaceae</i>
Ankula	<i>Alangium lamarckii</i>	<i>Cornaceae</i>
Amla	<i>Embllica officinalis</i>	<i>Phyllanthaceae</i>
Arjuna	<i>Terminalia arjuna</i>	<i>Combretaceae</i>
Asan	<i>Terminalia tomentosa</i>	<i>Combretaceae</i>
Ashoka	<i>Saraca asoca</i>	<i>Fabaceae</i>
Aswastha	<i>Ficus religiosa</i>	<i>Moraceae</i>
Babul	<i>Acacia nilotica</i>	<i>Fabaceae</i>
Bahada	<i>Terminalia belerica</i>	<i>Combretaceae</i>
Bandhana	<i>Desmodium oojeinensis</i>	<i>Fabaceae</i>
Bara	<i>Ficus bengalensis</i>	<i>Moraceae</i>
Barada	<i>Bauhinia retusa</i>	<i>Fabaceae</i>
Barbakulia / Dhobi	<i>Delbergia paniculata</i>	<i>Fabaceae</i>
Barkoli	<i>Ziziphus jujuba</i>	<i>Rhamnaceae</i>
Baruna	<i>Crataeva religiosa</i>	<i>Capparaceae</i>
Bastura	<i>Litsea polyantha</i>	<i>Lauraceae</i>
Batra	<i>Melia composita</i>	<i>Meliaceae</i>
Behenta	<i>Limonia acidissima</i>	<i>Rutaceae</i>
Bela	<i>Aegle marmelos</i>	<i>Rutaceae</i>
Bhaincha	<i>Flacourtia indica</i>	<i>Salicaceae</i>
Bhalia	<i>Semecarpus anacardium</i>	<i>Anacardiaceae</i>
Bhendiamardan / Genduli /	<i>Sterculia urens</i>	<i>Malvaceae</i>



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Name	Scientific Name	Family
Girdhini		
Bheru	<i>Chloroxylon swietenia</i>	<i>Rutaceae</i>
Bija/Piasal	<i>Pterocarpus marsupium</i>	<i>Fabaceae</i>
Bura / Simuli	<i>Bombax ceiba</i>	<i>Malvaceae</i>
Cashew	<i>Anacardium occidentale</i>	<i>Anacardiaceae</i>
Chadaigodi	<i>Vitex peduncularis</i>	<i>Verbenaceae</i>
Chakundi	<i>Cassia siamea</i>	<i>Fabaceae</i>
Champa	<i>Michelia champaca</i>	<i>Magnoliaceae</i>
Chandan	<i>Santalum album</i>	<i>Santalaceae</i>
Chara	<i>Buchanania lanzan</i>	<i>Anacardiaceae</i>
Chauli	<i>Elaeodendron glaucum</i>	<i>Celastraceae</i>
Chhatian	<i>Alstonia scholaris</i>	<i>Apocynaceae</i>
Chhuinpatuli	<i>Stereospermum aungustifolium</i>	<i>Bignoniaceae</i>
Dalasingha/ Kumbharchikini	<i>Canthium didymum</i>	<i>Rubiaceae</i>
Damkurudu / Katarang	<i>Gardenia latifolia</i>	<i>Rubiaceae</i>
Debadaru	<i>Polyalthia longifolia</i>	<i>Annonaceae</i>
Dhala Sirisa	<i>Albizia procera</i>	<i>Fabaceae</i>
Dhaman	<i>Grewia tiliifolia</i>	<i>Tiliaceae</i>
Dhaura	<i>Anogeissus latifolia</i>	<i>Combretaceae</i>
Dhaurang	<i>Holoptelea integrifolia</i>	<i>Ulmaceae</i>
Dimiri	<i>Ficus racemosa</i>	<i>Moraceae</i>
Gambhari	<i>Gmelina arborea</i>	<i>Lamiaceae</i>
Gandhapalas	<i>Milusa velutina</i>	<i>Annonaceae</i>
Gangasiuli	<i>Nyctanthes arbortristis</i>	<i>Oleaceae</i>
Ganiari	<i>Cochlospermum gossypium</i>	<i>Bixaceae</i>
Genduli	<i>Sterculia urens</i>	<i>Sterculiaceae</i>
Ghantal	<i>Trema orientalis</i>	<i>Cannabaceae</i>
Ghodalanjia	<i>Albizia stipulata</i>	<i>Fabaceae</i>
Giringa	<i>Pterospermum heyneanum</i>	<i>Sterculiaceae</i>
Gohira	<i>Acacia leucophloea</i>	<i>Fabaceae</i>
Gotha	<i>Croton oblongifolius</i>	<i>Euphorbiaceae</i>
Gundi	<i>Mallotus philippinensis</i>	<i>Euphorbiaceae</i>
Halanda	<i>Diospyros montana</i>	<i>Ebenaceae</i>
Haldu/Kurum/Mundi	<i>Adina cordifolia</i>	<i>Rubiaceae</i>
Harida	<i>Terminalia chebula</i>	<i>Combretaceae</i>



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Name	Scientific Name	Family
Hentala	<i>Licuala peltata</i>	<i>Arecaceae</i>
Hinjala	<i>Barringtonia acutangula</i>	<i>Lecythidaceae</i>
Jaisanda	<i>Litsea sebifera</i>	<i>Lauraceae</i>
Jamu	<i>Syzigium cuminii</i>	<i>Myrtaceae</i>
Jari	<i>Ficus infectoria</i>	<i>Moraceae</i>
Jeotha	<i>Artocarpus lakoocha</i>	<i>Moraceae</i>
Kadamba	<i>Anthocephalus cadamba</i>	<i>Rubiaceae</i>
Kaitha	<i>Feronia limonia</i>	<i>Rutaceae</i>
Kaiyan / Tentuli	<i>Tamarindus indica</i>	<i>Fabaceae</i>
Kala Sirisa	<i>Albizia lebeck</i>	<i>Fabaceae</i>
Kalucha	<i>Diospyros sylvatica</i>	<i>Ebenaceae</i>
Kanchan	<i>Bauhinia purpurea</i>	<i>Fabaceae</i>
Kangada	<i>Xylia xylocarpa</i>	<i>Fabaceae</i>
Kansa	<i>Hymenodictyon excelsum</i>	<i>Rubiaceae</i>
Kapasia	<i>Kydia calycina</i>	<i>Malvaceae</i>
Karada	<i>Cleistanthus collinus</i>	<i>Euphorbiaceae</i>
Karamanga	<i>Averrhoa carambola</i>	<i>Oxalidaceae</i>
Karanja	<i>Pongamia glabra</i>	<i>Fabaceae</i>
Kasi	<i>Bridelia retusa</i>	<i>Phyllanthaceae</i>
Katakala	<i>Strychnos potatorum</i>	<i>Loganiaceae</i>
Katha Champa	<i>Plumeria rubra</i>	<i>Apocynaceae</i>
Kendu	<i>Diospyros melanoxylon</i>	<i>Ebenaceae</i>
Keruan	<i>Sonneratia apetala</i>	<i>Lythraceae</i>
Khair	<i>Acacia catechu</i>	<i>Fabaceae</i>
Khakada	<i>Casearia elliptica</i>	<i>Flacourtiaceae</i>
Kharsan	<i>Ficus glaberrima</i>	<i>Moraceae</i>
Kochila	<i>Strychnos nuxvomica</i>	<i>Loganiaceae</i>
Kodala	<i>Sterculia villosa</i>	<i>Malvaceae</i>
Kumbhi	<i>Careya arborea</i>	<i>Lecythidaceae</i>
Kurein	<i>Holarrhena antidysenterica</i>	<i>Apocynaceae</i>
Kuruma	<i>Adina cordifolia</i>	<i>Rubiaceae</i>
Kusuma	<i>Schleichera oleosa</i>	<i>Sapindaceae</i>
Lembura Moi	<i>Bursera serrata</i>	<i>Burseraceae</i>
Mahalimba	<i>Gmelina azadirachata</i>	<i>Lamiaceae</i>
Mahula	<i>Madhuca indica</i>	<i>Sapotaceae</i>



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Name	Scientific Name	Family
Manjari / Paldhua	<i>Erythrina indica</i>	<i>Fabaceae</i>
Mankadakendu	<i>Diospyros embryopteris</i>	<i>Ebenaceae</i>
Mitikinia	<i>Mitragyna parvifolia</i>	<i>Rubiaceae</i>
Moi	<i>Lannea grandis</i>	<i>Anacardiaceae</i>
Mukha	<i>Schrebera swietenoides</i>	<i>Oleaceae</i>
Mundi	<i>Mitragyna parvifolia</i>	<i>Rubiaceae</i>
Nageswar	<i>Mesua ferrea</i>	<i>Calophyllaceae</i>
Nima	<i>Azadirachta indica</i>	<i>Meliaceae</i>
Oau	<i>Dillenia indica</i>	<i>Dilleniaceae</i>
Paladhua	<i>Erythrina indica</i>	<i>Fabaceae</i>
Palasa	<i>Butea monosperma</i>	<i>Fabaceae</i>
Panasa	<i>Artocarpus heterophyllus</i>	<i>Moraceae</i>
Panigambhari	<i>Trewia nudiflora</i>	<i>Euphorbiaceae</i>
Patuli	<i>Stereospermum suaveolens</i>	<i>Bignoniaceae</i>
Phasi	<i>Anogeissus acuminata</i>	<i>Combretaceae</i>
Piasal	<i>Pterocarpus marsupium</i>	<i>Fabaceae</i>
Pitamoi	<i>Garuga pinnata</i>	<i>Burseraceae</i>
Rai	<i>Dillenia pentagyna</i>	<i>Dilleniaceae</i>
Rakta Chandan	<i>Pterocarpus santalinus</i>	<i>Fabaceae</i>
Rithaphala	<i>Sapindus laurifolia</i>	<i>Sapindaceae</i>
Rohini	<i>Soymida febrifuga</i>	<i>Meliaceae</i>
Saguan	<i>Tectona grandis</i>	<i>Lamiaceae</i>
Sahada	<i>Streblus asper</i>	<i>Moraceae</i>
Sal	<i>Shorea robusta</i>	<i>Dipterocarpaceae</i>
Salai	<i>Boswellia serrata</i>	<i>Burseraceae</i>
Salapa	<i>Caryota urens</i>	<i>Arecaceae</i>
Sidha	<i>Lagerstroemia parviflora</i>	<i>Lythraceae</i>
Simili	<i>Bombax ceiba</i>	<i>Malvaceae</i>
Sirisa (Dhala)	<i>Albizia procera</i>	<i>Fabaceae</i>
Sirisa (Kala)	<i>Albizia lebeck</i>	<i>Fabaceae</i>
Sisoo	<i>Dalbergia latifolia</i>	<i>Fabaceae</i>
Suam	<i>Soymida febrifuga</i>	<i>Meliaceae</i>
Sunari	<i>Cassia fistula</i>	<i>Fabaceae</i>
Sweta Simili	<i>Ceiba pentandra</i>	<i>Malvaceae</i>
Tala	<i>Borassus flabellifer</i>	<i>Arecaceae</i>



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Name	Scientific Name	Family
Tela keruan	<i>Ixora parviflora</i>	<i>Rubiaceae</i>
Tinia	<i>Albizia odoratissima</i>	<i>Fabaceae</i>
Shurb		
Agnijal	<i>Vernonia roxburghii</i>	<i>Compositae</i>
Anka-Koli	<i>Carissa spinarum</i>	<i>Apocynaceae</i>
Arakha	<i>Calotropis gigentia</i>	<i>Apocynaceae</i>
Arguna	<i>Cycas Circinalis</i>	<i>Cycadaceae</i>
Baincha koli	<i>Flacourtia jangomos</i>	<i>Salicaceae</i>
Basanga	<i>Adhatoda vasica</i>	<i>Acanthaceae</i>
Baula	<i>Mimusops elengi</i>	<i>Sapotaceae</i>
Begunia	<i>Vitex negundo</i>	<i>Lamiaceae</i>
Beta (Gouri)	<i>Calamus latifolius</i>	<i>Arecaceae</i>
Beta (Kanta)	<i>Calamus guruba</i>	
Beta (Pani)	<i>Calamus viminalis</i>	<i>Arecaceae</i>
Bhalia	<i>Semecarpus anacardium</i>	<i>Anacardiaceae</i>
Bhersunga	<i>Murraya koenigii</i>	<i>Rutaceae</i>
Bhuin Anala	<i>Phyllanthus niruri</i>	<i>Phyllanthaceae</i>
Bhuin nima	<i>Andrographis paniculata</i>	<i>Acanthaceae</i>
Bichhuati	<i>Tragia involacrata</i>	<i>Euphorbiaceae</i>
Chakundi	<i>Casia tora</i>	<i>Fabaceae</i>
Dhatki	<i>Woodfordia fruticosa</i>	<i>Lythraceae</i>
Dudura	<i>Datura stramonium</i>	<i>Solanaceae</i>
Durikoli	<i>Opilia amantacea</i>	<i>Opiliaceae</i>
Gangasiuli	<i>Nyctanthes arbortristis</i>	<i>Oleaceae</i>
Ghurudu	<i>Gardenia gummifera</i>	<i>Rubiaceae</i>
Giliri	<i>Indigofera pulchella</i>	<i>Fabaceae</i>
Guakoli	<i>Maba boxifolia</i>	<i>Moraceae</i>
Jhumpuri	<i>Phyllochlamys spinosa</i>	
Kantaikoli	<i>Zyziphus oenoplia</i>	<i>Rhamnaceae</i>
Khirkoli	<i>Mymuspos hexendra</i>	<i>Sapotaceae</i>
Lajakoli	<i>Mimosa pudica</i>	<i>Fabaceae</i>
Lantana (Naga airi)	<i>Lantana camara</i>	<i>Verbenaceae</i>
Lodha	<i>Symplocus racemosa</i>	<i>Symplocaceae</i>
Mamari	<i>Antidesma diandrum</i>	<i>Phyllanthaceae</i>
Mersunga	<i>Murrya koenigii</i>	<i>Rutaceae</i>



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Name	Scientific Name	Family
Mura	<i>Helectris isora</i>	<i>Malvaceae</i>
Nagairy	<i>Lantana camara</i>	<i>Verbenaceae</i>
Nalbeli	<i>Sipadesa fruticosa</i>	<i>Meliaceae</i>
Narguni	<i>Atlantia monophylla</i>	<i>Rutaceae</i>
Panijamu	<i>Wedlandia excreta</i>	
Patalagaruda	<i>Rauwolfia serpentina</i>	<i>Apocynaceae</i>
Phanaphana	<i>Oroxylum indicum</i>	<i>Bignoniaceae</i>
Pokasungha	<i>Eupatorium odoratum</i>	<i>Asteraceae</i>
Ranidantakathi	<i>Flemingi-a-chappar</i>	<i>Fabaceae</i>
Ranidanturi	<i>Desmodium cephalotes</i>	
Siju	<i>Euphorbia royalenna</i>	<i>Euphorbiaceae</i>
Soyam nai	<i>Ichnocarpus frutiscens</i>	<i>Apocynaceae</i>
Tilei	<i>Wedlandia tinctoria</i>	<i>Rubiaceae</i>
Climber		
Anantamula	<i>Hemidesmus indicus</i>	<i>Apocynaceae</i>
Asadua	<i>Capparis horrida</i>	<i>Capparaceae</i>
Atundi	<i>Combretum decandrum</i>	<i>Combretaceae</i>
Baidanka	<i>Mucuna pruriens</i>	<i>Fabaceae</i>
Banamali	<i>Jasminum arborescens</i>	<i>Oleaceae</i>
Buduli	<i>Butea Superba</i>	<i>Fabaceae</i>
Dantari	<i>Acacia Pennata</i>	<i>Fabaceae</i>
Durkoli	<i>Erycibe paniculata</i>	<i>Convolvulaceae</i>
Gaja	<i>Millettia auriculata</i>	<i>Fabaceae</i>
Gila	<i>Entada scandens</i>	<i>Fabaceae</i>
Gudamari	<i>Gymnema sylvestre</i>	<i>Apocynaceae</i>
Guluchi	<i>Tinospora cordifolia</i>	<i>Menispermaceae</i>
Kaincha	<i>Abrus precatorius</i>	<i>Fabaceae</i>
Malati	<i>Aganosma dichotoma</i>	<i>Apocynaceae</i>
Marda	<i>Millettia racemosa</i>	<i>Fabaceae</i>
Muturi	<i>Smilax macrophylla</i>	<i>Smilacaceae</i>
Raktapituli	<i>Gouarnia leptostachya</i>	<i>Rhamnaceae</i>
Satabari	<i>Asparagus racemosus</i>	<i>Asparagaceae</i>
Siali	<i>Bauhinia vahlii</i>	<i>Fabaceae</i>
Uturudi	<i>Pergularia daemia</i>	<i>Apocynaceae</i>
Grass		



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Name	Scientific Name	Family
Baguli	<i>Eulaliopsis binata</i>	<i>Poaceae</i>
Bena	<i>Vetiveria zizanioides</i>	<i>Poaceae</i>
Chhana	<i>Imperata arundinacea</i>	<i>Poaceae</i>
Dhanwantary	<i>Cymbopogon martini</i>	<i>Poaceae</i>
Duba grass	<i>Cynodon dactylon</i>	<i>Poaceae</i>
Phulchanchhuni	<i>Thysanolaena maxima</i>	<i>Poaceae</i>
Bamboo		
Daba baunsa	<i>Bambusa arundinacea</i>	<i>Graminae</i>
Salia baunsa	<i>Dendrocalamus strictus</i>	<i>Poaceae</i>
Balangi baunsa	<i>Oxytenanthera nigrociliata</i>	<i>Poaceae</i>

3. List of fauna.

Local Name	English name	Scientific name	Schedule
Mamals			
Bajra kapta	Pangolin	<i>Manis crassicaudata</i>	I
Bagha	Tiger	<i>Panthera tigris</i>	I
Badodi	Shortnosed fruitbat	<i>Cynopterus spinax</i>	IV
Banabiradi	Jungle cat	<i>Felis chaus affinis</i>	II
Barha	Wild boar	<i>Sus scrofa cristatus</i>	III
Balia kukur	Wild dog	<i>Cuon alpinus dukhunensis</i>	I
Bhalu	Black bear	<i>Melursus ursinus</i>	II
Bilua	Jackal	<i>Canis sureus indicus Hodgson</i>	II
Chittal	Spotted deer	<i>Axis axis</i>	III
Gundichimusa	Squirrel	<i>Funumbulus pennanti</i>	IV
Gurandi	Mouse deer	<i>Tragulus minna</i>	III
Hati	Indian elephant	<i>Elephas maximua</i>	I
Heta	Haeyna	<i>Hyaena hyaena</i>	III
Jhinka	Porcupine	<i>Hystrix indica</i>	IV
Kalarapatria bagh	Leopard	<i>Panthera pardus fusca</i>	I
Kokisiali	Fox	<i>Vulpes bengalensis</i>	II
Kutura	Barking deer	<i>Muntiacus mintijack</i>	III
Mankad (Hanu)	Monkey	<i>Presbytis entellus</i>	II
Mankada (Pati)	Rhesus macacue	<i>Macaca mulatta</i>	II



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Local Name	English name	Scientific name	Schedule
Musa	Rat	<i>Rattus rattus</i>	IV
Musa (nepali)	Flying squirrels	<i>Petauristaphili philippinensis</i>	I
Neula	Common mongoose	<i>Herpestes edwardsii</i>	II
Odha	Common otter	<i>Lutra lutra</i>	II
Sambar	Sambar	<i>Carvus unicolour</i>	III
Saliapatani	Small Indian civet	<i>Viverricula indica</i>	II
Reptiles			
Ahiraj	King Cobra	<i>Naja Hannah</i>	II
Ajarh	Indian python	<i>Pythonmolurus</i>	I
Chandra Boda	Russels viper	<i>Viper russelli</i>	II
Chiti	Common Indian Krait	<i>Bungarus cacruleus</i>	IV
Dhamana	Rat snake	<i>Ptyas mucosus</i>	II
Gokhar	Indian cobra	<i>Naja naja naja</i>	II
Laudankia	Common green whip snake	<i>Dryophis nasutrus</i>	IV
Pani dhanda	Checkeered keel back	<i>Natrix piscator</i>	II
Rana	Banded krait	<i>Bungarus fasiatus</i>	IV
Tampa	Monocellata cobra	<i>Naja Naja kuothia</i>	II
Lizards			
Bahurupi	Indian chameleon	<i>Chammaeleon zeylanicus</i>	
Champainali	Mabuya	<i>Mabuya bibro</i>	II
Endua	Common garden lizard	<i>Calotesversicolor</i>	
Godhi	Cargelandmonitor	<i>Vernus monitor</i>	I
Jhitipiti	House lizard	<i>Homidactylus flaviriridis</i>	I
Birds			
Bani	Indian myna	<i>Acridotheres tristis</i>	IV
Banakukuda	Jungle fowl (Red)	<i>Gallus gallus</i>	IV
Bhadabhadalia	Roller / Blue jay	<i>Coracas bengalensis</i>	IV
Bhaliakhai	Common grey born bill	<i>Tikos birostris</i>	I
Chatak	Pied crested cuckoo	<i>Clammator jacobinus</i>	IV
Dahuka	Water Hen	<i>Amanronis phoenicury</i>	
Deulia para	Pigeon	<i>Anastomus oseitans</i>	IV
Gendalia	Open billed stork	<i>Anastomus oseitans</i>	
Ghar chatia	House scarriw	<i>Passer domesticus</i>	
Gobara chadhei	Nightingale	<i>Molpates cafer</i>	
Haladi Basanta	Black headed oriole	<i>Oriolus xanthornus</i>	IV



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Local Name	English name	Scientific name	Schedule
Harada Chadhei	Partridge	<i>Creopus phoenicopterus</i>	
Kajalapati	Black drongo	<i>Dicrurus maerocerus</i>	IV
Kau (ati)	King crow	<i>Corvus splendens</i>	V
Kau (Damara)	Jungle crow	<i>Corvus macrohyreos</i>	V
Kochilakhai	Malabr pied Horn Bill	<i>Anthrococeros coronatus</i>	I
Koili	Indian cuckoo	<i>Eudynamis scolopaclus</i>	IV
Kumbhatua	Crow pheasant	<i>Cantopus sinensis</i>	IV
Kapta	Dove	<i>Streptopellchin oensis</i>	IV
Mayura	Peacock	<i>Pavo cristatus</i>	
Machharanka	Pied King fisher	<i>Ceryle rudis</i>	IV
Panikua	Little cormorant	<i>Phalacrocorax niger</i>	IV
Pecha	Owl	<i>Athena brama</i>	IV
Sari	Hyna	<i>Gracula religiosa</i>	IV
Sua	Parrot	<i>Psittacula eupilia</i>	IV
Sarguna	King vulture	<i>Sacrongyas calvus</i>	IV
Sankhachila	Kite brahmny	<i>Heliastur Indus</i>	
Turtle			
Kainchha	Land tortoise	<i>Testudo elonguta</i>	I
Pani Kainchha	Water turtle	<i>Lissemys punctan granose</i>	I
Fish			
Balia	Trout	<i>Wallagonia attu</i>	
Baligarada	Sandeel	<i>Glossogobius giuris</i>	
Bhakura	Carp / White fish	<i>Catle catla</i>	
Chenga	Gilt head	<i>Ophiocapalus gachua</i>	
Chitala	Flat fish	<i>Notopterus chitala</i>	
Dand-khiri	Grig	<i>Esomus dandrica</i>	
Illishi	Hilsa fish	<i>Hilsa ilisa</i>	
Jalanga		<i>Pangasisus</i>	
Jallah		<i>Chela argentea</i>	
Kantia		<i>Myotus cavausius</i>	
Kerandi	Minnow	<i>Barbus ambassis</i>	
Magura	Sheat fish	<i>Clarias batrachus</i>	
Mirkali	Mackerel	<i>Cirrhina mrigala</i>	
Mahurali		<i>Amblypharyngodon mola</i>	
Phali	Flounder	<i>Notopterus notopterus</i>	



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Local Name	English name	Scientific name	Schedule
Rohi	Breeding fish	<i>Labeo rohita</i>	
Serana		<i>Barbus serana</i>	
Seula	Biggudgeon	<i>Ophiocephalus striatus</i>	
Singi	Scorpion fish	<i>Heterophneustes fossil</i>	



Executive Summary

- Rairakhol Forest Division is an old division functioning since 1948 with headquarters at Rairakhol, district Sambalpur. Consequent upon re-organization of Forest Department vide Government of Odisha Notification No. No.13228 / F & E dt.08.8.2003 the erstwhile Rairakhol Forest Division was bifurcated and a portion i.e. Khalasuni Sanctuary transferred from Rairakhol Division to Bamra Wildlife Division.
- The division has also undergone further reorganization during 2009-10. During the second reorganization Subalaya & Hatlimunda section of Rairakhol & Mochibahal Range respectively have been transferred to newly Constituted Subarnapur Division w.e.f 20.01.2010.
- The division is bounded by Latitude 20° 58' 22" N to 21° 21' 48" N & Longitude 83° 59' 0" E to 84° 46' 15" E.
- The total Geographical area of Rairakhol Forest Division is 1870.67 sq. Km.
- The Rairakhol Division comprises of two CD Block, Two Tahasil having twelve RI Circle and 27 Gram panchyat.
- The total population of the Sub Division is 1,45,578. The male population is 57,690 and Female is 56,888. The male female ratio is 986 female per 1000 male.
- The SC Population is 18,490 (16.14%), ST Population is 25,498 (22.25%). The literacy percentage is 66.39%.
- The population density of the Sub division is 98.13 per Sq. Km. The area is mostly a rural tract.
- Rairakhol Division is mostly a forested division. There are 13 numbers of Reserved Forests, 16 numbers of Proposed Reserved Forests, one Village Forest and one Protected Forest. The total forest area is 1415.703 Sq. Km which constitutes about 75.67 % of the Geographical area.
- Rairakhol Division has been divided in to 6 Ranges, 19 Sections and 61 beats.
- The division has adequate buildings to house Offices, Staffs'. Many buildings are in damaged condition.
- There are 19 Forest Roads covering a length of 244.30 Km. There are three Forest Rest Houses in the division. At present there is no Check gate in the Division. All the check gates functioning previously were abolished as per Memo No.16213 dt.28.07.2018 of P.C.C.F Odisha, Bhubaneswar.
- Rairakhol Division is coming within Rairakhol Sub Division of Sambalpur District. The



tract is mostly hilly with broken plains.

- Physio-graphically, Rairakhol Division forms a part of the stable landmass of Indian peninsular. This tract is largely composed of the most ancient rocks of the earth's crust. The recent topographical features are combined result of long continued erosion at hills and upliftment at plain.
- Champali Nala divides this Division into two parts. The forest block named as Hatidhara, Bindhybasini, Landimal, Rail, Nadia etc are lying in the eastern part of this Division with a highest altitude of 565.00 mt above the mean sea level.
- The forest blocks named as Landakot, Kholgarh, Sagmali, etc are lying in the western part of this Division with a highest altitude of 598.00 mt above mean sea level.
- Harihar jhor is marked as the western boundary line of this Division from river Mahanadi to village Ganja. River Tikira flows on the bordering to Northern boundary of this Division.
- Most of the areas are hilly and undulating. A narrow plain extends from Hirajor to Kundeijari via-Naktideul and separates Khalasuni Sanctuary of Bamra (W.L) Division from Rairakhol Division.
- There is no major River System in the Division. The River Mahanadi flows on South and Tikira River on North. The tract has a slope towards northern side. The drainage pattern is distinctly divided in to two half's i.e. towards River Mahanadi and towards Tikira / Brahmani.
- Geologically the area is divided into two main groups. (i) Archean group (ii) Lower Gondwana group. Archean group is found in most of the hill ranges and valleys, where as lower Gondwana group is marked in isolated low hills and low lying valleys.
- In addition to the above, another two groups of geological formation are noticed in this tract, which are (i) Intrusive and (ii) Recent. Roughly the area to the east of Karandi jhor up to Rairakhol and then a line drawn from Rairakhol to Naktideul comes under Gondwana group.
- A large part of the area under this division has quite rugged surface. Soil and Alluvial tracts are very much limited to narrow flat plain along the valleys between the hills.
- The soil of this tract can be broadly classified as Black Soil (Vertisol), Saline alkaline Soil, Brown Soil, Lateritic Soil, Reddish Soil:
- The division experiences three distinct seasons in a year i.e. summer, Rain and winter. Summer is from March- June, Rains from July to October and winter from November



to February. Due to away from the sea, the climate is supposed to be extreme but due to highly dense forested area the climate is ameliorated. The rainfall is comparatively high and winter is little cooler than other parts of the district.

- The average rainfall is about 1300mm. The number of rainy days is above 65 days in a year which helped the growth of forests. As per the data furnished above, the rainfall in this tract is irregular. Due to change of rainfall pattern, the condition and composition of the vegetation differ from Northern part to that of Southern part of this Division. The southern part experiences better rainfall than that of Northern part of the division.
- The temperature pattern depicts a fluctuating upper and lower range of temperature. This is due to erratic behavior of climate in this tract. The presence of good forest always influences the temperature regime of the locality. The average temperature during May goes up to 45°C and minimum during December goes down to 6°C.
- Rairakhhol is a table land with high hills and plains. No major river is flowing in the division. The flood in Mahanadi / Tikira does not affect the division. No flood is experienced during last decade or so.
- Rairakhhol is about 200 km from sea / Bay of Bengal. The effect of Cyclonic storm in Bay of Bengal only brings heavy rainfall to this tract. No cyclone above 40-50 Km wind speed has been experienced in this tract.
- This division does not experience any frost during last decades. It has no effect on Forest crops of Rairakhhol division.
- The tract does not experience severe drought in recent past. Though rainfall is erratic to some extent, drought like condition didn't arise during last 5 years. There is no forest crop loss / retardation due to drought.
- The outgoing plan was by Sri Sankarsan Behera, OFS –I (SB). The plan period was 2007-08 to 2016-17. The plan was prior to second reorganization i.e. 01st January, 2010. The forest blocks transferred from Rairakhhol Division are not considered in this current revised plan.
- In the outgoing plan there was eight Working Circle out of which two Working Circle are independent WC and rest are overlapping Working Circle.
- The total boundary length of Rairakhhol Division is 286.00 km. the natural boundary is only 6.9% whereas artificial boundary is 93.1%. Out of total Boundary pillar for RF, PRF and DPF 34.7% is in good condition where as the rest is either damaged or missing.



Hence it is inferred that the boundary of forests are not secured.

- Conditions of the boundary pillars of PF and VF have not been assessed.
- Considering the ground reality, it is proposed to have a boundary maintenance Cycle of 5 years.
- The forest of Rairakhol Division comes under the major group Tropical Forest on the basis of “Champion and Seth revised classification”. Three Varieties of sub-type 3C/C2e (Moist peninsular Sal) occur in different blocks and compartments. One Type of sub-group 4C (Tropical fresh water swamp forest) occurs in both the side of perennial and semi perennial Nala flowing in this Division. Four Types of sub-group 5B (Northern tropical dry deciduous forest) occur in different blocks and compartment.
- Besides the notified forest areas of the Division (RF, PRF, DPF and VF) there are many revenue forest areas, Avenue plantations, and fuel & Fodder plantations raised by department contribute to Tree Outside the Forests (TOF).
- From Social Forestry Project period; Farm Forestry is being patronized by the Govt. by free distribution of seedlings.
- The TOF are integrated contribution of Plantations taken up outside the conventional Forest area by Forest Department, Horticultural plantation and other department.
- Plantations raised by private individuals in their fellow land and back yard, Agro Forestry practices, Avenue Plantations, Institutional Plantations also contribute to TOF. .
- Shifting Cultivation is not in practice in this tract of forest.
- The Forests of Rairakhol Division are mostly Sal Forests. Due to biotic interference and reduced number of rainy days vegetation is marching towards dryer tract. Mixed vegetation with Sal as a primary Species are observed in many forest blocks.
- Bamboo is also occurring in a greater extent of the division.
- The Species diversity varies from Pure Sal crop to dryer mixed vegetation. For working Plan purpose enumeration has been taken up on Sample Point basis as per National Working Plan Coad-2014. The NRSC / (ORSAC) have provided analysis report for 970 Sample points.
- At each Sample point 0.1 ha area (mostly a Square Plot) have been enumerated and analyzed.
- A diversity index (also called phylogenetic or Simpson's Diversity Index) is a quantitative measure that reflects how many different types (such as species) there



are in a dataset (a community) and that can simultaneously take into account the phylogenetic relations among the individuals distributed among those types, such as richness, divergence or evenness.

- These indices are statistically representations of biodiversity in different aspects (richness, evenness and dominance).
- There are Six Ranges in the division. Each Range is taken as strata. There are 970 Sample plots of 0.1 ha (31.62 m Sq) in each range. Data for four Sample Plots from each Range have been analyzed for Bio Diversity index) to find out Shannon-Weiner Species Diversity Index, Evenness Index, Index of Dominance using the formula.
- Rairakhol Forest Division is not in limelight on Bio Diversity Conservation point of view. The forests are mainly a Sal Forest. Due to high Density prevalence of other species is low.
- No specific steps have been taken on Bio Diversity Conservation Measures. Steps have been initiated to prepare Peoples Bio Diversity Register in various Panchyats after constitution of Bio Diversity Committee in Panchyat / Blocks.
- The forest of Rairakhol Division is prone to over exploitation due to heavy demand on timber and building materials. Sal, Bija, Pahadi sisoo, Kuruma, Kashi has been exploited beyond the delivery capacity.
- Now Bija, Pahadi sisoo are becoming rare species in forests. Sal due to its vigorous coppicing capacity and fire hardy nature is surviving the threat.
- Due to unscientific collection methods of NTFP, Species like Barun, Kochila, Manjusha, Panki, Paldhua, Sunamukhi, Tamul, Bal Harida, Bhumi Kusmanda etc. are becoming rare and species like Amla, Kuturi, Gudmari, Chhatiana, Meda, Bidanga are on the verge of being threatened one.
- There is no Rare and Endangered species in the forests of Rairakhol Division. Due to over exploitation Bandhan, Pahadi Sissoo, Bija, Kuruma are seems to be pushed to a tight corner and can be remarked as threatened. Time has reached to be careful about propagation & conservation of these species from being extinct in this area.
- The forests of Rairakhol Division is adjacent to Khalasuni Wildlife Sanctuary (Before reorganization of Forest Department it is with Rairakhol Division). Forests of this division is well stocked with crown density more than 60%. It gives a good shelter to animals. Animal from Sanctuary freely comes to this division. Animal concentration is quite good in the division.



- The most commonly observed fauna of this region are Elephant, Leopard, Sloth Bear, Jungle cat, Hyena, Wild boar, Spotted Deer, Barking Deer, Sambar, Porcupine, Fox, Jackal, Mongoose etc.
- The common birds found are Peafowl, Jungle fowl, Green Pigeon, Grey Partridge, and Golden Oriole etc.
- Tal-Kholgarh Corridor connects Tal RF with Kholgarh RF and Landakot RF thereby maintains connectivity of elephant population between Khalasuni WLS with Satkosia WLS through Baruni, RF (East & West) and Raun RF.
- National Highway-55 and railway track connecting Angul and Sambalpur districts pass through the corridor. Heavy traffic on NH-55, infrastructure development along the highway has been affecting elephant movement.
- Proposed expansion of highway for four lanes and railway for double lanes will aggravate the condition. Elephants cross the railway track between Kuhu and Purunagarh villages.
- This landscape has a network of Tiger Reserves interspersed with forest patches or corridors. These corridors fall outside the definition of Protected Areas (PAs) thus making them highly susceptible to degradation, fragmentation and increasing poaching pressure. Increasing urbanization and developmental activities on corridors threaten the long-term viability of tigers in India.
- In Rairakhol division Tiger landscape has been identified in Naktideul Range. The forest area coming within 1.5km on both sides of Central line has been identified for maintaining Tiger landscape.
- Construction of New Roads / up gradation of existing road net work exerts pressure on Forest Land. This depletes forest wealth as well as fragments the habitat leaving the animals in isolation.
- Similarly the transmission lines are being drawn in all rural / urban areas and it passes through forests. Electrocutions of animals are frequently observed.
- Now as it is observed the Forests are more or less confined to Hills / Ridges. Plain Forests are decreasing day by day and are subject to much biotic pressure.
- Animals are withdrawing from forest fringes and concentrating on inaccessible pockets of Forest.
- Day by Day the rainfall is erratic and number of Rainy days in a year is decreasing. The nalla / Rivulets are drying up and in summer it became dry. The animals face water



scarcity. Sometimes, in search of water they come to nearby habitation and endangered their life.

- From satellite imagery study and experience, it is observed that the crop density is more or less is declining and more forest blocks are being managed under Rehabilitation Working Circle.
- Reasons for such depletion / thinning of over wood resulted in depletion of cover to animals. Due to lack of camouflaging the animals became easy prey to predators.
- The forests of the tract are becoming more dryer due to annual fire, reduced rainfall and reduced rainy days, grazing beyond its carrying capacity, compacting of soil, increased runoff, top soil erosion etc.
- The plant community is gradually regressing towards thorny, unpalatable, stunted seral stage rather than improving towards climax.
- In the process the forest lacks quality food / fodder to herbivorous. Due to lack of micro organisms, bears, wild boar etc are facing scarcity of food stock.
- All the forests of Rairakhol Division are of deciduous nature mixed with Bamboo in few blocks.
- Annual Fire is a common occurrence which destroyed the ground flora, regeneration, humus layer and affects the living of animals.
- Though adequate steps are being taken by department, it is felt the need to associate the VSS, general public in an intensive manner to combat fire menace.
- The forests are freely assailable to the public throughout the year though it is legally prohibited.
- Lopping of branches, cutting of trees for fodder for cattle, Goat etc is a common phenomenon. It always breaks the tranquility of wild animals. It seriously hampered the breeding, movement and always in a state of disturbed environment and grazing related problems.
- There are ten salt licks being maintained in the division. These are at Sagmalia RF, Landakote RF, near Balikiary Village, Landimal RF, Mahaling Sirini Mandir, Seizure yard of Naktideul, Rengali-Badmal PRF.
- Regular Public awareness camps on various occasions like Wildlife week, World Forest Day, national Wetland day are being conducted at division level and range level.
- Regeneration survey has been conducted during point sampling enumeration. The procedure followed is as per Para 74 of the National Working Plan Code-2014.



- From recorded data it is observed that the regeneration is good but in whippy stage for Sal and moderate for other important species.
- Bamboo is available to a greater extent. All culms occurring in the clump has been enumerated as per different classes of National Forest Inventory and these data has been used to assess the availability of bamboo/rattan using post stratification for a management unit as per the methodology adopted by FSI.
- Data from plot enumeration has been used to estimate the number of clumps per management unit (compartment, village or any other unit) and inference has been derived basing on the following criteria.
- The major causes of fire in forests of Rairakhol Division are enumerated in the text for better understanding of the nature of the fire and how to Control & Manage.
- Normally the forests experience Ground Fire in general. No Crown fire has been noticed in forests of this division.
- Burning of forest floor for local people / cultivators / cow herd boys etc. for good growth of grass.
- During winter (November to February), people of locality and far places visit important places in Forest & do their picnic. After Picnic Un-extinguished and unattended fires sometimes caused accidental fire.
- Burning of fallen woods / Green timber for preparation of Charcoal, sometimes spread to nearby Forest, if not properly attended.
- Un-extinguished cigarettes or bidi butts being thrown by passerby leads to break out of ground fire.
- Collectors of NTFP sometimes set fire to get better harvest / yield.
- To prevent movement of wild elephants to a particular region / part, people may set fire to scar them. This fire became wild and causes Forest Fire.
- Encroachers set fire to clean the encroached area free from debris.
- Some cultivators set fire to get ashes into their crop land through runoff water to provide organic manure to nearby agricultural field.
- The Rairakhol Division are having 415 villages [Rairakhol Block- 214 village – habitated 188, unhabitaed26, Naktideul Block- 201 village habituated-172, Unhabitated- 29] The Cattle , Goat population is high. The livestock used to graze in forests and have an adverse effect on regeneration and establishment of tree crop.
- Lopping in some species retarded the growth. Fruit / flower bearing capacity also



reduced due to frequent lopping.

- In some first growing species and fodder species lopping is part of management practice.
- In forest lopping of Sisoo, Ghambar, Bija, Kubhi, Zyziphus for fodder and Sal, Siali, Bela for leafs, Amnla, Char, Kendu, Harida and Bahada for fruits have serious retarding effect on growth.
- The weeds affected area is very high and constitutes about 6.7 % of the total forest area under RF/ PRF & DPF combine. It is in alarming stage. Immediate precautionary measures are required to be initiated.
- In course of implementing working plan prescriptions, ANR (Aided Natural Regeneration), Plantation and various Soil & Moisture Conservation measures are being taken up in the division.
- In all forest vegetation improvement activities Soil & Water Conservation Measures are being implemented.
- Creation of Water body throughout the Division in all RF/ PRF/ DPF has been taken up under various programs specially for wildlife managements. This helps in retention of water and improves moisture regime in the locality.
- The aquifer is gradually recharged. Due to proximity of River Mahanadi and Rairakhol being a table land, the ground water position is below normal.
- Hydrogeology of Sambalpur district can divide into two major hydro geological units, viz; (1) Consolidated formations comprising of hard rock's of Precambrian age occupying 85% of the area and (2) Semi consolidated rocks of Gondwana Super Group occurring in pockets in northern and southern eastern parts.
- Overall ground water quality in Sambalpur district is good for drinking, industrial and irrigational uses.
- All the chemical constituents, particularly electrical conductivity, fluorides, arsenic and iron are within the permissible limits. There is no instance of presence of chemical constituents beyond permissible limits in observation wells of Sambalpur district excepting some isolated instance of occurrence of higher electrical conductivity value in patches and Fluoride value of 3.7 ppm at Daicha and 1.7 ppm at Jugipalli.
- pH in the range of 7 to 8.5 shows ground waters of phreatic aquifers are slightly alkaline.
- Some decline in depth to water level conditions are observed particularly during pre-



monsoon summer season in south western part of district in Rairakhol block where pre-monsoon depth to water levels reaches up to 10 meters below ground levels.

- The Growing stock has been estimated basing on Sample enumeration carried out at 1133 Sample points furnished by NRSC (Data analysis carried out for 970 sample points).
- The field staff enumerated the trees available within 1000 m² taking the Sample points on the centre of the Square of 31.623m side. The collected data has been analyzed.
- On analysis the Growing stock in each forest block has been computed.
- Data analysis report has been obtained for 970 points from NRSC, Hyderabad.
- From the graphical representation it is observed that, in Sal Forests composition of Sal is about 50% of the total crop where as in Miscellaneous (Non Sal Forest) Forest, the Sal percentage is about 10-15% of the crop.
- The total Growing Estimated to be 101.28 lakh cum (10.1 MCum).
- There are bamboo forests in the division covering an area of 13821.014 ha. Bamboo has been encountered during Sample point enumeration.
- The number of clumps above 125 numbers per ha is observed over 30% of the bamboo forests. Number of bamboo clumps in between 60- 125 per ha is over 45% of the bamboo area. Rest of the area under bamboo is considered to be in a stage of degradation. The Growing stock is about 3 times of harvestable bamboo i.e. 167835 SU equivalent to 1.68 lakh Ton.
- The average yield per annum is estimated to be 13900 SU. Safe harvestable limit is 8000 SU per annum. This may be considered as Standard for this Division.
- It is observed that Sal is of Quality Class II/III in moist areas where as it is of III/ IV quality Class in a dry low altitude areas.
- Improvement of Soil quality by SMC will enhance the quality of Forest coupled with rigid Fire protection
- The total carbon stock in Rairakhol Division (For RF/DPF/PRF) is estimated to be 30.17x10⁵ Ton which is sequestered Carbon dioxide equivalent to 110.65x10⁵ T.
- Considering the coupe working from 2007-08 to 2016-17, 88543.15 ha of Forest has been worked out as regular coupe and 51619 trees have been marked and felled. Number of trees marked per ha is 0.582 and productivity is 0.281 cum per ha.
- Though there was six cutting series prescribed for Bamboo Working in the outgoing



plan. No bamboo coupe was worked out and production of bamboo is NIL.

- Most of the available NTFP & MAP are now collected by the registered collectors under Gram Panchyat jurisdiction.
- Records of removal of NTFP except Sal leaf are not available. Kendu leaf is also produced in this tract. Sal leaf locally collected for own consumption.
- Rairakhol Division is rich in Kendu leaf. Rairakhol KL Division and Athmalik KL Division (Part) are working in the area. Siali climber is available in Moist Deciduous Forest of this Division. Its concentration is high in Badmal and Girishchandrapur Range. Leafs are used for making Plates / Chaupati. Its fiber is also collected for bundling of Kendu leaf during processing of Kendu Leaf.
- From the leaf & fiber primary collectors are getting a good price.
- There is no Licensed Saw Mill in Rairakhol Division.
- One Timber and Firewood depot is being maintained at Rairakhol By Odisha Forest Development Corporation Ltd.
- Regarding NTFP, the supply is rapidly falling and their secured market is not available. The price is decided mostly by purchasers. Except collection of Mahua Flowers, Kanta badhuni, Sal leaf, Siali leaf & Fiber, char seed and honey others are not so lucrative and assured market.
- Kendu Leaf being a nationalized NTFP, its collection & trade is systematic and remunerative to people. Many welfare schemes are also launched by Government to attract people to this trade. Bamboo an important NTFP is also in a decline condition.
- As a whole, the NTFP demand is comparatively very high but the supply is much below the expectation.
- There is no record of Import & Export of wood and wood products to this division during last five years.
- There is no record available about import & export of NTFP to / from the division except Kenduleaf.
- Kendu leaf is normally exported to Sri lanka, Bangladesh etc by traders.
- In Rairakhol Division there are 160 VSS in operation.
- Plantations have been raised in this division during Social Forestry Project during 1985 onwards till 1995 which has been declared as village forest under section 30 of the Odisha Forest Act, 1972. These forests are being managed by VFC (Village Forest Committee) as per Odisha Village Forest Rules, 1985.



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

- For uplift of labours, occasional health camps, Skill up-gradation training camps are being conducted by the department. No such camps have been organized within last five years.
- There are number of Sacred Groves in the Division which is being maintained by the department.
- There is no Site in the Division for development of Eco Tourism.
- Under Forests Rights act, 2006 till December'2018 1099 cases has been decided in favour of applicants and 815.961 hectares (2288.91 Ac) of Forest land has been given to Tribal's under individual category.
- Forest land has been diverted for Non Forestry used in 25 cases involving 11.8585 ha of Forest land Forest land under FRA Provisions.
- Forest land diverted under Forest (Conservation) Act, 1980 for various projects is 616.524 ha.
- The JFM Resolution 2011 has elaborated the rights & responsibilities of VSS.
- Similarly the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 has admitted certain rights & concessions to forest dwellers. Besides the above there are no other rights & concessions admitted for the public.
- The major NTFP on which the livelihood of people depends are Kendu Leaf, Sal leaf, Sal Seed, Mahua Flower & Cornel, Siali Leaf & Fiber and Bamboo to a major extent. It's collection & earning supports about 25% of their income annually.
- Kendu leaf wings of the Forest Department recently lunched various welfare schemes for the labour engaged in Kendu leaf operation. Besides group insurance, support for children's education, daughter's marriage and other facilities to improve their skill & efficiency are being provided.
- For management of Forests, regulation of forest produce, protection of Wildlife, For collection & use of NTFP various Acts, Rules and Regulation, policy have been framed by the Central Government and State Government.
- This revised plan comprises the entire area of the Division (All RF, PRF, DPF, VF and PF). On event of its approval it will be for the period from 2021-22 to 2030-31 (For 10 years i.e. 1st April 2021 to 31st March 2031).
- In course of preparation of Plan modern techniques has been adopted to estimate the Growing Stock, Carbon sequestration and Crop density. The village forests of the erstwhile Social Forestry Project have been included in this plan to have a better



management of forests created under participatory approach.

- There is no case of violation under Forest (Conservation) Act, 1980.
- There are no research activities in Rairakhol Division.
- The budgetary allocation under various sub head is furnished below. The total State plan, Non Plan & Central plan was Rs 72.8 lakh during 2008-09 and has increased many folds till date.
- Besides the regular staffs, there are protection squads, fire fighting squads, elephant trackers to assist the regular staffs in the field.
- Considering the workload, various schemes under implementation, it is felt that more ministerial and technical staffs at grass root level (Forest Guards and Foresters) are required to be deployed for better management of forest & wildlife.
- It is also felt to have full-fledged computer cell and GIS Cell to monitor the work, prepare maps and study the growth of plantations through satellite imagery.
- In 1931 Mr.F.A Hart, the Agency Forest Officer introduced Selection-cum-Improvement system of working with a felling cycle of 30 years. He had set up four felling series with exploitable girth of 135 cm (4'6") in each felling series.
- Mooney's Plan (1942 to 1957) was the first regular Working Plan of Rairakhol State, which was prescribed for the management of 14 number of Reserve Forest covering an area of 309178.00 acres. It came into operation from October 1942 and continued up to 1960. Revision of this Plan could not be completed in time, which resulted in continuity of the Plan period from September 1957 to 1960. Sri A.P. Mohanty's Plan (1961-62 to 1980-81).
- Sri A.P.Mohanty, A.I.F.C, Plan covered 14 Reserve Forest of total 247851.1 acres. Sri A. N. Nath's Plan (1982-83 to 2001-02).The area covered in this plan included 19 blocks covering an area of 107613.0 ha. In order to achieve the objectives five Working Circle were constituted. These are Selection Working Circle, Coppice Working Circle, Teak Plantation Working Circle, Rehabilitation Working Circle & Bamboo Overlapping Working Circle.
- For management of 13 DPF covering an area of 7188.02 ha Working Schemes were prepared and implemented
- M.R Panda's First Scheme (1981-82 to 1990-91): The scheme covered 13 Demarcated Protected Forest blocks covering an area of 7188.02 ha. Selection and Bamboo over lapping Working Circle were formed in this scheme.



- M.R Panda's Second Scheme (1982-83 to 1991-92): In this Scheme 5 number of demarcated protected forest blocks covering an area of 997.182 ha was included. All the blocks were allotted to Selection Working Circle and only one felling series was formed with felling cycle of 20 years. Exploitable girth of different species was fixed but rotation had not been fixed.
- Sri Sankarsan Behera Plan: (2007-08 to 2016-17): The outgoing Plan was by Sri Sankarsan Behera. It was for the period 2007-08 to 2016-17. This plan includes part of the areas coming under Birmaharajpur Sub division and subsequently transferred to Subarnapur Division. (These are under erstwhile Rampur range and Mochibahal Range).
- The total area included in this Plan was 107488.52 ha (RF, PRF, DPF, and VF).
- For management of forests two independent Working Circle and Six Overlapping Working Circle were constituted. These Working Circles are Selection Working Circle (88543.15 ha), Rehabilitation Working Circle (18945.37), Plantation (O) Working Circle, Non Timber Forest Produce (O) Working Circle, Bamboo (O) Working Circle, Protection (O) Working Circle, Joint Forest Management (O) Working Circle, Wild Life Management (O) Working Circle.
- The outgoing Plan has expired on 31st March 2017. Though the PWPR (Preliminary Working Plan Report) has been approved in time, the final working plan could not be prepared and submitted in time.
- To continue working annual working schemes have been prepared on the same line of outgoing plan with same working Circles.
- Rairakhol Forest Division is one of the good moist forests of the State. It is a combination of Plane Forests, Hill Forests, Valley Forests and Riparian Forests.
- To assess the Growing stock Sample enumeration has been taken up over 1133 points. Analysis by NRSC has been carried out over 970 Sample points through various modeling by NRSC, Hyderabad. The growing stock has been assessed.
- It is observed that Non Sal Forest area (15.52%) and Sal Forest is of 84.48%. The species composition in Most of the Forest is Moist Sal. Non Sal Forest is of Dryer Tract.
- Due to biotic interference Sal forests are becoming dryer and being replaced by miscellaneous forest.
- From Bio diversity point of view though mixed forest are preferable from other aspect Sal should be maintained at a Climax stage in this tract. All out efforts are to be made



to improve moisture regime to protect Sal at this Climatic Stage.

- The carbon Stock of the Division has been estimated to be 4026.24 x103 Ton of Carbon which is equivalent to 14762.89 x103 Tons of Carbon Dioxide (Forest & TOF Combined).
- The objectives of this working plan is to provide a basic approach for sustainable management of forests and preserve its biodiversity in light of the National Forest Policy, encompassing the ecological (environmental), economic (production) and social (including cultural) dimensions.
- The objectives for attaining this goal include conservation of forests and reducing forest degradation, maintenance and enhancement of ecosystem services including ecotourism, enhancement of forest productivity together with establishment of regeneration to improve forest health and vitality as per ecological and silvicultural requirements of the species, progressively increasing the growing stock and carbon sequestration potential, maintenance of biological diversity, sustainable yield of forest produce, prevention of soil erosion and stabilization of the terrain; improvement and regulation of hydrological regime; people's involvement in planning and management of forests fulfilling socio-economic and livelihood needs of the people.
- The sectors of consideration are Dynamics of Forests and Stands, Forests and Soil, Forests and Water, Forest Biodiversity, Climate and Forests, Socioeconomic Considerations and generation of forest based employment opportunities and livelihood options.
- The Working Circles have been constituted for scientific management of available forest resources of the Division. These are Selection Working Circle (80468.466 ha), Rehabilitation Working Circle (9995.9725ha), Plantation Working Circle (455.0830 ha), Protection Working Circle (10937.910 Ha), Bamboo (Overlapping) Working Circle (13821.014ha), Non Timber Forest Produce (Overlapping) Working Circle (101761.1785 Ha), Wildlife (Overlapping) Working Circle (101761.1785 Ha), Joint Forest Management (Overlapping) Working Circle (5506.50 Ha) and TOF Working Circle (4157.69 ha +414 RKM Avenue Plantation).
- In total it is proposed to have Nine Working Circle. Out of these working circles, Four Working Circle will have independent area where as other four Working Circle will have overlapping jurisdiction. The TOF (Tree outside the Forest Area) Working Circle does not cover any RF/ PRF or VF.



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- Prescription in short has been furnished at Chapter 26 (Summary of Prescriptions).
- For implementing the prescriptions on an average Rs 50 crores will be required per annum.
- On implementation, it is expected the forests will be maintained at a Climatic Stage with Sal as a major constituents.
- Carbon Sequestration will be enhanced at a rate of 2-3% per annum.





REVISED WORKING PLAN OF RAIRAKHOL FOREST DIVISION PART-I.





CHAPTER-1

THE TRACT DELT WITH

1.1 Name and Situation:

Rairakhol Forest Division is an old division functioning since 1948 with headquarters at Rairakhol, district Sambalpur. Consequent upon re-organization of Forest Department vide Government of Odisha Notification No. No.13228 / F & E dt.08.8.2003 the erstwhile Rairakhol Forest Division was bifurcated and a portion i.e. Khalasuni Sanctuary transferred from Rairakhol Division to Bamra Wildlife Division. (Annexure- I). The division has also under gone further reorganization during 2009-10. During the second reorganization Subalaya & Hatlimunda section of Rairakhol & Mochibahal Range respectively have been transferred to newly Constituted Subarnapur Division w.e.f 20.01.2010 vide notification No.17803/ F & E dt.27.10.2009 of Govt. of Odisha, F&E Department (**Annexure-II**).

After reorganization, the Rairakhol Division is limited to Rairakhol Sub Division of Sambalpur District except Khalasuni Wildlife Sanctuary which has been transferred to administrative control of Bamra Wildlife Division. The division is bounded by $20^{\circ} 58' 22''$ N and $21^{\circ} 21' 48''$ N latitude and $83^{\circ} 59' 0''$ E and $84^{\circ} 46' 15''$ E longitude. The reorganized division's boundary is described as follows.

North: Bamra (Wild Life) Division and Deogarh Division,
 South: Boudh Division and Athamallik Division,
 East: Athamallik Division and Angul Division,
 West: Sambalpur Division.
 South-West: Subarnapur Division

The division finds place in Survey of India Toto sheet as furnished below.

Table 1.1 Survey of India Topo Sheet

New No	Old No	New No	Old No	New No	Old No
F45M3	73 C/3	F45M11	73C/11	F44R16	64O/16
F45M4	73C/4	F45M12	73C/12	F45S1	73D/1
F45M7	73C/7	F45M15	73 C/15	F45S5	73D/5
F45M8	73C/8	F45M16	73 C/16	Total 11 Sheet	



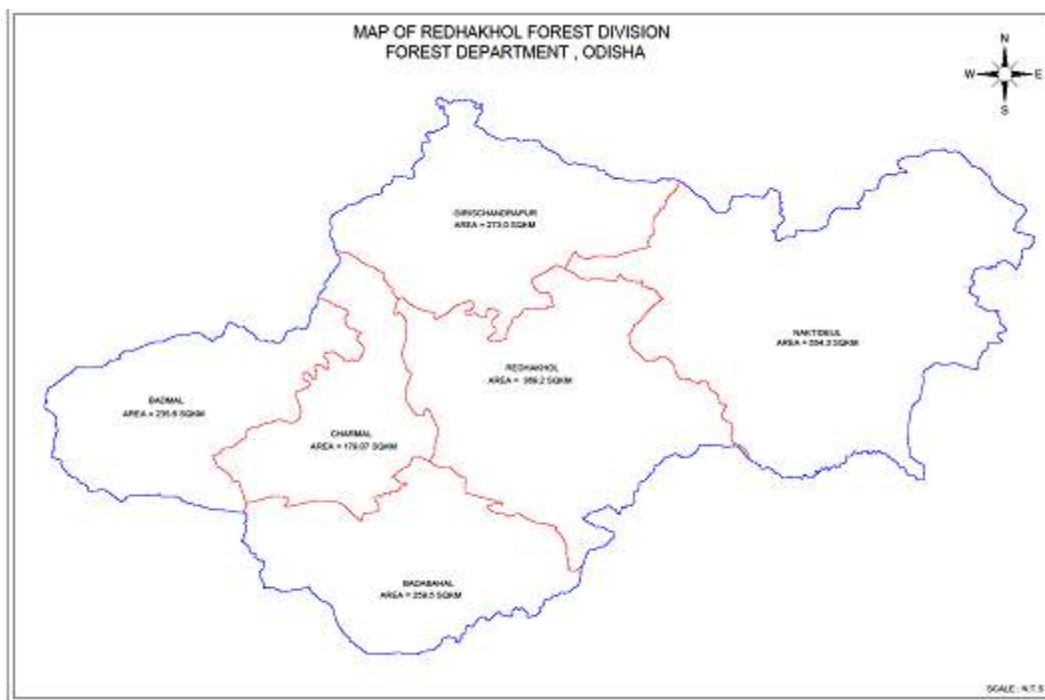
1.1.1 Geographical Area:

The total Geographical area of Rairakhol Forest Division is 1870.67 sq. Km. The Rairakhol Division comprises of two CD Block, Two Tahasil having twelve RI Circle and 27 Gram panchyat. There are three Police Station namely Rampur PS, Charmal PS and Naktideul PS. The population of Rairakhol Sub division / Forest Division is as follows (**Table No 1.2**).

Table No 1.2 Demographic Profile of Rairakhol Sub division.							
Name of PS (census Code No)	No of House Hold	Total Population	Male	Female	SC	ST	Literate
Charmal P.S (02796)	7268	29526	14876	14650	4565	9418	19607
Rairakhol P.S(02797)	12920	55502	28064	27438	7981	10343	37440
Naktideul P.S(02798)	6935	29550	14750	14800	5944	5737	19027
Total	27123	114578	57690	56888	18490	25498	76074
Percentage			50.35	49.65	16.14	22.25	66.39
Source: census data 2011							

The total population of the Sub Division is 1,45,578. The male population is 57,690 and Female is 56,888. The male female ratio is 986 female per 1000 male. The SC Population is 18,490 (16.14%), ST Population is 25,498 (22.25%). The literacy percentage is 66.39%. The population density of the Sub division is 98.13 per Sq. Km. The area is mostly a rural tract. The range and their jurisdiction is furnished at **Table No -1.3**

Table No 1.3- Ranges & their Jurisdiction:				
Sl No	Name of the Range	Name of Tahasil / CD Block	Area in Sq. KM	Important Township / Municipality / NAC
1	Rairakhol	Rairakhol / Rairakhol	369.2	Rairakhol Municipality
2	Badbahal	Rairakhol / Rairakhol	259.5	-----
3	Charmal	Rairakhol / Rairakhol	179.07	-----
4	Badmal	Rairakhol / Rairakhol	235.6	----
5	Naktideul	Naktideul / Naktideul	554.3	-----
6	Girishchandrapur	Naktideul / Naktideul	273.0	-----
	Total	2 Tahasil / CD Block	1870.67	



1.1.1 Forest Area:

Rairakhol Division is mostly a forested division. There are 13 numbers of Reserved Forests, 16 numbers of Proposed Reserved Forests and one Village Forest. The legal class wise forests and area is furnished in **Table no 1.4**.

Table No 1.4 Forest areas in Rairakhol Division.

Sl No	Category of Forest	Number of Blocks	Area in Ha	Percentage
1	Reserved Forest	13	89051.10	62.90
2	Proposed Reserved Forest	16	9103.10	6.43
3	Demarcated Protected Forest	15	2751.10	1.94
4	Village Forest	1	30.00	0.02
5	Protected Forest	1	38.393	0.03
6	DLC Forest		40596.70	28.68
7	Rev. Forest (Other than DLC)			
	Total Forest area.	46	141570.393	100.00

The total forest area is 1415.703 Sq. Km which constitutes about 75.67 % of the Geographical area.



1.1.2 Administrative Setup:

Keeping administrative convenience in consideration, the Division has been sub divided to Ranges, Ranges in to Sections and Sections in to beats. Beat is the smallest unit of administration. Rairakhol Division has been divided in to 6 Ranges, 19 Sections and 61 beats as detailed in **Table No 1.5**.

Table No 1.5 Administrative Structure of Rairakhol Division.

Sl No	Name of Range / Hqs	Name of Section / Hqs		Name of Beat/hqs		Coordinate of Hqs.
1	Redhakhol N21 04 05.38 E84 20 26.51	1	Rampur N21 ⁰ 04' 05.92" E84 ⁰ 20' 26 .62"	1	Rampur	N 21 ⁰ 04' 05.38" E 84 ⁰ 20 26.51"
				2	Redhakhol	N21 ⁰ 04 '28.05" E84 ⁰ 21 13.39"
				3	Kalindar	N21 ⁰ 04' 05.44" E84 ⁰ 20 25.56"
		2	Burda N21 ⁰ 07' 20.48" E84 ⁰ 19' 23.84"	4	Burda	N21 ⁰ 07' 21.16" E 84 ⁰ 19 22.52"
				5	Bantoloi	N21 ⁰ 10' 36.11" E 84 ⁰ 17 21.61"
				6	Jharapada	-
		3	Daincha N21 ⁰ 09' 57.85" E 84 ⁰ 25' 35.94"	7	Daincha	N21 ⁰ 09' 57.84" E 84 ⁰ 25 36.00"
				8	Terbeda	N 21 ⁰ 07' 23.48" E 84 ⁰ 23 38.20"
				9	Gogua	-
				10	Sardhapur	N 21 ⁰ 12' 13.91" E 84 ⁰ 27 18.73"
		4	Luhapank N21 ⁰ 04' 14.69" E 84 ⁰ 24' 19.29"	11	Luhapank	N 21 ⁰ 04' 14.69" E 84 ⁰ 24 19.29"
				12	Kutasingha	N 21 ⁰ 03' 36.84" E 84 ⁰ 26 17.22"
				13	Hemamura	N 21 ⁰ 01' 27.18" E 84 ⁰ 23 23.24"
		5	Brahmani N21 ⁰ 06' 46.46" E 84 ⁰ 28' 02.04 "	14	Brahmani	N 21 ⁰ 06' 46.93" E 84 ⁰ 28 01.90"
				15	Dhunkchhali	N 21 ⁰ 06' 36.23" E 84 ⁰ 24 39.54"
				16	Badmal	N 21 ⁰ 07' 16.97" E 84 ⁰ 29 37.18"
2	Badbahal N21 01 18.09 E84 20 13.85	6	Badbahal N21 ⁰ 01' 18.09" E84 ⁰ 20' 13.85"	17	Badbahal	N21 ⁰ 01' 18.09" E84 ⁰ 20' 13.85"
				18	Podabalanda	N21 ⁰ 01' 37.80" E84 ⁰ 20' 04.52"
		7	Tribanpur N20 ⁰ 58' 53.10" E84 ⁰ 14' 23.96"	19	Tribanpur	N20 ⁰ 58' 53.10" E84 ⁰ 14' 23.96"
				20	Godakhol	N21 ⁰ 01' 28.87" E84 ⁰ 14' 43.13"
				21	Badkhol	N21 ⁰ 01' 56.00" E84 ⁰ 10' 54.00"
		8	Kadaligarh N20 ⁰ 57' 11.04" E84 ⁰ 18' 44.06"	22	Kadaligarh	N20 ⁰ 57' 11.04" E84 ⁰ 18' 44.06"
				23	Ambajhari	N20 ⁰ 55' 32.33" E84 ⁰ 17' 00.81"
				24	Tal	N21 ⁰ 00' 39.18" E84 ⁰ 18' 41.79 "
3	Charmal N21 06 42.76 E84 12 49.44	9	Charmal N21 ⁰ 06' 41.65" E84 ⁰ 12' 49.83"	25	Charmal	N21 ⁰ 06' 42.76" E84 ⁰ 12' 49.44"
				26	Berhampura	N21 ⁰ 06' 41.56" E84 ⁰ 12' 50.63 "
				27	Brahmani	N21 ⁰ 11' 0.31" E84 ⁰ 13' 35.03"
		10	Banshajal N21 ⁰ 04' 37.95" E84 ⁰ 13' 22.15"	28	Banshajal	N21 ⁰ 04' 37.95" E84 ⁰ 13' 22.15"
				29	Gargadbahal (Kardapal)	N21 ⁰ 05' 26.59" E84 ⁰ 07' 52.38"



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4	Badmal N21 06 18.16 E84.04.05.0 2	11	Badmal N21° 06' 19 21" E84° 04' 06 50"	30	Badmal	N 21° 06' 18.16. E 84° 04' 05.02"
				31	Rengali	N21° 04' 44 83" E 84° 04' 03 01"
				32	Sagjori	N21° 07' 03 00" E 83° 59' 56 00"
				33	Kuakhoh	N 21° 02' 44 52" E84° 07' 34 29"
		12	Mochibahal N21° 09' 54 31" E 84° 09' 45 75"	34	Mochibahal	N 21° 09' 54 31" E 84° 09' 45 75"
				35	Saiberni	N 21° 08' 34 44" E 84° 06' 28 78"
				36	Khandsi	N 21° 09' 44 52" E 84° 09' 48 58"
				37	Bhaliakata	N 21° 08' 28 00" E 84° 03' 15 49"
5	Naktideul N 21 15 01.57 E 84 32 12.35	13	Naktideul N21° 15' 15.97" E84° 32' 29.81"	38	Naktideul	N21° 15' 01.57" E84° 32' 12.35"
				39	Sahebi	N21° 14' 19.01" E84° 35' 13.73"
				40	Sarapali	N21° 16' 06.20" E84° 32' 44.48"
		14	Batgaon N21° 17' 22.40" E84° 39' 21.07"			N21° 17' 22.40" E84° 39' 21.07"
				41	Jamujori	N21° 14' 23.33" E84° 42' 34.26"
				42	Hitasara	N21° 13' 28.14" E84° 39' 27.47"
				43	Salebhata	N21° 17' 49.97" E84° 41' 17.01"
				44	Chadchadi	N21° 11' 22.32" E84° 44' 00.81"
				45	Tileipasi	N21° 17' 10.22" E84° 38' 31.02"
				46	Panunali	
		15	Ghosramal N21° 09' 35.52" E84° 30' 23.22"	47	Ghosramal	N21° 09' 36.15" E84° 30' 22.25"
				48	Kadobahali	N21° 11' 17.62" E84° 28' 27.52"
				49	Kaunsipal	N21° 12' 19.56" E84° 28' 22.02"
		16	Rail N21° 07' 06.58" E84° 34' 05.55"	50	Rail	N21° 07' 06.72" E84° 34' 05.53"
				51	Koing	N21° 08' 15.94" E84° 36' 33.28"
				52	Kudanali	N21° 07' 01.53" E84° 39' 37.87"
				53	Talanali	N21° 06' 06.6" E84° 39' 21.39"
6	Girish Chandra Pur N21 19 17.65 E 84 22 55.70	17	G.C.Puri N21° 19' 16.39" E 84° 22' 58.51"	54	G.C.Pur	N21° 19' 16.39" E 84° 22' 58.51"
				55	Sodo	N21° 15' 31. 77" E84° 24' 13.71"
				56	Hiraloi	N21° 19' 13. 73" E84° 18' 32.84"
		18	Balikiari N21° 12' 26.77" E 84° 20' 05.01"	57	Balikiari	N21° 12' 26. 73" E84° 20' 05.69"
				58	Kholgarh	
		19	Luhabir N21° 14' 47. 91" E84° 19' 27.69"	59	Talab	N21° 15' 20. 27" E84° 17' 14.52"
				60	Luhabir	N21° 14' 47. 55" E84° 19' 27.53"
	6 Range		19- Section	61	Jaresingha	N21° 17' 19. 17" E84° 20' 28.53"
					61 Beat	



Abstract of Administrative Units.

Sl No	Range	No of Section	No of Beat
1	Redhakhol	5	16
2	Badbahal	3	8
3	Charmal	2	5
4	Badmal	2	8
5	Naktideul	4	16
6	Girishchandrapur	3	8
Total	6 Ranges	19	61

1.1.3 Building & Forest Road

1.1.3.1 Buildings:

The division is an old division functioning since 1948. It has adequate buildings to house Offices, Staffs' many buildings are in damaged condition. The list of buildings as on 31.03.2020 is as furnished below. **(Table No 1.6)**

Table No 1.6 List of Buildings in Rairakhol Division.

Sl. No.	Name of building	Place	Year of construction	Initial cost	Present condition
1	D.F.O' Office	Rairakhol	1958-59	21400.00	Bad
2	D.F.O's quarter	-do-	1930-31	800.00	Bad
3	Head clerk's quarter	-do-	1936-37	700.00	Damaged
4	Accountant quarter	-do-	1935-36	700.00	Damaged
5	4 th clerk's quarter	-do-	1950-51	1000.00	Damaged
6	L.D clerk quarter	-do-	1959-60	4360.00	Damaged
7	-do-	Rampur	1961-62	5665.00	Damaged
8	-do-	-do-	1966-67	x	Damaged
9	Ranger's quarter	Charmal			Habitable
10	-do-	Giripur	1943-44	350.00	Damaged
11	-do-	Mochibahal	x	x	x
12	-do-	Naktideul	x	x	x
13	-do-	Rairakhol	2006-07		Damaged



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14	-do-	Rampur	1941-42	500.00	Damaged
15	Forester's quarter	Badmal			Habitable
16	-do-	Balikiari	1948-49	200.00	Damaged
17	-do-	Bansajal			Damaged
18	-do-	Brahmani			Damaged
19	-do-	Charmal			Damaged
20	-do-	Daincha			Damaged
21	-do-	Ghusramal			Habitable
22	-do-	Giripur	1931-32	1000.00	Damaged
23	-do-	Jamjhuri			Damaged
24	-do-	Luhapank	1957-58	4360.00	Damaged
25	-do-	Mochibahal	1942-43	500.00	Damaged
26	-do-	Naktideul	1932-33	700.00	Damaged
27	-do-	Rail			Damaged
28	-do-	Rairakhol			Damaged
29	-do-	Rampur	1964-65	5665.00	Damaged
30	-do-	Sarapali			Damaged
31	-do-	Tribanpur	1933-34	1000.00	Damaged
32	F.G's quarter	Amjhari	1944-45	150.00	Damaged
33	-do-	Badbahal			Damaged
34	-do-	Badkhol			Damaged
35	-do-	Badmal (M)			Damaged
36	-do-	Badmal (N)	1959-60	2640.00	Damaged
37	-do-	Balikiary	1941-42	150.00	Damaged
38	-do-	Bansajal		150.00	Damaged
39	-do-	Bantalai			Damaged
40	-do-	Berhampura			Damaged
41	-do-	Bhaliakata			Damaged
42	-do-	Brahmani (C)			Damaged
43	-do-	Brahmani (R)			Damaged
44	-do-	Burbuda			Damaged
45	-do-	Chadchadi			Damaged



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46	-do-	Charmal	1950-51	1000.00	Damaged
47	-do-	Daincha			Damaged
48	-do-	Dunkchhali			Damaged
49	-do-	Gadakhhol			Damaged
50	-do-	Gargadbahal			Damaged
51	-do-	Ghosaramal			Damaged
52	-do-	Giripur			Damaged
53	-do-	Gogua			Damaged
54	-do-	Hemamura			Damaged
55	-do-	Hiralai	1941-42	1000.00	Damaged
56	-do-	Hitasara			Damaged
57	-do-	Jamjhor			Damaged
58	-do-	Jarasinga			Damaged
59	-do-	Jharapada			Damaged
60	-do-	Kadaligarh			Damaged
61	-do-	Kadobahali			Damaged
62	-do-	Kalindar		150.00	Damaged
63	-do-	Kaunsipali			Damaged
64	-do-	Khandsi			Damaged
65	-do-	Kholgarh			Damaged
66	-do-	Koing			Damaged
67	-do-	Kuakhhol		250.00	Damaged
68	-do-	Kudanali			Damaged
69	-do-	Kutasang	1965-66	6450.00	Damaged
70	-do-	Luhahir			Damaged
71	-do-	Luhapank			Damaged
72	-do-	Mochibahal	1944-45	150.00	Damaged
73	-do-	Naktideul			Damaged
74	-do-	Panunali			Damaged
75	-do-	Podabalanda			Damaged
76	-do-	Rail			Damaged
77	-do-	Rampur (East)	1962-63	3460.00	Habitable



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78	-do-	Rampur (West)	1973-74		Damaged
79	-do-	Rengali			Damaged
80	-do-	Sahebi			Damaged
81	-do-	Sagjori			Damaged
82	-do-	Saiberni			Damaged
83	-do-	Salebhata		150.00	Damaged
84	-do-	Sarapali			Damaged
85	-do-	Sardhapur		150.00	Damaged
86	-do-	Sergeda			Damaged
87	-do-	Soda			Damaged
89	-do-	Tal			Damaged
90	-do-	Talab	1941-42	150.00	Damaged
91	-do-	Talanali			Damaged
92	-do-	Terbeda			Damaged
93	-do-	Tileiposi			Damaged
94	-do-	Tribanpur	1944-45	150.00	Damaged
95	Check gate's quarter	Mochibahal			Damaged
96	-do-	Hiralai			Damaged
97	-do-	Naktideul			Damaged
98	-do-	Rampur	1959-60	1538.00	Damaged
99	Tribanpur Beat Qtrs.	Rairakhol	2009-10 CAMP APO	300000/-	Good
100	Charmal Beat Qtrs	Charmal	2009-10 CAMP APO	300000/-	Good
101	ACF Qtrs.	Rairakhol	-do-	800000/-	Good
102	Rairakhol beat	Rairakhol	2010-11 CAMP APO	350000/-	Good
103	Kadaligarh beat	Rairakhol	-do-	350000/-	Good
104	Dhunkchhali beat	Rampur	-do-	350000/-	Good
105	Rampur East	Rampur	-do-	350000/-	Good
106	Naktideul beat	Naktideul	-do-	350000/-	Good
107	Ghosramal beat	Naktideul	-do-	350000/-	Good



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108	Berhampura beat	Charmal	-do-	350000/-	Good
109	Rampur West (Divl.office)	Rampur	2011-12 CAMP APO	350000/-	Good
110	Terbeda beat	Rampur	-do-	350000/-	Good
111	Saiberni beat	Mochibahl	-do-	350000/-	Good
112	Tileipasi beat	Naktideul	-do-	350000/-	Good
113	Badmabahal beat	Rairakhol	-do-	350000/-	Good
114	Khandashi beat	Mochibahal	-do-	350000/-	Good
115	Forester Qtrs,Bansajal	Charmal	-do-	580000/-	Good
116	Hemamura beat	Rampur	2012-13 CAMP APO	480000/-	Good
117	Gargadbahal beat	Mochibahal	-do-	480000/-	Good
118	Girischandrapur Beat	Girischandrapur	-do-	480000/-	Good
119	Badmal beat	Mochibahal	-do-	480000/-	Good
120	Podabalanda beat	Rairakhol	-do-	480000/-	Good
121	Tal beat	Rairakhol	-do-	480000/-	Good
122	Fr. Qtr.Daincha	Rampur	-do-	665000/-	Good
123	Fr.Qtr.Rampur	Rampur	-do-	665000/-	Good
124	Fr.Qtrs.Rairakhol	Rairakhol	-do-	665000/-	Good
125	Fr.Qtr.Charmal	Charmal	-do-	665000/-	Good
126	Fr.Qtr.Rail	Naktideul	-do-	665000/-	Good
127	R O Res.Rampur	Rampur	-do-	868000/-	Good
128	R O Res.Rairakhol	Rairakhol	-do-	868000/-	Good
129	Range Office,Badmal	Mochibahal	-do-	1100000/-	Good
130	Barrack at Kelakata	Rairakhol	-do-	1087000/-	Good
131	Barrack at Mochibahal	Mochibahal	-do-	1087000/-	Good
132	Malkhana at Rampur	Rampur	-do-	575000/-	Good
133	Kuakhol beat	Charmal	2013-14 CAMP APO	480000/-	Good
134	Sado beat	Girischandrapur	-do-	480000/-	Good
135	Salebhata beat	Naktideul	-do-	480000/-	Good
136	Badmal(Ghosramal) beat	Naktideul	-do-	480000/-	Good



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137	Amjhari beat	Rairakhol	-do-	480000/-	Good
138	Gadakhol beat	Rairakhol	-do-	480000/-	Good
139	Rengali beat	Mochibahal	-do-	480000/-	Good
140	Brahamani beat	Rampur	-do-	480000/-	Good
141	Fr.Qtr.Batgoan	Naktideul	-do-	665000/-	Good
142	Fr.Qtr.Kadaligarh	Rairakhol	-do-	665000/-	Good
143	Fr.Qtrs.Mochibahal	Mochibahal	-do-	665000/-	Good
144	R.O Res. Girischandrapur	Girischandrapur	-do-	868000/-	Good
145	R.O Res.Naktideul	Naktideul	-do-	868000/-	Good
146	Office Building Penthahal Up- gradation Nursery	Naktideul	-do-	1100000/-	Good
147	Watchmen Shed	Naktideul	-do-	117000/-	Good
148	Labour shed	Naktideul	-do-	1500000/-	Good
149	Ministrial Qtr.	Rampur	2013-14	568000/-	Good
150	Class IV Qts	Rampur	2013-14	382000/-	Good
151	Seed-Godown P Nursery Penthahal	Naktideul	14-15 APO CAMPA	985000/-	Good
152	Store House at P.Nursery Penthahal	Naktideul	-do-	1474000/-	Good
153	D F O's Res	Rampur	2014-15	2584000/-	Good
154	Ministrial Qtr.	Rampur	2015-16	607000/-	Good
155	Class IV Qts	Rampur	2015-16	408000/-	Good

1.1.3.2 Forest Roads:

For facilitating forest inspection, patrolling and transportation of timer and other forest produce, there are 19 Forest Roads covering a length of 244.30 Km. All roads are all weather roads. The list of Forest Roads is furnished below. (Table No 1.7)



Table No 1.7 List of Forest Roads in Rairakhol Division.

Sl No	Name of Forest Road	Length in Km	Nature of Road	Name of Range.
1	Dhunkchali-Rail	18.8	Morrum Road	Redhakhol / Naktideul
2	Lahapank-Brahmani	8.4	Morrum Road	Redhakhol
3	Charmal-Balikiary	16.0	Morrum Road	Charmal
4	Kuakhol-Bhatra	16.8	Morrum Road	Charmal
5	Dhalpur-Machhudihi	6.4	Morrum Road	G.C. Pur
6	Balikiary-Bantloi	5.6	Morrum Road	G.C. Pur
7	Talab-Phulkusum	15.6	Morrum Road	G.C. Pur
8	Balikiary-Talab	10.8	Morrum Road	G.C. Pur
9	Kanchanpur-Sarapali	17.6	Morrum Road	G.C. Pur
10	Naktideul-Chadchadi	24.0	Morrum Road	Naktideul
11	Kudanali-Chadchadi	14.8	Morrum Road	Naktideul
12	Rail-Pathargarh	8.0	Morrum Road	Naktideul
13	Rail-Kudanali	12.0	Morrum Road	Naktideul
14	Madhapur-Bhatra	16.8	Morrum Road	Badbahal
15	Tribanpur-Ambjhari	5.5	Morrum Road	Badbahal
16	Mochibahal-Badmal	12.0	Morrum Road	Badmal
17	Mochibahal-Talab	16.0	Morrum Road	Badmaland G.C.Pur
18	Punjipathar - Bhaluchuan	15.2	Morrum Road	Badmal
19	Badmal-Dabtaila	4.0	Morrum Road	Badmal
	Total	244.30		

1.1.3.3 Forest Rest Houses:

There are three Forest Rest Houses in the division. The list of Forest Rest Houses is at **Annexure- III.**

1.1.3.4 Forest Check Gates:

At present there is no Check gate in the Division. All the check gates functioning previously were abolished as per Memo No.16213 dt.28.07.2018 of P.C.C.F Odisha, Bhubaneswar

1.2 Configuration of the ground:

Rairakhol Division is coming within Rairakhol Sub Division of Sambalpur District. The tract is mostly hilly with broken plains.



1.2.1 Topography:

Physio-graphically, Rairakhol Division forms a part of the stable landmass of Indian peninsular. This tract is largely composed of the most ancient rocks of the earth's crust. The recent topographical features are combined result of long continued erosion at hills and upliftment at plain.

The southern part of Rairakhol Division is divided into three zones by Surbali jhor and Karandi jhor. The blocks named as Tal, Suani, Rahan, San-Rengali, Hemantakhol and Podabalanda are in the middle zone. Dhoja hill in Rahan block has the highest altitude of 672.00 mt above mean sea level.

Champali Nala divides this Division into two parts. The forest block named as Hatidhara, Bindhybasini, Landimal, Rail, Nadia etc are lying in the eastern part of this Division with a highest altitude of 565.00 mt above the mean sea level. The forest blocks named as Landakot, Kholgarh, Sagmali, etc are lying in the western part of this Division with a highest altitude of 598.00 mt above mean sea level. Harihar jhor is marked as the western boundary line of this Division from river Mahanadi to village Ganja. River Tikira flows on the bordering to Northern boundary of this Division. Most of the areas are hilly and undulating. A narrow plain extends from Hiraloi to Kundeijari via-Naktideul and separates Khalasuni Sanctuary of Bamra (W.L) Division from Rairakhol Division.

1.2.2 Hills and Plateaus:

There are many Hills / Hillocks in the division. The altitude of different hills lying within the geographical jurisdiction of different forest blocks above mean sea level has been furnished at table No 1.8 below.

Table no 1.8 Altitude of hills observed in Rairakhol Division.			
Sl. No.	Name of the blocks	Name of the hills	Altitude in mt.
1	Rahan	Dhoja	672
		Bindhya	609
2	Kholgarh	Sodo	598
3	Tal	Tal	590
4	Rail	Rail	565
5	Sagmslia	Chirguni	578
6	Hatidhara	Sureswari	577
7	Landakot	Bad-jharan	562



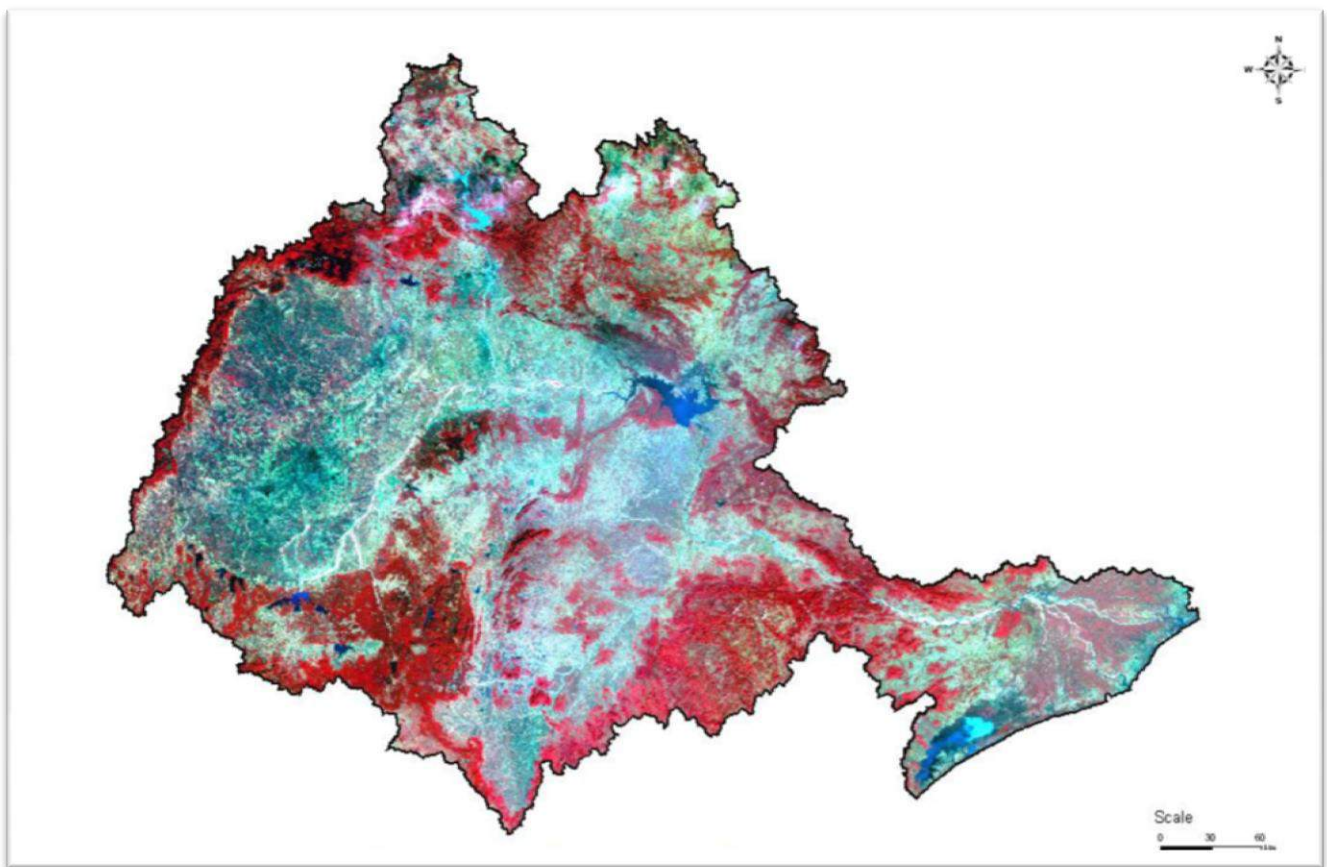
Table no 1.8 Altitude of hills observed in Rairakhol Division.			
Sl. No.	Name of the blocks	Name of the hills	Altitude in mt.
8	Rail	Murdhan	556
9	Kholgarh	Panchamundia	554
10	Landakot	Bantaloi	549
		Gaighat	529
11	Landimal	Kala	521
12	Landakot	Gandighosura	516
		Kanduria	515
13	Sagmalia	Kandhal	506
14	Bindhyabasini	Bindhyabasini	487
15	Suani	Suani	486
16	Kholgarh	Kankadakhol	461
17	Hatlimunda	Dhoja	459
18	Rail	Sankha	455
19	Gaudgad	Dimbiribahal	443
20	Landakot	Luhadhara	440
		Churmani	433
21	Nadia	Nadia	428
22	Kholgarh	Ushakodhi	406
23	Landimal	Kalapat	406
24	Rahan	Rahan	369
25	Podabalanda PRF	Podabalanda	369
26	Rail	Deulgarh	325
27	Chadchadi	Binakhai	297
		Saliamaliha	243
Sources – Assistant Director of Survey of India, Bhubaneswar.			

1.2.3 River system:

There is no major River System in the Division. The River Mahanadi flows on South and Tikira River on North. The nallas on the Sothern side drains to Mahanadi having a gentle slope towards South. The part of the division on northern side drains to River Tikira. The tract has a slope towards northern side. The drainage pattern is distinctly divided in to two half's i.e. towards River Mahanadi and towards Tikira / Brahmani. The drainage map is furnished below.

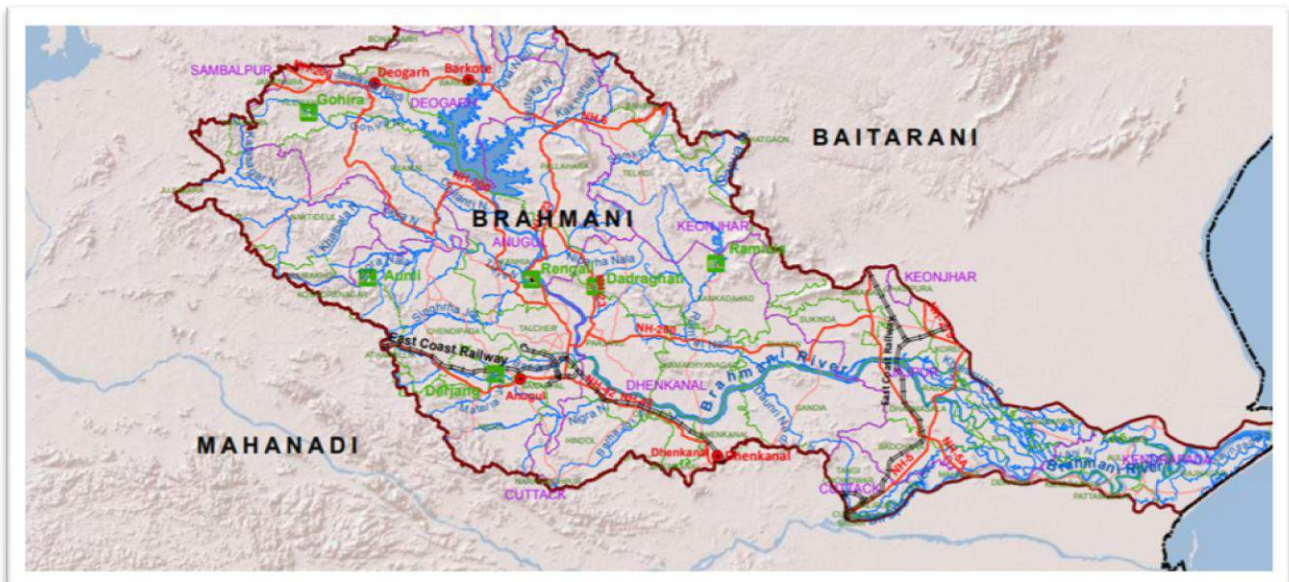


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Revised working plan of Rairakhol Division (2021-22 to 2030-31)





1.3 Geology, Rock and Soil:

1.3.1 Geology & Rock-

Geologically the area is divided into two main groups. (i) Archean group (ii) Lower Gondwana group. Archean group is found in most of the hill ranges and valleys, where as lower Gondwana group is marked in isolated low hills and low lying valleys. In addition to the above, another two groups of geological formation are noticed in this tract, which are (i) Intrusive and (ii) Recent. Roughly the area to the east of Karandi jhor up to Rairakhol and then a line drawn from Rairakhol to Naktideul comes under Gondwana group. The formation of different rocks from the geological groups is given in the table below.

Table No 1.9 Formation of rock in Rairakhol Division

Sl. No.	Name of Geology group	Name of Rock
1	Archean	Khondalite, Charnockite, Porphyritic granite gneiss, Pyroxene granulites schist, Garnetiferous, granite gneiss, Quartzite, Quartz schist etc.
2	Gondwana	Feldspathic, Gritty sandstone, Green shale, Barkar, Carbonaceous shale, Talchirs, Panchets etc
3	Intrusive	Pegmatite, Quartz veins, Dolerite etc.
4	Recent	Alluvium, Laterite etc

Rocks—Distribution of different rocks and its availabilities in the forest blocks are furnished in table No 1.10



Table No 1.10 Description of rock vis a vis distribution.

Sl. No.	Name of rocks	Description	Name of blocks
1	Khondalite	Khondalite is the common rock made up of metamorphosed sediments in the series. This is an oldest and prevalent rock formation in this zone. It contains varying proportions of Quartz, Feldspar, Garnet and Sillimanite. In some patches it contains Graphite and Biotite. They are medium to very coarse-grained containing large crystals of pink garnet. It exhibits schistose to gneissose texture. Quartzites are hard, compact and dirty white to light gray in colour.	Kholgarh, Sagmalia, Rahana & Landakot
2	Charnockite	The Charnockite rocks are noticed in high rugged hills due to their resistance to weathering and erosion. The rocks are medium to fine grained and compact. The rocks have waxy appearance and are found to consist mostly of gray feldspar and pink garnets. It is characterized by granulites texture and presence of hypersthene. Its constituents are Quartz, Orthoclase, Plagioclase and Augite. The Quartz –muscovite schist make of the long chain of east-west hill ranges of Nadia reserve forest. Being less resistant to weathering and erosion it is found as mounds in low laying area along Arkhai, Charmunda and Tikira nalas.	Landakot Nadia Landimal Ambajhori Dhadarkhol Penthabahal
3	Quartzite	The band of syenite occurs within band of granular Quartzite. It is medium to coarse grained in texture and white in colour. It is composed mainly of feldspar with minor amount of biotite and hornblende. It is quite big in size and contains Quartz. It is marked along the foliation plains.	Kholgarh Landakot Landimal Sagmalia



4	Pegmatite	The pegmatite is found as intrusion into the country rock. It is acidic in nature and occurs as zoned or simple small bodies. At the intermediate zone the pegmatite shows development of distinct Quartz core and mineralization of muscovite mica. The pegmatite of Sagmalia reserve forest is reported to contain gem quality beryl crystal of transparent variety. Its colour varies from light blue to greenish.	Sagmalia Hatidhara Kholgarh Rahana
5	Sand-stone	The youngest group of rocks belonging to the Gondwana group of sediment is found to occur as isolated low hill of typical hunch shape in the eastern part of this Division. The lower group of Gondwana rocks are marked as greenish laminated shale inter bedded with dirty gray sandstone. It contains undecomposed feldspar suggestive of prevalent cold condition during the period of deposition.	Landimal Rail Hatidhara Suani
6	Shale	The shale corresponded to the needle shale of Talcher. It is the youngest group of rocks belonging to the Gondwana group. It is found in isolated low hills.	Nadia Rail Hatidhara
7	Barkar	It is the group of rocks consisting of white to fawn colour feldspatchic sandstone and gritty with occasional informational conglomerate beds and shale. The sandstone often contains decomposed feldspar in course angular grains of Quartz. Gradation of medium grained sandstone to pebbly stone through grit is observed at different places, which may be grouped under Barkar.	Rail Landimal Suani
8	Iron stone	A group of rocks represented by alternate beds of purple red shale and micaceous sandstone occur at places. It corresponds to the upper Gondwana formation.	Landimal Rail



1.3.2 Mineral Occurrences:

The important Minerals noticed in this tract along with their description and distribution have been discussed in brief as follows (Table No- 1.11)

Table No 1.11 Description of minerals available in Rairakhol Division

Sl. No.	Name of Minerals	Description	Name of blocks
1	Graphite	Crystalline flaky Graphite is sparsely disseminated as streaks and lenticels along the foliation of the gneiss. The gneissic rock is superficially almost rotten and crumbling. Separation of the Graphite from the associated components of the gneiss is not very difficult. The local concentration of Graphite has been noticed in limited places. The percentage of Graphite is nowhere high enough for the occurrence to be commercially exploited.	Kholgarh Hatidhara Purunapani Bindhybasini
2	Coal	Thin bed of carbonaceous shale has been noticed in the bed of Champali nala. It occurs as a flat lens in the gritty formation. The thickness of the formation varies from 0.5 mt to 1.5 mt at a minimum depth of 1 mt. During winter and summer season local people are extracting the Coal for burning bricks.	Rail Landimal Landakot
3	White Clay	The result of disintegration and decomposition of the feldspathic elements of the Gondwana formation developed White Clay. The development of this White Clay on the top of the Gondwana grits has been noticed in different nala of this tract. These minerals have considerably developed in an elevated area between two tributaries of Khalbala Jor.	Landimal Rail Hatidhara Chadchadi
4	Iron-ore	The gritty formation in the Gondwana system often shows fairly rich hematite and limonitic materials in them. The accumulation of ferruginous materials is also very common	Rail Hatidhara



		in this zone. In the past, the local smelters used the ferruginous concentration in their charcoal furnaces worked for extraction of pig iron. This is evidenced by the huge accumulation of slag in many villages of this area.	Kholgarh
5	Mica	The pegmatite is composed of muscovite transparent Quartz and plagioclase feldspar. Muscovite bearing pegmatite dykes have been found intrusive into the garnetiferous gneissic formation. Mica bearing pegmatite of cream coloured is fairly numerous in rocky tracts. The materials as judged from the surface indication are not of commercial important.	Hatidhara Kholgarh
6	Rock crystal	Coarsely crystallized Quartz occurring in a highly fractured Quartz dyke has been seen in this zone. The crystals aggregate occur as nest crowding the cracks and crevices of the dyke. The crystals attain a considerable size but they are not perfect for manufacturing.	Hatidhara Rail
7	Manga-nese	It resembles iron in its behavior and usually occurs as an oxide. Its availability is reduced by bad drainage and organic matter content and deficiency may occur in soil, which are rich in organic matter or bad drained and with a high water table or are calcareous in nature. Oxidizing bacteria also render it unavailable to plant.	Chadchadi Landakot

1.3.3 Soil

A large part of the area under this division has quite rugged surface. Soil and Alluvial tracts are very much limited to narrow flat plain along the valleys between the hills. This soil capping is generally found over Khondalitic plains. But Charnockitic hilly terrains are mostly devoid of any soil mantle. Alluvial tracts are restricted to the bank of rivers and nalas. In general the soil is apparently derived from the underlying country rocks. Re-working by natural agencies have brought about sorting to a certain extent, carrying the finer particles



into the low laying areas along drainage lines, leaving the upland somewhat sandy. The different types of soil noticed are as follows.

i) Black Soil (Vertisol):

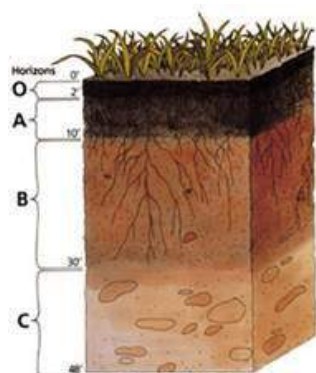
Black soils are mineral **soils** which have a **black** surface horizon, enriched with organic carbon that is at least 25 cm deep. Two categories of **black soils** (1st and 2nd categories) are recognized. CEC in the **black** surface horizons ≥ 25 cmol/kg; and. A base saturation in the **black** surface horizons is $\geq 50\%$.

1st category Black Soils (the most vulnerable and endangered, needing the highest rate of protection at a global level) are those having all five properties given below:

- ❖ The presence of black or very dark surface horizons typically with a chroma of ≤ 3 moist, a value of ≤ 3 moist and ≤ 5 dry (by Munsell colours);
- ❖ The total thickness of black surface horizons ≥ 25 cm;
- ❖ Organic carbon content in the upper 25-cm of the black horizons of $\geq 1.2\%$ (or $\geq 0.6\%$ for tropical regions) and $\leq 20\%$;
- ❖ CEC in the black surface horizons ≥ 25 cmol/kg; and
- ❖ A base saturation in the black surface horizons $\geq 50\%$.
- ❖ Most but not all 1st category Black soils:
- ❖ Have well-developed granular or fine sub-angular structure and high aggregate stability in the black surface horizons that are in a non- or slightly degraded state, or in the humus-rich underlying horizon which has not been subjected to degradation.

2nd category Black soils (mostly endangered at the national level) are those having all three properties given below:

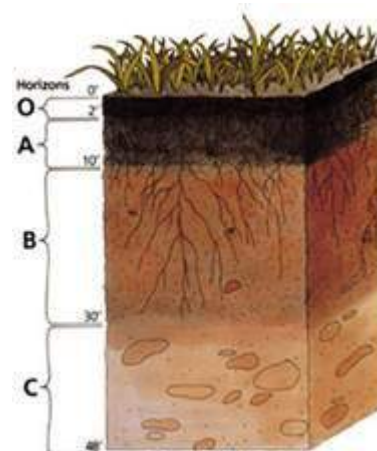
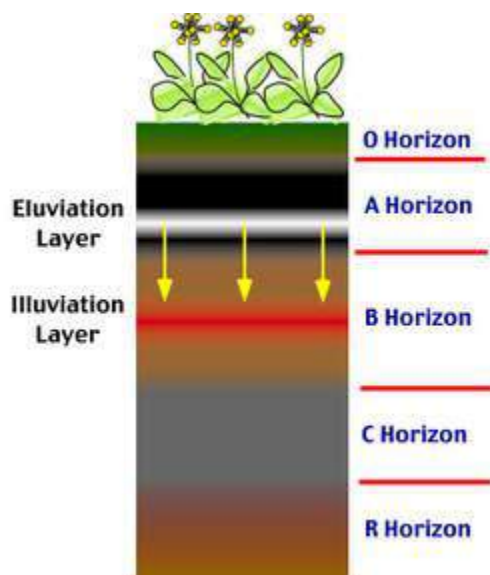
- ❖ The presence of black or very dark surface horizons typically with a chroma of ≤ 3 moist, a value of ≤ 3 moist and ≤ 5 dry (by Munsell colours);
- ❖ The total thickness of the black surface horizons of ≥ 25 cm; and
- ❖ Organic carbon content in the upper 25-cm of the black horizons $\geq 1.2\%$ (or $\geq 0.6\%$ for tropical regions) and $\leq 20\%$.



This type of Soil is observed in Hatidhara, Gaudgad, Butukhamana, Durdura, Rahan, Sanrengali, R-Badmal forest blocksetc.

ii. Saline alkaline Soil:

Alkali, or Alkaline, soils are clay soils with high pH (> 8.5), a poor soil structure and a low infiltration capacity. Often they have a hard calcareous layer at 0.5 to 1 metre depth. Alkali soils owe their unfavorable physico-chemical properties mainly to the dominating presence of sodium carbonate, which causes the soil to swell and difficult to clarify/settle. They derive their name from the alkali metal group of elements, to which sodium belongs, and which can induce basicity. Sometimes these soils are also referred to as *alkaline sodic soils*. Alkaline soils are basic, but not all basic soils are alkaline.



This type of soil is seen in Durdura, Butukhaman, Kisinda, Bhalukhol, Tikira etc forest blocks.



iii. Brown Soil:

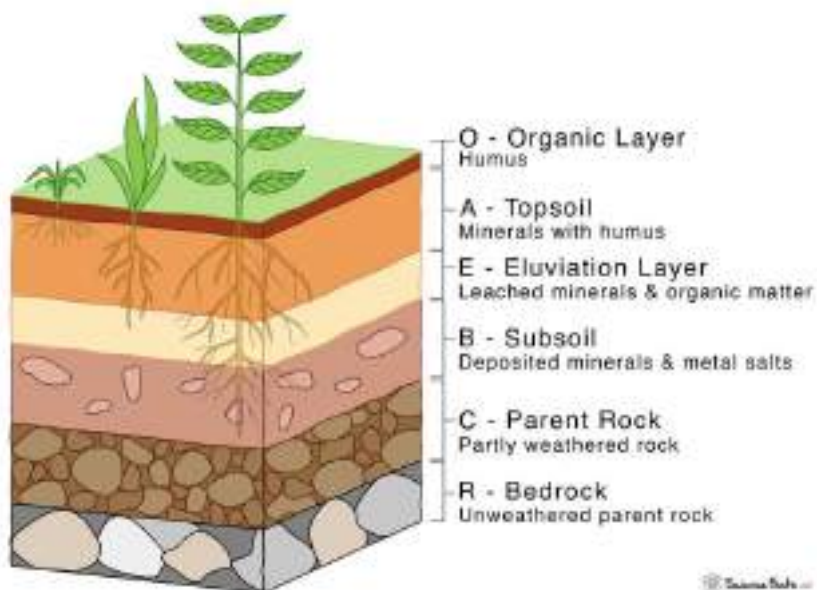
Brown earth is a type of soil. They are common in lowland areas (below 1,000 feet) on permeable parent material. The most common vegetation types are deciduous woodland and grassland. Due to the reasonable natural fertility of brown earths, large tracts of deciduous woodland have been cut down and the land is now used for farming. They are normally located in regions with a humid temperate climate. Rainfall totals are moderate; they are well-drained fertile soils with a pH of between 5.0 and 6.5.

Brown Earths are important, because they are permeable and usually easy to work throughout the year, so they are valued for agriculture. They also support a much wider range of forest trees than can be found on wetter land. They are freely drained soils with well-developed A and B horizons. They often develop over relatively permeable bedrock of some kind, but are also found over unconsolidated parent materials like river gravels. Some soil classifications include well-drained alluvial soils in the brown earths too.

Typically the Brown Earths have dark brown top soils with loamy particle size-classes and good structure – especially under grassland. The B horizon lacks the grey colours and mottles characteristic of grey soils. The rich colour is the result of iron compounds, mainly complex oxides which, like rust, have a reddish-brown colour. Some of these soils are, in fact, red. This is because rain tends to wash the “alkaline” bases out of the soil. Of course, the parent material also has an effect, and hard acidic rocks give rise to more acidic soils than do the softer sandstones. The landscapes where these lowland soils occur are typically undulating, and interesting variations in the profiles relate to the slopes where they are found. The processes of weathering and plant growth that were responsible for the formation of soils from bare parent materials in the first place are still going on. This is most easily seen on a hill slope. The top of the hill is usually convex, and it is here that most erosion is taking place – upper slopes and summits are more exposed to wind, and rain, and gravity is slowly but surely moving the topsoil down the hill.



Soil Horizons

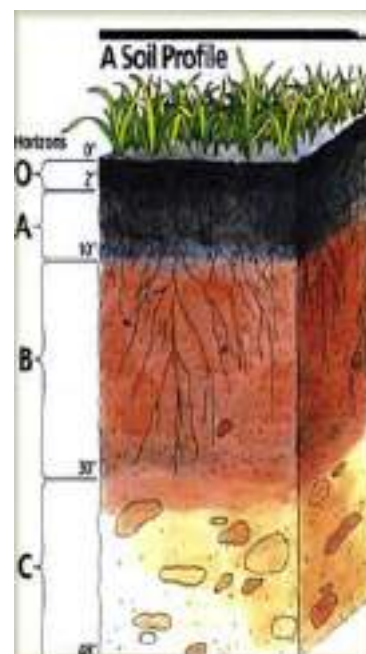


This type of soil is found in Kholgarh, Landakot, Landimal, Hatidhara, Rail, Chadchadi, Tal and Talab forest blocks.

iv. Lateritic Soil:

Laterite is both a soil and a rock type rich in iron and aluminium and is commonly considered to have formed in hot and wet tropical areas. Nearly all laterites are of rusty-red coloration, because of high iron oxide content. They develop by intensive and prolonged weathering of the underlying parent rock. Tropical weathering (laterization) is a prolonged process of chemical weathering which produces a wide variety in the thickness, grade, chemistry and ore mineralogy of the resulting soils. The majority of the land area containing laterites is between the tropics of Cancer and Capricorn.

Laterites are formed from the leaching of parent sedimentary rocks (sandstones, clays, limestones); metamorphic rocks (schists, gneisses, migmatites);



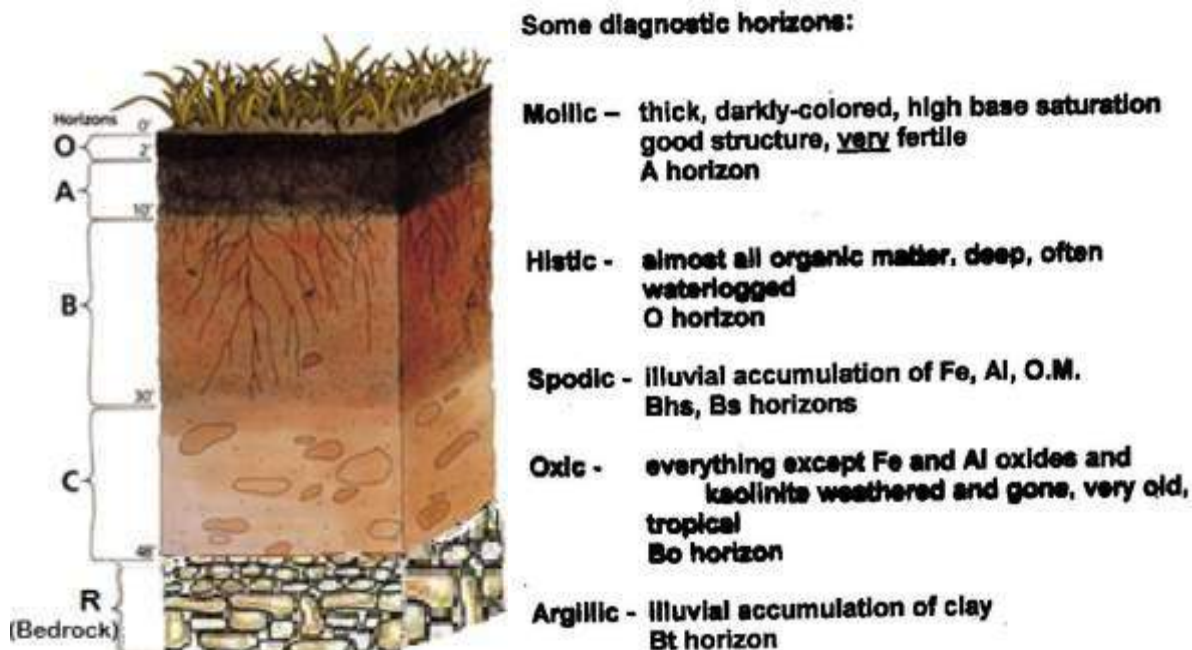


igneous rocks (granites, basalts, gabbros, peridotites); and mineralized proto-ores; which leaves the more insoluble ions, predominantly iron and aluminum. The mechanism of leaching involves acid dissolving the host mineral lattice, followed by hydrolysis and precipitation of insoluble oxides and sulfates of iron, aluminum and silica under the high temperature conditions^[8] of a humid sub-tropical monsoon climate.

This type of Soil is observed in Bindipur, Ambajhari, Dhadarkhol ,Rohinigadia forest blocks

v. Reddish Soil:

Red soil is a type of soil that develops in a warm, temperate, moist climate under deciduous or mixed forest, having thin organic and organic-mineral layers overlying a **yellowish-brown** leached layer resting on an alluvium red layer. Red soils are generally derived from crystalline rock. They are usually poor growing soils, low in nutrients and humus and difficult to be cultivated because of its low water holding capacity. Red soils denote the third largest soil group of India covering an area of about 3.5 lakhs sq. km (10.6% of India's area) over the Peninsula from Tamil Nadu in the south to Bundelkhand in the north and Rajmahal hills in the east to Katchch in the west. They surround the red soils on their south, east and north. It looks yellow in its hydrated form.





This type of soil is observed in Landakot , Hatidhara Kholgarh, Podabalanda Berhampura Suani Hemantakhol forest blocks of the division

1.4: Climatic Parameters:

The division experiences three distinct seasons in a year i.e. Summer, Rain and winter. Summer is from March- June, Rains from July to October and winter from November to February. Due to away from the sea, the climate is supposed to be extreme but due to highly dense forested area the climate is ameliorated. The rainfall is comparatively high and winter is litter cooler than other parts of the district.

1.4.1 Rainfall:

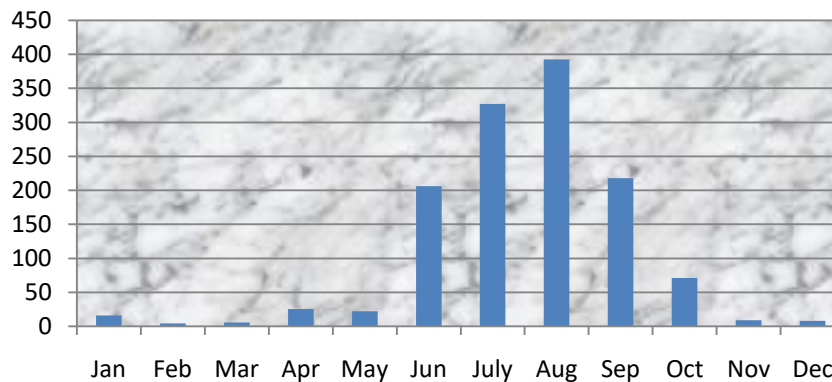
The rainfall data collected from meteorological stations / websites recorded rainfall as follows. (Table No 1.12)



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Year	1.12(A) Monthly Rainfall Data of Rairakhol C.D Block in mm.												
	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Total
2010	0.00	0.00	0.00	0.00	44.00	87.00	251.00	95.00	239.00	67.00	21.00	0.00	804.00
2011	0.00	2.00	0.00	54.00	65.00	259.00	250.00	224.00	573.00	11.00	0.00	0.00	1438.00
2012	144.0	3.00	0.00	41.00	0.00	216.00	413.00	560.00	161.00	76.00	64.00	0.00	1678.00
2013	0.00	6.00	0.00	4.00	17.00	245.00	454.00	143.00	124.00	229.00	0.00	0.00	1222.00
2014	0.00	26.00	0.00	0.00	41.00	120.00	507.00	503.00	0.00	0.00	0.00	0.00	1197.00
2015	2.00	0.00	0.00	105.00	0.00	427.00	367.00	360.00	114.00	0.00	0.00	2.00	1377.00
2016	3.00	1.00	23.00	8.00	3.00	62.00	196.40	710.00	86.50	28.00	0.00	0.00	1120.90
2017	9.00	0.00	2.00	0.00	4.00	316.00	276.40	193.00	166.00	34.60	4.20	0.00	1005.20
2018	0.0	0.00	0.00	7.50	38.00	175.80	555.10	545.20	185.60	32.00	0.00	76.50	1615.70
2019	0.0	4.00	29.70	34.00	11.20	155.20	1.00	592.60	529.40	231.30	0.00	2.00	1590.40
Average	15.8	4.2	5.47	25.35	22.32	206.3	327.09	392.58	217.85	70.89	8.92	8.05	1304.82

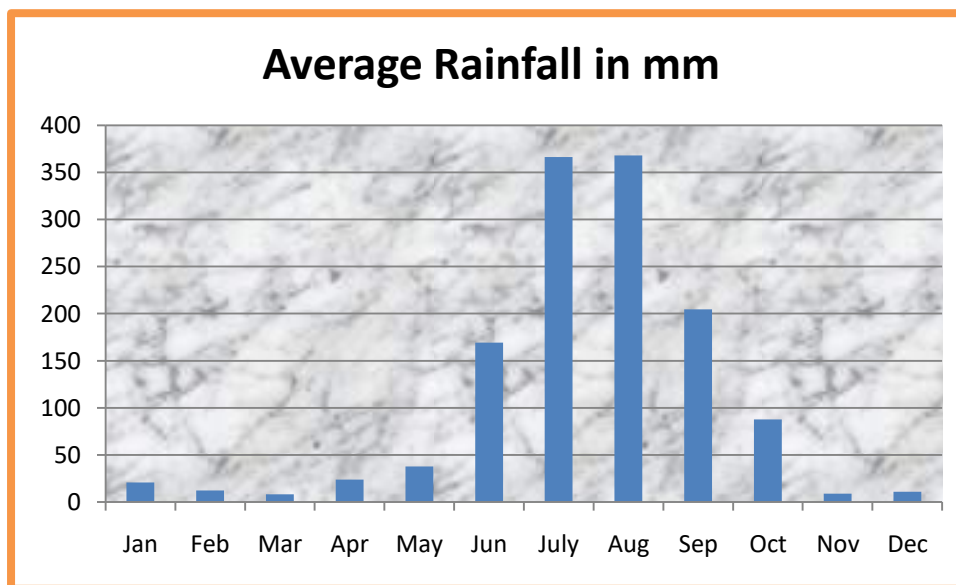
Average Rainfall in mm





Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Year	Table No 1.12 (B) Monthly Rainfall Data of Naktideul C.D Block in mm.												
	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Total
2010	0.00	0.00	0.00	0.00	53.20	90.00	275.00	212.00	174.00	53.00	16.00	20.00	893.20
2011	0.00	30.00	10.00	41.00	67.00	222.00	380.00	343.00	675.00	18.00	0.00	0.00	1786.00
2012	145.00	13.00	0.00	0.00	0.00	101.00	372.00	560.00	129.00	134.00	40.00	0.00	1494.00
2013	19.00	7.00	0.00	51.00	14.00	162.00	475.00	278.00	190.00	331.00	0.00	0.00	1527.00
2014	0.00	51.00	3.00	0.00	9.00	111.00	524.00	490.00	0.00	0.00	0.00	0.00	1188.00
2015	9.00	5.00	8.00	90.00	4.00	275.30	517.00	359.00	101.00	0.00	0.00	13.00	1381.30
2016	8.00	6.00	13.00	0.00	4.00	87.00	392.40	513.00	224.20	99.20	0.00	0.00	1346.80
2017	28.00	0.00	6.20	0.00	103.00	376.80	418.00	229.60	77.00	115.60	31.00	0.00	1385.20
2018	0.00	0.00	1.00	42.60	112.00	143.60	309.60	396.40	196.00	18.00	0.00	77.00	1296.20
2019	0.00	9.00	42.00	14.00	10.00	124.00	0.00	298.00	281.00	109.00	0.00	0.00	887.00
Average	20.90	12.10	8.32	23.86	37.62	169.27	366.30	367.90	204.72	87.78	8.70	11.00	1318.47





Revised working plan of Rairakhol Division (2021-22 to 2030-31)

The average rainfall is about 1300mm. The number of rainy days is above 65 days in a year which helped the growth of forests. As per the data furnished above, the rainfall in this tract is irregular. Due to change of rainfall pattern, the condition and composition of the vegetation differ from Northern part to that of Southern part of this Division. The southern part experiences better rainfall than that of Northern part of the division.

The number of rainy days in a year has been presented below for better appreciation.

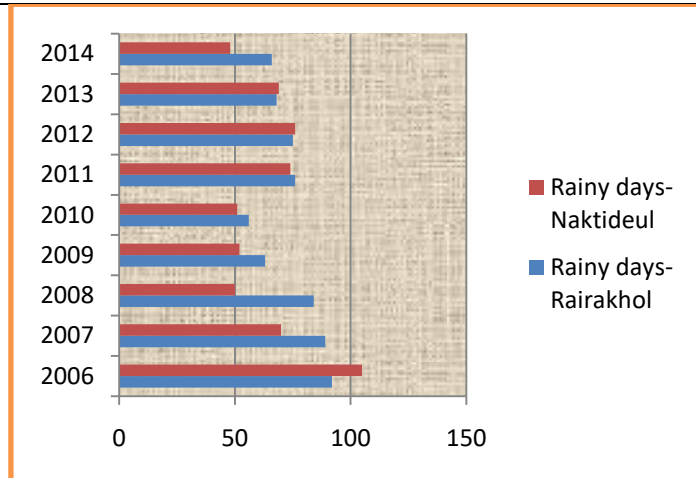
Year	Table No 1.13 (A) Monthly rainy days of Rairakhol C D Block												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2006	0	0	4	3	9	7	23	26	12	3	5	0	92
2007	0	1	1	3	5	15	17	23	20	4	0	0	89
2008	3	2	1	2	2	19	18	19	15	2	1	0	84
2009	0	0	0	0	5	4	22	15	10	5	2	0	63
2010	0	0	0	0	4	6	14	11	13	4	4	0	56
2011	0	1	0	5	3	13	14	18	20	2	0	0	76
2012	4	3	0	2	0	0	19	24	16	5	2	0	75
2013	0	2	0	1	2	13	20	8	9	13	0	0	68
2014	0	2	0	0	0	7	20	20	14	3	0		66
Average	1	1	1	2	3	9	19	18	14	5	2	0	74

Year	Table No 1.13 (B) Monthly rainy days of Naktideul C D Block												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2006	0	0	2	4	20	10	17	25	13	14	0	0	105
2007	0	0	0	0	0	23	21	19	0	7	0	0	70
2008	2	2	0	0	0	12	11	14	7	1	1	0	50
2009	0	0	0	0	3	5	20	13	6	5	0	0	52
2010	0	0	0	0	3	6	13	9	12	5	1	2	51
2011	0	2	1	3	5	12	16	16	17	2	0	0	74
2012	4	1	0	0	0	7	20	21	13	7	3	0	76
2013	1	1	0	4	0	12	21	8	10	12	0	0	69
2014	0	3	1	0	2	12	17	13	0	0	0	0	48
Total	1	1	0	1	4	11	17	15	9	6	1	0	66

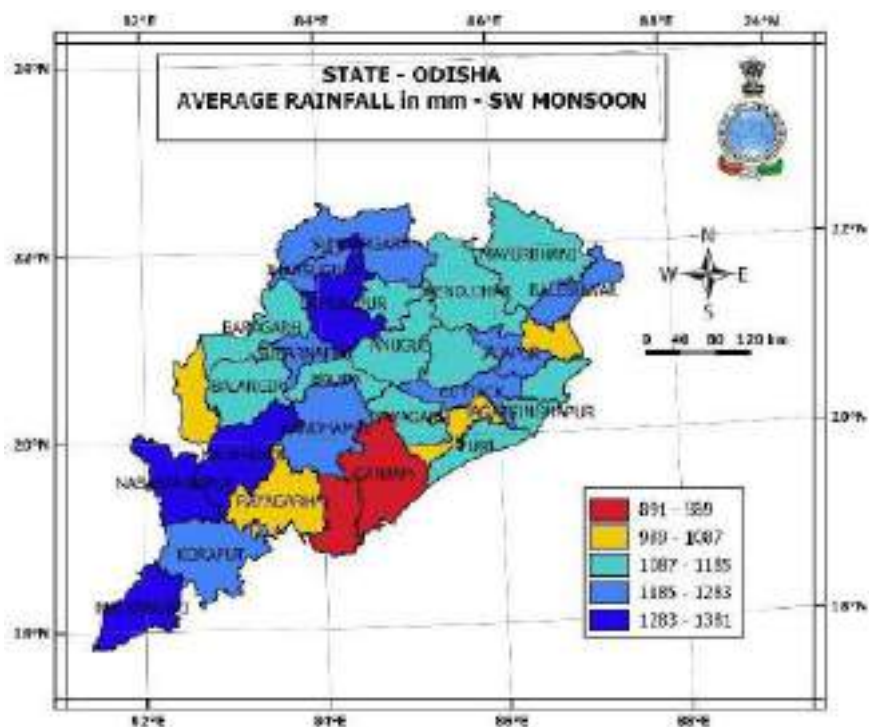


Table No 1.13 (C) No of rainy days Rairakhol and Naktideul Block

Year	No of rainy days in Rairakhol CD Block	No of rainy days in Naktideul CD Block
2006	92	105
2007	89	70
2008	84	50
2009	63	52
2010	56	51
2011	76	74
2012	75	76
2013	68	69
2014	66	48

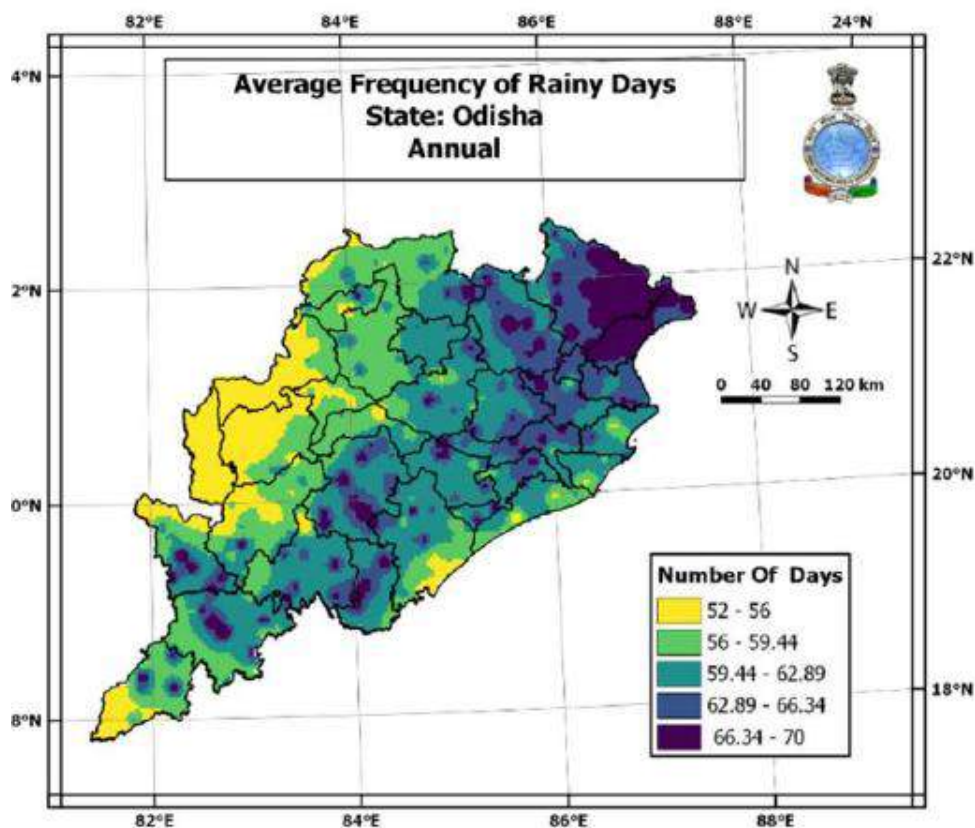
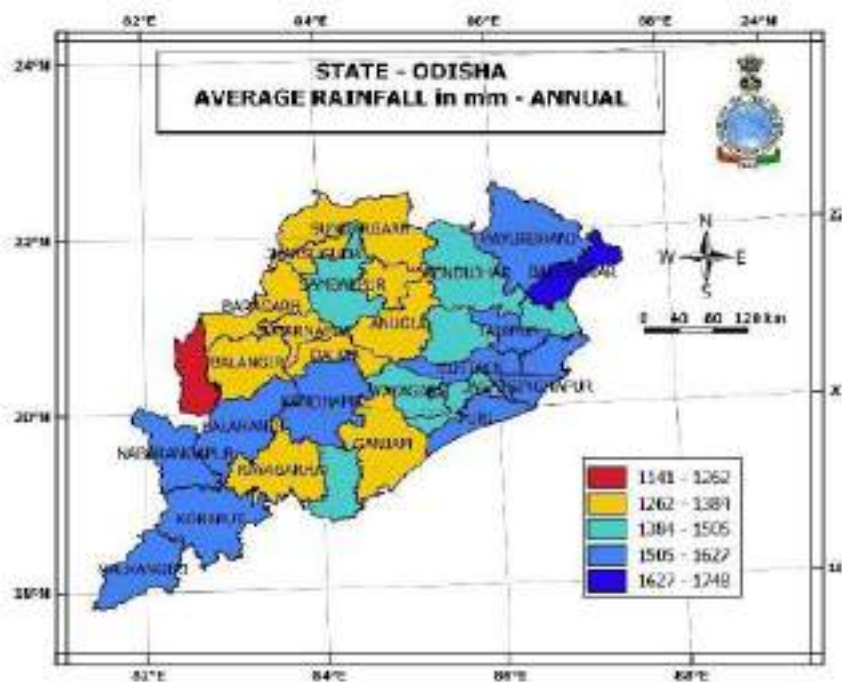


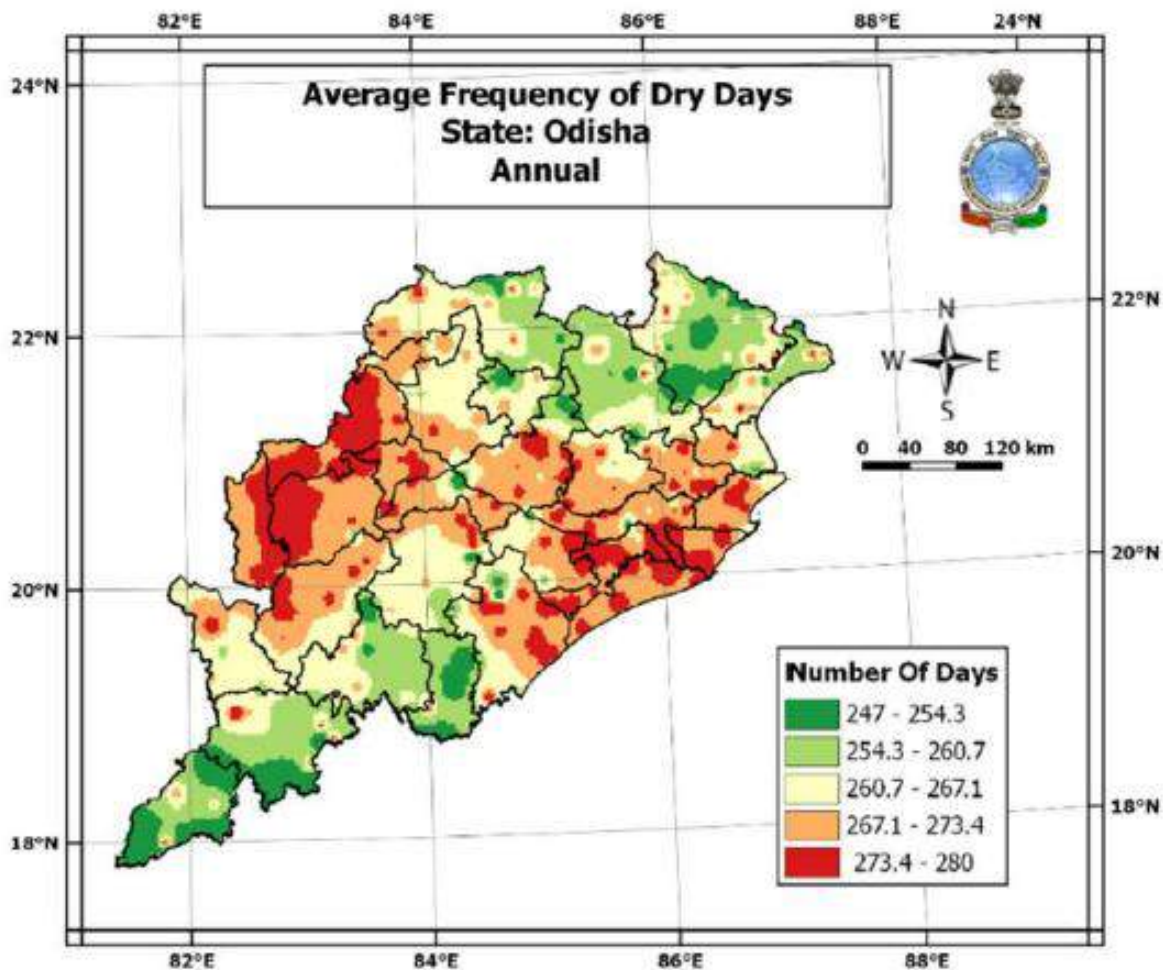
The number of Rainy days in both the block has a down ward trend. Taking 2006 as the base, during 2014 the fall is about 28% in case Rairakhol block and 55% in case of Naktideul block. This is very adverse sign for health of forest in the division.





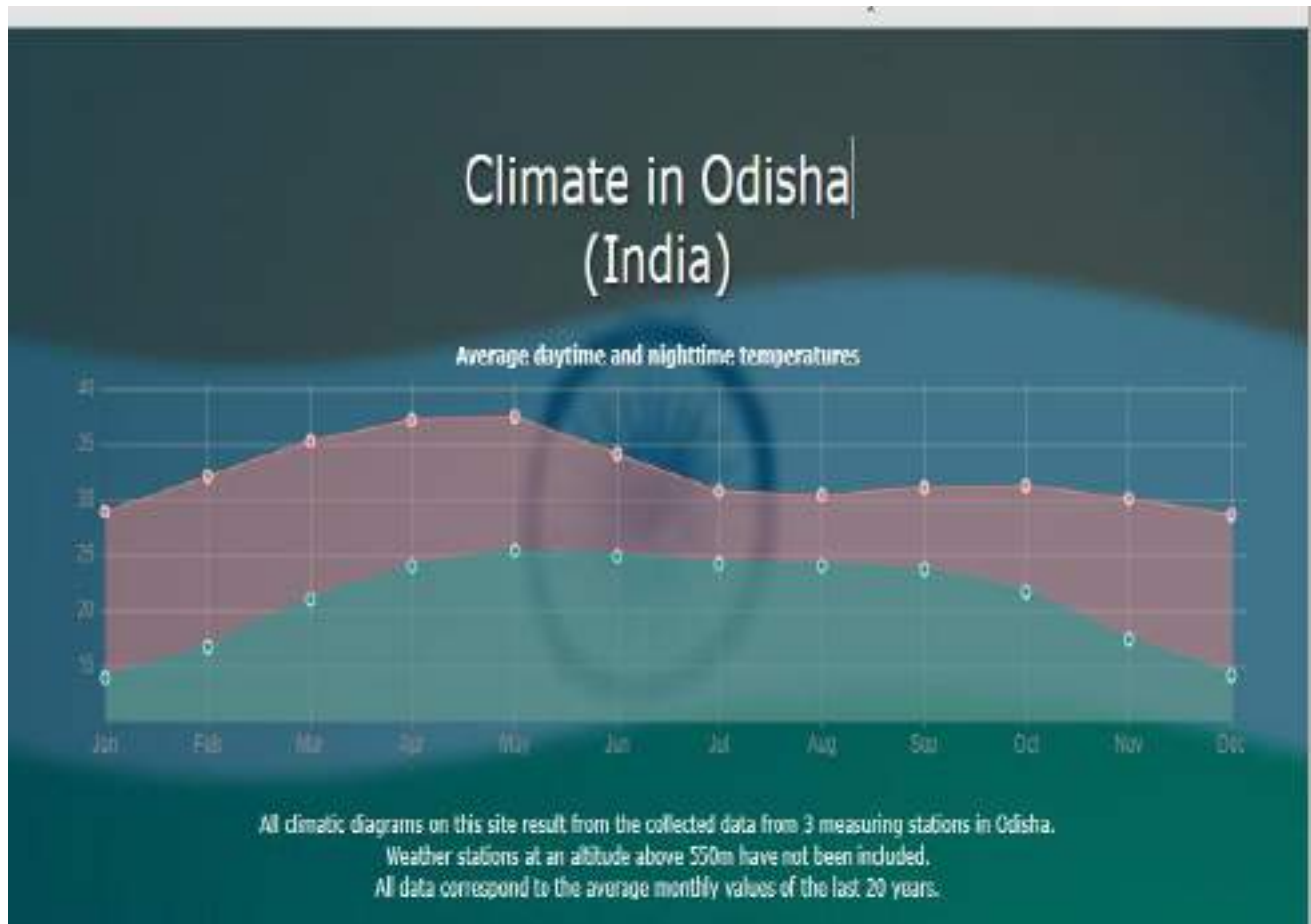
Revised working plan of Rairakhol Division (2021-22 to 2030-31)





1.4.2 Temperature:

The temperature pattern depicts a fluctuating upper and lower range of temperature. This is due to erratic behavior of climate in this tract. The presence of good forest always influences the temperature regime of the locality. The average temperature during may goes up to 45⁰ C and minimum during December goes down to 6⁰C.



1.4.3 Humidity:

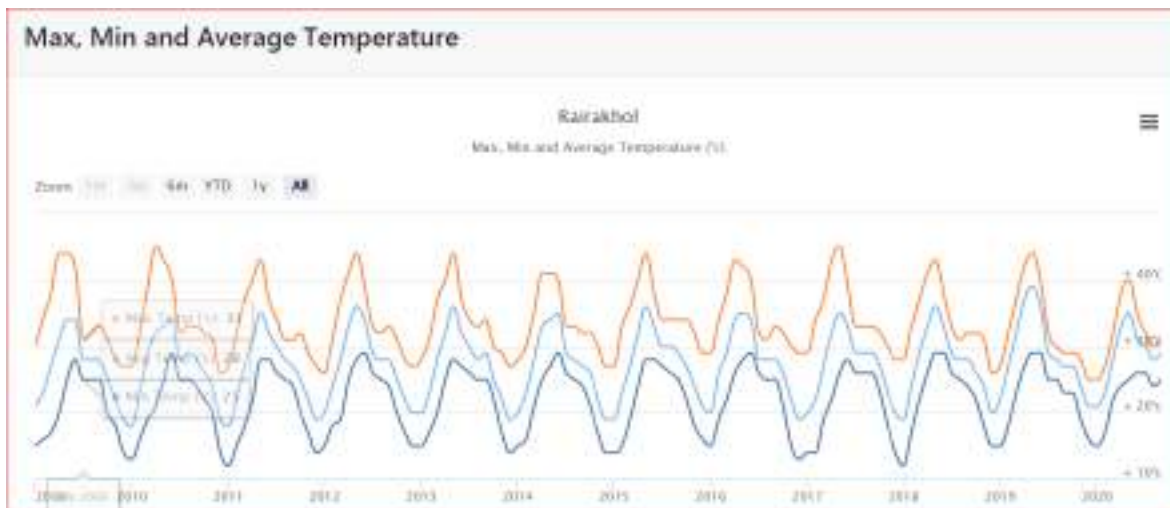
The volume of air contains maximum amount of water vapor during the month of August and minimum during the month of April. In general minimum Humidity is observed from the month of January / February and maximum from the month of July / August of the year.

1.4.4 Drought:

The tract does not experience savior drought in recent past. Though rainfall is erratic to some extent, drought like condition didn't arise during last 5 years. There is no forest crop loss / retardation due to drought.

1.4.5 Frost:

This division does not experience any frost during last decades. It has no effect of on Forest crops of Rairakhol division.



1.4.6 Cyclone / Storm:

Rairakhol is about 200 km from sea / Bay of Bengal. The effect of Cyclonic storm in Bay of Bengal only brings heavy rainfall to this tract. No cyclone above 40-50 Km wind speed has been experienced in this tract.

1.4.7 Flood:

Rairakhol is a table land with high hills and plains. No major river is flowing in the division. The flood in Mahanadi / Tikira does not affect the division. No flood is experienced during last decade or so.





CHAPTER-2

MAINTENANCE / INCREASE IN THE EXTENT OF FOREST AND TREE COVER.

2.1 Area of Forests under different legal Classes:

There are Reserved Forests, Proposed Reserved Forests, Demarcated Protected Forest, Village Forest and Protected Forests in Rairakhol. The total forest area is 1415.703 Sq. Km. The details of forest blocks (legal class wise) are as follows.

2.1.1 Reserved Forests:

There are 13 forest blocks having total area 89051.10 ha. the list is at Table No 2.1 below.

Table 2.1 List of Reserve Forests of Rairakhol Division

Table 2.1 List of Reserve Forests of Rairakhol Division				
Sl. No.	Block and Class.	Area in ha.		Notification No.
		Notified	GIS as per current W.P	
Division: Redhakhol				
1	Bindhybasini (B)	726.00	755.91	15831/12F-179(M)-57-CF dt.2.9.1957
2	Chargarh (B)	425.00	473.41	15831/12F-179(M)-57-CF dt.2.9.1957
3	Hatidhara(A)	7609.00	7527.02	15831/12F-179(M)-57-CF dt.2.9.1957
4	Kholgarh (A)	19280.1	18882.61	15831/12F-179(M)-57-CF dt.2.9.1957
5	Landakot (A)	24697.0	24507.18	15831/12F-179(M)-57-CF dt.2.9.1957
6	Landimal (A)	13864.0	14026.78	15831/12F-179(M)-57-CF dt.2.9.1957
7	Nadia (B)	937.00	932.53	15831/12F-179(M)-57-CF dt.2.9.1957
8	Rahan (A)	3192.00	3145.14	15831/12F-179(M)-57-CF dt.2.9.1957
9	Rail (A)	11389.0	11289.54	15831/12F-179(M)-57-CF dt.2.9.1957
10	Rengali-Badmal(B)	1137.00	1139.13	15831/12F-179(M)-57-CF dt.2.9.1957
11	Sagmalia (B)	3099.00	3004.87	15831/12F-179(M)-57-CF dt.2.9.1957
12	Suani (B)	687.00	679.97	15831/12F-179(M)-57-CF dt.2.9.1957
13	Tal (B)	2009.00	2060.66	15831/12F-179(M)-57-CF dt.2.9.1957
Total- 13 blocks		89051.1	88424.75	



2.1.2 Proposed Reserved Forests (PRF):

The PRF (Proposed Reserved Forests) are forest blocks declared U/s 4 of Forest Act and at various stages of Reservation. These are furnished below. (Table No 2.2)

Table No 2.2 List of Proposed Reserved Forest

Sl. No.	Name of block	Notified area in ha	GIS area in ha	Notification No. under sec-4
1	Berhampura	815.78	777.38	26719R dt. 02.4.1979
2	Kalia	239.15	318.26	17117R dt 11.4.1960
3	Koilpadar	317.08	227.83	17122R dt. 11.4.1960
4	Mochibahal	1733.8	1553.13	13680R dt. 24.2.1978
5	Podabalanda	157.89	273.95	17115R dt. 11.4.1960
6	Purunapani	1012.1	962.39	7077R dt. 01.2.1978
7	Sagjori	801.31	610.66	10215R dt 14.2.1978
8	San-Rengali	281.37	311.61	20450R dt. 10.4.1978
9	Satasama	343.44	474.95	12266R dt. 20.2.1978
10	Siaripani	376.16	204.72	12075R dt 20.2.1978
11	Talab	593.11	630.44	15310R dt. 17.3.1987
12	Goudpali	42.1	58.24	58526R dt. 28.9.1987
13	Chadchadi	1791.5	2832.13	58278 / R dt.28.9.1987
14	Rasibeda	70.34	93.62	FS-93 / 04-28500R dt.19.7.2005
15	Rohinigadia	309.72	569.43	58213 / R dt.26.9.1987
16	Hemantkhol	218.22	214.92	FS-9/ 05-28500R&MD dt.26.05.07
Total (16 blocks)		9103.07	10113.66	

2.1.3 Demarcated Protected Forests (DPF):

These are the forest blocks demarcated and proposed for declaration under provisions of Forest Act, 1972. These forest blocks are not yet declared under section 4 of the Odisha Forest Act, 1972 but included in the working plans for its scientific management. The list of such forests is at Table No 2.3 below.



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 2.3 List of Demarcated Protected Forest of Rairakhol Division.

Sl. No.	Forest block	Area in ha	GIS area in ha.	Sent to Govt. vide No.
01	Amjhari	159.90	189.41	Memo.No- 01 dt 05.1.2005
02	Amjhari-Dhadrakhol	452.63	596.42	Pending with collector.
03	Bad-Hindol	583.41	581.32	Memo.No-119/FS dt.31.05.2005
04	Bahaljharan	146.57	128.14	Memo .No- 39 dt.03.3.2005
05	Balikiari	46.35	37.60	Memo.No- 51 dt.09.4.2003
06	Budbuda	068.49	102.42	Pending with Collector
07	Dhadrakhol	273.30	326.84	Memo.No- 05 dt.05.1.2005
08	Hintrei	73.95	111.55	Memo.No-57 dt.16.3.2005
09	Jarasingha	178.00	179.13	Memo.No- 56 dt.17.4.2003
10	Kusumbahali	269.72	326.49	Memo.No- 53 dt.16.3.2005
11	Lampaphuli	198.86	426.58	Memo.No-101 dt 07.5.2005
12	Penthabahal	31.00	28.46	Memo.No- 20 dt.12.3.2003
13	Phulkusum	87.40	86.05	Memo.No- 41 dt.03.4.2003
14	Podamal	143.72	110.00	Memo.No- 47 dt.09.4.2003
15	Terbeda	37.80	35.99	Memo.No- 37 dt.03.4.2003
Total		2751.10	3266.40	

2.1.4 Village Forest (As notified u/s 30 of OFA'1972):

There are village woodlots planted during Social Forestry Project within village boundary and subsequently declared u/s 30 of the Odisha Forest Act,1972. The list of such village forests are at Table No 2.4 below.

Table No 2.4 List of Village Forest in Rairakhol Division

Sl. No.	Range	Name of V.F.	Comp. No.	Area as per Notification		GIS area (in Ha.)
				Notification No	Area (in Ha)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	Naktideul	Bindpur	-	No.1981-AFFN (DIDA)- F&E dt. 28.01.1992	30.0	57.86
Total 1 block					30.00	57.86



2.1.5 Protected Forests:

There are forest blocks declared under section 35 of Odisha Forest Act, 1972. These are generally plantations raised on **“Compensatory Afforestation Scheme”**

Table No 2.5 List of Protected Forest.

Sl. No.	Range	Name of P.F.	Comp. No.	Area as per Notification		GIS area (in Ha.)
				Notification No	Area (in Ha)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	Rampur Now Rairakhol Range	Khajurijharan	-	No. 10F (Div.) 16/2009-14217 dt. 20.08.2009	38.393	-

2.1.6 Un Classed Forest:

There are lands under administrative control of Forest Department but not declared under provisions of Forest Act. Such lands are designated as **“Un-classed” Forests”**. The list of such forests are at Table no 2.6.

Table No: 2.6 List of Un-Classed forests in Rairakhol Division.

Sl No	Description of Un-Classed Forest	Area in ha
Charmal Range		
1	Charmal Range Office, Mouza- Charmal, Khata No. 151 Plot No. 871, Kissam-Ghara Bari	0.196
2	Range Officer Residence Mouza- Charmal, Khata No. 151 Plot No. 871, Kissam-Ghara Bari	0.08
3	Forester Qtr Charmal, Mouza- Charmal, Khata No. 151 Plot No. 871, Kissam-Ghara Bari	0.04
4	Fg Qtr Charmal , Mouza- Charmal, Khata No. 151 Plot No. 871, Kissam- Ghara Bari	0.02
5	Fg Qtr Berhampura , Mouza- Charmal, Khata No. 151 Plot No. 871, Kissam-Ghar a Bari	0.02
6	Fg Qtr Berhampura (Old), Mouza- Berhampura , Khata No. 35 Plot No. 258, Kissam- Ghara Bari	0.044
7	Fg Qtr Brahmani , Mouza- Brahmani , Khata No. 13 Plot No. 132, Kissam- Basti Yogya	0.024
8	Charmal P Nursery, Mouza- Charmal , Khata No. 151 Plot No. 1243, Kissam- Sal jangal	4.4



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 2.6 List of Un-Classed forests in Rairakhol Division.

Sl No	Description of Un-Classed Forest	Area in ha
9	Seizure yard, Mouza- Charmal , Khata No. 151 Plot No. 1243, Kissam- Sal jangal	0.252
10	Barrack Charmal, Mouza- Charmal , Khata No. 151 Plot No. 1243, Kissam- Sal jangal	0.02
11	FRH Charmal, Mouza- Charmal , Khata No. 151 Plot No. 1243, Kissam- Sal jangal	0.08
12	Fr Qtr Banshajal , Mouza- Banshajal , Khata No. 106 Plot No. 1068, Kissam- Jangal Kisam	0.04
13	Fg Qtr Banshajal , Mouza- Banshajal , Khata No. 106 Plot No. 1030, Kissam- Ghara Bari	0.02
14	Fg Qtr Gargadbahal , Mouza- Kardapal , Khata No. 50 Plot No. 863, Kissam- Sal jangal	0.168
	Total (14 site)	5.404
Badbahal Range		
15	Dhaurakhaman Permanent Nursery	1 .00
	Forester's Quarters	0.1
	Forest Guard Quarters (Kendumundi)	0.08
	Total	1.18
Naktideol Range		
19	Forester Quarter Ghosramal Plot No. 1887, 1888, 1889 & 1898	0.13
20	Forest Guard Quarter Ghosramal Plot No. 1887, 1888, 1889 & 1898	0.13
21	Forest Guard Qtrs. at Kadobahali plot No. 331 & 332 Khata No. 155 Mouza - Lusura	0.112
22	Nursery shed Charadapasi Khata No 21 Plot No. 196 (Jabardakhal Banabibhaga)	1.0
23	Range Office Building Naktideul Plot No. 1354	0.076
24	Range Office Residence Naktideul Plot No. 1354	0.076
25	Forester Qtrs. Naktideul Plot No. 656, 657,658,659,660,661,662 & 663	0.13
26	Forest Guard Qtrs. at Naktideul	0.13
27	Forest Guard Qtrs. Sahebi Plot No. 15 & 69	0.048
28	Forest Guard Qtrs at Sarapali Khata No. 371 Plot No.3839	0.2
29	Forester Qtrs. Rail	0.06
30	Forest Guard Qtrs. Rail	
31	Forest Guard Qtrs. Koing	0.05



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 2.6 List of Un-Classed forests in Rairakhol Division.

Sl No	Description of Un-Classed Forest	Area in ha
32	Forest Guard Qtrs. Kudanali (Private land)	0.06
33	Forester Qtrs. Batgaon Plot No. 2852 Khata No. 179 (jabardakhal)	0.072
34	Forest Guard Qtrs. Hitasara plot No. 159	0.032
35	Forest Guard Qtrs. Jamujori Plot No. 913 & 912	0.12
36	Forest Guard Qtrs. Chadchadi plot No. 34	0.024
37	Forest Guard Qtrs. Salebhata plot No. 721	0.32
38	Forest Guard Qtrs. Tileipasi Khata No. 50 Plot No. 432	0.008
39	Permanent Nursery Penthabahal khata No. 41 Plot No. 457 (Jabardakhal Banabibhaga)	5.0
	Total	7.778
GC Pur Range		
49	Seizure Yard at Girishchandrapur	0.74
50	Range Office at Girishchandrapur	
51	FRH at Girishchandrapur	
52	RO Residence at Girishchandrapur	0.49
53	Forest Guard Quarter at Girishchandrapur	
54	Forester Quarter (Old) at Girishchandrapur	
55	Forest Guard Quarter at Soda	0.04
56	Forest Guard Quarter (Old) at Hiralo	0.09
57	Watch Tower at Kholgarh Compt.1	0.26
58	Forester Quarter at Balikiari	
59	Forest Guard Quarter at Balikiari	
60	ForestGuard Quarter(Old) at Balikiari	
61	FRH(Old) at Talab	0.11
62	Forester Quarter at Luhabir	0.09
63	Forest Guard Quarter at Luhabir	
64	Forest Guard Quarter (old) at Jaresingha	0.08
	Total	
	Division Total	17.456



2.1.7 DLC Forest:

District Level Committee (DLC) was constituted during the year 1997 in each district under the Chairmanship of the District Collector as per the Orders passed by the Hon'ble Supreme Court of India in W.P.(C) 202/1995 to identify all forest areas under the administrative control of F&E Department /Revenue Department and Forest land / Plantations belonging to private persons. After necessary scrutiny of the DLC Reports by the State Level Expert Committee, the details of such Forest land were submitted before the Hon'ble Apex Court in shape of an affidavit. All such Forest Lands which found place in the final DLC reports are to be regulated under the provisions of the Forest (Conservation) Act, 1980.

Instruction has been issued by the Government of Odisha, Revenue and Disaster Management Department vide letter No RDM/-LRGEA.POLICY – 0018-23784/ R&DM Dated 30.06.2018 (**Annexure-IV**) to enter this DLC Forest land in the BHULEKH DATA BASE. However for ready reference of the Forest staff. The village wise area in each Tahasil is furnished at **Part-III of this Plan**. The Tahasil wise abstract is given at Table No 2.7.

Table No 2.7 Abstract of DLC land (Tahasil Wise)

Sl No	Name of Tahasil	Number of Villages recorded in DLC Report	Area in acre	Area in ha
1	Rairakhol	314	700.44	283.45
2	Naktideul	737	1620.17	655.65
	Total	1051	2320.61	939.11

2.1.8 Forests under Revenue Records:

Besides above forest indicated there are forests in revenue records name as Gramya Jungal, Patra Jungal, Sal Jungal etc. The detail records are not with forest department. In various records (not confirmed) about 39657.59 ha of such forest available in the division.

2.1.9 Total Forest area of the Division:

The total Forest area computed to be 141570.393 ha (1415.57 Sq. km) in the division as furnished at Table No 2.8



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 2.8 Abstract of Forest area in Rairakhol Division.

Sl No	Category of Forest	No of Blocks	Area in ha (notified)	Percentage	Remark
1	Reserved Forest	13	89051.10	62.90	
2	Proposed Reserved Forest	16	9103.10	6.43	
3	Demarcated Protected Forest	15	2751.10	1.94	
4	Village Forest	1	30.00	0.02	
5	Protected Forest	1	38.393	0.03	
6	DLC Forest		40596.70	28.68	
7	Rev. Forest (Other than DLC)				
8	Total Forest area.	46	141570.393	100.00	

2.1.10 Forest Area under different Working Circle/ Management Plan:

The outgoing plan was by Sri Sankarsan Behera, OFS –I (SB). The plan period was 2007-08 to 2016-17. The plan was for prior to second reorganization i.e. 01st January, 2010. The forest blocks transferred to Rairakhol Division are not considered in this plan.



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

2.2.1 Working Circles of Outgoing Plan.

In the outgoing plan there is eight Working Circle out of which two Working Circle are independent WC and rest are overlapping Working Circle. The block wise area allotted to different working circle is furnished at Table No 2.9

Table No 2.9 Forest blocks allotted to different Working Circle in outgoing Plan (A- For Reserved Forests)

Table No 2.9 Forest blocks allotted to different Working Circle in outgoing Plan (A- For Reserved Forests)											
SI No	Name of Forest Block	Area in Ha		Allotted to							
		Notified	GIS computed	SWC	RWC	Pl(O) WC	Bamboo (O) WC	Protection (O) WC	NTFP (O) WC	Wildlife (O) WC	JFM (O) WC
Reserved forests											
Rampur Range											
1	Bindhybasini	726.00	755.91	755.91	0	0	755.91	755.91	755.91	755.91	200.0
2	Hatidhara	7609.00	7527.02	7527.02	0	501.80	5037.15	7527.02	7527.02	7527.02	
3	Kholgarh (P) Comp 21 to 39	19280.10	7968.44	7968.44	0	28.0	1864.51	7968.44	7968.44	7968.44	
Range Total		27615.10	16251.37	16251.37	0.00	529.80	7657.57	16251.37	16251.37	16251.37	200.00
Rairakhol Range											
4	Rahana	3192.00	3145.14	1896.09	1249.05	55.00	2738.37	3145.14	3145.14	3145.14	250.0
5	Tal	2009.00	2060.66	2060.66	0	78.00		2060.66	2060.66	2060.66	1500.0
Range Total		5201.00	5205.80	3956.75	1249.05	133.00	2738.37	5205.80	5205.80	5205.80	1750.00
Mochibahal Range											
6	Charghar	425.00	473.41	0	473.41	0		473.41	473.41	473.41	
7	Landakot (P-I) Comp-60 to 71	24697.00	2931.52	2931.52	0	27.00		2931.52	2931.52	2931.52	
8	Re-Badmal	1137.00	1139.13	0	1139.13	40.00		1139.13	1139.13	1139.13	50.00
Range Total		26259.00	4544.06	2931.52	1612.54	67.00		4544.06	4544.06	4544.06	50.00
Girishchandrapur Range											
9	Kholgarh(B) Comp No 1 to 20		10914.17	10914.17	0	88.00		10914.17	10914.17	10914.17	705.00



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 2.9 Forest blocks allotted to different Working Circle in outgoing Plan (A- For Reserved Forests)

Sl No	Name of Forest Block	Area in Ha		Allotted to							
		Notified	GIS computed	SWC	RWC	Pl(O) WC	Bamboo (O) WC	Protection (O) WC	NTFP (O) WC	Wildlife (O) WC	JFM (O) WC
10	Landakot (P-2) Comp- 1 to 38, 75,76,77, 81 to 87		13663.65	13663.65	0	139.50		13663.65	13663.65	13663.65	616.00
Range Total			24577.82	24577.82	0.00	227.50		24577.82	24577.82	24577.82	1321.00
Charmal Range											
11	Landakot(P-3) Comp- 39 to 59, 72,73,74,78,79,80,		7912.01	7912.01	0	20.00		7912.01	7912.01	7912.01	
12	Sagmalia	3099.00	3004.87	3004.87		126.70	3004.87	3004.87	3004.87	3004.87	232.0
13	Suani	687.00	679.97	352.79	327.18	0		679.97	679.97	679.97	
Range Total		3786.00	11596.85	11269.67	327.18	146.70	3004.87	11596.85	11596.85	11596.85	232.00
Naktideul Range											
14	Landimal	13864.00	14026.78	14026.78		139.50		14026.78	14026.78	14026.78	100.0
15	Nadia	937.00	932.53	0	932.53	90.00		932.53	932.53	932.53	440.00
16	Rail	11389.00	11289.54	11289.54		0		11289.54	11289.54	11289.54	265.00
Range Total		26190.00	26248.85	25316.32	932.53	229.50		26248.85	26248.85	26248.85	805.00
16 Blocks		89051.10	88424.75	84303.45	4121.30	1333.50	13400.81	88424.75	88424.75	88424.75	4358.00



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 2.9 Forest blocks allotted to different Working Circle in outgoing Plan (B- For Proposed Reserved Forests)

Sl No	Name of Forest Block	Area in Ha		Allotted to							
		Notified	GIS computed	SWC	RWC	PI(O) WC	Bamboo (O) WC	Protection (O) WC	NTFP (O) WC	Wildlife (O) WC	JFM (O) WC
Proposed Reserved forests											
Rampur Range											
1	Purunapani	1012.14	962.39		962.39	2		962.39	962.39	962.39	124.17
Range Total		1012.14	962.39		962.39	2.00		962.39	962.39	962.39	124.17
Rairakhol Range											
2	Podabalanda	157.89	273.95	273.95				273.95	273.95	273.95	
3	San-Rengali	281.37	311.61	311.61				311.61	311.61	311.61	100.00
4	Hemantkhol	218.22	214.92	214.92				214.92	214.92	214.92	102.94
Range Total		657.48	800.48	800.48				800.48	800.48	800.48	202.94
Mochibahal Range											
5	Kalia	239.15	318.26	318.26				318.26	318.26	318.26	
6	Mochibahal	1733.8	1553.13	1553.13				1553.13	1553.13	1553.13	
7	Sagjori	801.31	610.66	610.66			610.66	610.66	610.66	610.66	66.88
8	Satasama	343.44	474.95		474.95			474.95	474.95	474.95	
Range Total		3117.70	2957.00	2482.05	474.95		610.66	2957.00	2957.00	2957.00	66.88
Charmal Range											
9	Berhampura	815.78	777.38		777.38			777.38	777.38	777.38	50.00
10	Koilpadar	317.08	227.83		227.83			227.83	227.83	227.83	100.00
11	Siaripani	376.16	204.72		204.72			204.72	204.72	204.72	100.00
12	Rasibeda	70.34	93.62		93.62			93.62	93.62	93.62	
Range Total		1579.36	1303.55		1303.55			1303.55	1303.55	1303.55	250.00



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 2.9 Forest blocks allotted to different Working Circle in outgoing Plan (B- For Proposed Reserved Forests)

Sl No	Name of Forest Block	Area in Ha		Allotted to							
		Notified	GIS computed	SWC	RWC	Pl(O) WC	Bamboo (O) WC	Protection (O) WC	NTFP (O) WC	Wildlife (O) WC	JFM (O) WC
Girishchandrapur Range											
13	Talab	593.11	630.44	630.44				630.44	630.44	630.44	101.00
14	Goudpali	42.1	58.24		58.24			58.24	58.24	58.24	42.00
Range Total		635.21	688.68	630.44	58.24			688.68	688.68	688.68	143.00
Naktideul Range											
15	Chadchadi	1791.49	2832.13		2832.13			2832.13	2832.13	2832.13	100.00
16	Rohinigadia	309.72	569.43		569.43			569.43	569.43	569.43	
Range Total		2101.21	3401.56		3401.56			3401.56	3401.56	3401.56	100.00
PRF Total		9103.1	10113.66	3912.97	6200.69	2.00	610.66	10113.66	10113.66	10113.66	886.99



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Table No 2.9 Forest blocks allotted to different Working Circle in outgoing Plan (C. For DPF)

Sl No	Name of Forest Block	Range	Area in Ha		Allotted to							
			Notified	GIS computed	SWC	RWC	PI(O) WC	Bamboo (O) WC	Protection (O) WC	NTFP (O) WC	Wildlife (O) WC	JFM (O) WC
Demarcated Protected Forests												
Rampur Range												
1	Bad-Hindol	Rampur	583.41	581.32		581.32			581.32	581.32	581.32	69
2	Hintrei	Rampur	73.95	111.55		111.55			111.55	111.55	111.55	73.95
3	Terbeda	Rampur	37.80	35.99		35.99			35.99	35.99	35.99	
Range Total			695.16	728.86		728.86			728.86	728.86	728.86	142.95
Charmal Range												
4	Kusumbahali	Charmal	269.72	326.49		326.49			326.49	326.49	326.49	
Range Total			269.72	326.49		326.49			326.49	326.49	326.49	
Naktideul												
5	Amjhari	Naktideul	159.90	189.41		189.41			189.41	189.41	189.41	100.00
6	Amjhari-Dhadrakhol	Naktideul	452.63	596.42		596.42			596.42	596.42	596.42	
7	Bahaljharan	Naktideul	146.57	128.14		128.14			128.14	128.14	128.14	
8	Dhadrakhol	Naktideul	273.30	326.84		326.84			326.84	326.84	326.84	
9	Lampaphuli	Naktideul	198.86	426.58		426.58			426.58	426.58	426.58	64.50
10	Penthabahal	Naktideul	31.00	28.46		28.46			28.46	28.46	28.46	
Range Total			1262.26	1695.85	0	1695.85			1695.85	1695.85	1695.85	164.5
GC Pur												
11	Balikiari	GCPur	46.35	37.60	37.60				37.60	37.60	37.60	46.35
12	Budbuda	GCPur	68.49	102.42		102.42			102.42	102.42	102.42	68.49
13	Jarasingha	GCPur	178.00	179.13	179.13				179.13	179.13	179.13	



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 2.9 Forest blocks allotted to different Working Circle in outgoing Plan (C. For DPF)

Sl No	Name of Forest Block	Range	Area in Ha		Allotted to							
			Notified	GIS computed	SWC	RWC	Pl(O) WC	Bamboo (O) WC	Protection (O) WC	NTFP (O) WC	Wildlife (O) WC	JFM (O) WC
14	Phulkusum	GCPur	87.40	86.05		86.05			86.05	86.05	86.05	
15	Podamal	GCPur	143.72	110.00	110.00				110.00	110.00	110.00	
Range Total			523.96	515.20	326.73	188.47			515.20	515.20	515.20	114.84
Total			2751.10	3266.40	326.73	2939.67	0	0	3266.40	3266.40	3266.40	422.29

Table No 2.9 Forest blocks allotted to different Working Circle in outgoing Plan (D- For Village Forest)

Sl No	Name of Forest Block	Range	Area in Ha		Allotted to							
			Notified	GIS computed	SWC	RWC	Pl(O) WC	Bamboo (O) WC	Protection (O) WC	NTFP (O) WC	Wildlife (O) WC	JFM (O) WC
Village Forests												
1	Naktideul	Bindpur	30.0	57.86		57.86						57.86
Total			30.0	57.86		57.86						57.86



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Table No 2.9 Forest blocks allotted to different Working Circle in outgoing Plan (E- For Protected Forest)

Sl No	Name of Forest Block	Range	Area in Ha		Allotted to							
			Notified	GIS computed	SWC	RWC	Pl(O) WC	Bamboo (O) WC	Protection (O) WC	NTFP (O) WC	Wildlife (O) WC	JFM (O) WC
Protected Forests												
1	Rampur (now Rairakhol)	Khajurijharan	38.393	--	Not allotted. Declared as PF after approval of Outgoing Plan							
	Total											

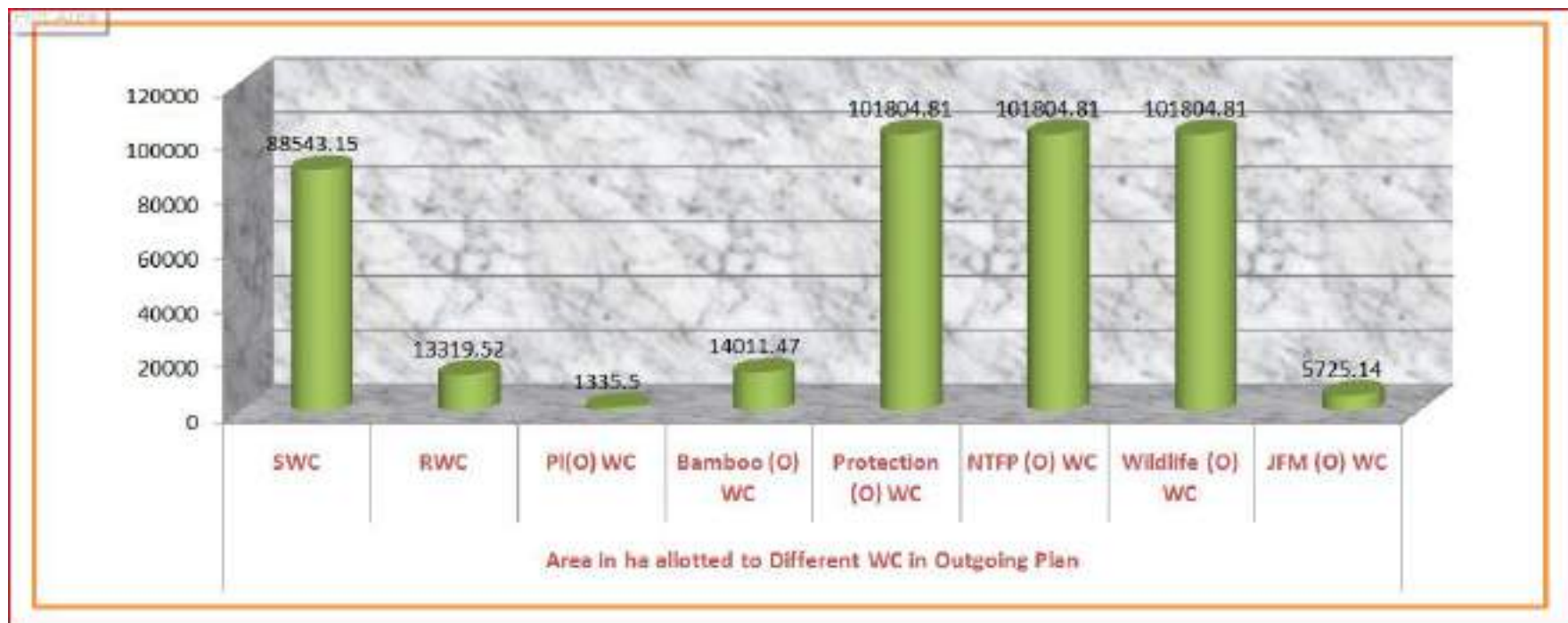
(NB: Not allotted, Declared as PF after approval of Outgoing Plan)

Table No 2.10 Area of Forest Category wise

Sl No	Category of Forest	Area in Ha	Allotted to									
		Notified	GIS Computed	SWC	RWC	PI(O) WC	Bamboo (O) WC	Protection (O) WC	NTFP (O) WC	Wildlife (O) WC	JFM (O) WC	
1	RF	89051.10	88424.75	84303.45	4121.30	1333.50	13400.81	88424.75	88424.75	88424.75	4358.00	
2	PRF	9103.1	10113.66	3912.97	6200.69	2.00	610.66	10113.66	10113.66	10113.66	886.99	
3	DPF	2751.10	3266.40	326.73	2939.67	0	0	3266.40	3266.40	3266.40	422.29	
4	VF	30.0	57.86		57.86						57.86	
	Total	100935.3	101862.7	88543.15	13319.52	1335.5	14011.47	101804.8	101804.8	101804.8	5725.14	
	%			86.92	13.08	1.31	13.76	99.94	99.94	99.94	5.62	



Revised working plan of Rairakhol Division (2021-22 to 2030-31)





2.3 Percentage of Forest with Secured Boundaries:

The total boundary length of Rairakhol Division is 286.00 km. The details of common boundary length with adjoining Divisions are given in the table below.

Table No 2.11 Division boundary		
Sl. No	Name of Divisions	Length of common boundary in km.
1	Rairakhol and Bamra (WL)	36.00
2	Rairakhol and Deogarh	32.00
3	Rairakhol and Angul	38.00
4	Rairakhol and Athamallik	68.50
5	Rairakhol and Sambalpur	74.50
6	Rairakhol and Rairakhol	37.00
	Total	286.00

2.3.1 Boundary of Reserve Forests:

Boundary line of all Reserve Forests has been surveyed by Survey of India during 1978-79 to 1980-81 and printed in 1:25000 scale maps. The common boundary line with adjoining District has been cleared to a width of 12 mt. The boundary of (A) class Reserve Forests has been cleared to a width of 10 mt. But in case of (B) class Reserve Forests to a width of 8 mt. Boundary of all Reserve Forest have been shown in the topo sheets by Survey of India. The details of boundary lengths and total pillars number of individual Reserve Forests have been given in the **Table No 2.10**.

2.3.2: Boundary of Proposed Reserve Forests:

Boundary line of all Proposed Reserve Forests have been surveyed by field staffs and checked by the Forest Settlement Officer. The boundaries have been cleared to a width of 6 mt. The boundary of all PRF has been shown in the topo sheets by the field staffs. The details of boundary and pillars are given in the Table 2.10.

2.3.3 Boundary of Demarcated Protected Forests:

The field staffs have surveyed boundary line of all Demarcated Protected Forests. The boundaries have been maintained at a width of 6 mt. All blocks are shown in the topo sheets by the field staffs. The details of boundary and pillars are given in the Table No 2.12



2.3.4 Boundary of Village Forests:

Boundary line of one Village Forest named as Bindapur, has been surveyed by field staff and cleared to a width of 8 mt. The length of boundary is 2.2 km, which is purely artificial. This block has 25 pillars on its boundary, which is constructed during the month of March 2006.

Table No 2.12 Boundary length and pillars of Forest Blocks

S. No.	Name of Forest block	Boundary Length in Km.			Boundary pillars			
		Natu'l	Arti'l	Total	Not'd	Good	Dag'ed	Missing
For Reserved Forests								
1	Landakot	34.04	175.55	209.59	1620	735	753	132
2	Kholgarh	13.6	167	180.6	1277	303	949	25
3	Rahan	1	137.97	138.97	160	98	62	x
4	Tal	x	14.06	14.06	136	45	91	x
5	Suani	3	8.56	11.56	69	x	47	22
6	Nadia	0.87	15.92	16.79	122	22	100	x
7	Sagmalia	x	58.3	58.3	557	253	264	40
8	R-Badmal	2.75	29.25	32	175	75	100	x
9	Chargarh	0.63	11.69	12.32	118	55	60	3
10	Rail	22.24	45.84	68.08	394	80	314	x
11	Landimal	3.55	66.8	70.35	362	250	112	x
12	Hatidhara	2.67	74.92	77.59	564	169	395	x
13	Bidhyabasini	x	23.34	23.34	225	60	101	64
	Total	84.35	829.2	913.55	5779	2145	3348	286
	Percentage	9.2	90.8	100.0	100	37.1	57.9	4.9
SI No.	Name of block	Boundary length in km			Number of pillars			
		Natural	Artifi'l	Total	Notified	Good	Dam'd	Missing
For PRF								
1	Purunapani	x	20.8	20.8	206	x	150	56
2	Podabalanda	x	10.73	10.73	69	x	69	x
3	San-Rengali	x	5.45	5.45	32		32	x
4	Mochibahal	x	29.15	29.15	150	12	130	8
5	Satsama	x	15.55	15.55	76	25	51	x
6	Berhampura	x	14.67	14.67	46	46	x	x
7	Koilipadar	x	6.625	6.625	57	45	10	2
8	Siaripani	x	7.150	7.150	100	x	100	x
9	Sagjori	x	13.45	13.45	51	11	40	x
10	Kalia	x	13.75	13.75	90	21	68	1



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Table No 2.12 Boundary length and pillars of Forest Blocks

S. No.	Name of Forest block	Boundary Length in Km.			Boundary pillars			
		Natu'l	Arti'l	Total	Not'd	Good	Dag'ed	Missing
11	Talab	x	16.49	16.49	94	40	49	5
12	Rasibeda	x	4.83	4.83	38	x	38	x
13	Rohinigadia	x	12.75	12.75	89	16	70	3
14	Chadchadi	x	28.00	28.00	91	42	49	x
15	Goudpali	0.913	1.868	2.781	09	4	5	x
16	Hemantakhol	x	4.484	4.484	109	x	109	x
	Total	0.913	205.747	206.66	1307	262	970	75
	Percentage	0.4	99.6	100.0		20.0	74.2	5.7
Sl. No.	Name of forest blocks	Boundary length in km			Number of pillars			
		Nature	Artifi'l	Total	Notified	Good	Dam'd	Missing
	For DPF							
1	Hintrei	x	3.734	3.734	35	x	23	12
2	Lampaphuli	x	11.50	11.50	68	25	43	x
3	Amjhor	x	7.937	7.937	103	40	55	8
4	Dhadrakhol	x	11.26	11.26	121	65	42	14
5	A.Dhadrakhol	x	12.396	12.396	119	60	50	9
6	Bhahaljharan	x	5.71	5.71	45	45	x	x
7	Badhindol	x	23.75	23.75	182	46	100	36
8	Balikiari	x	2.568	2.568	06	3	3	x
9	Podamal	x	8.05	8.05	33	12	21	x
10	Phulkusum	x	4.93	4.93	45	11	34	x
11	Jaresinga	x	1.93	1.93	18	15	2	1
12	Terbeda	x	3.37	3.37	25	x	21	4
13	Penthabahal	x	2.431	2.431	26	26	x	x
14	Kusumbahali	x	9.65	9.65	88	x	88	x
15	Burbuda	x	3.6	3.6	33	33	x	x
	Total		112.816	112.816	947	381	482	84
	Percentage					40.2	50.9	8.9
	Division Total (RF/ PRF/DPF)	85.263	1147.763	1233.026	8033	2788	4800	445
	Percentage	6.9	93.1	100.0	100	34.7	59.8	5.5

From the above facts it is observed that, the natural boundary is only 6.9% whereas artificial boundary is 93.1%. Out of total Boundary pillar for RF, PRF and DPF 34.7% is in good condition where as the rest is either damaged or missing. Hence it is inferred that the boundary of forests are not secured. The boundary pillars of PF and VF have not been assessed.



2.3.5 Boundary maintenance Cycle.

Considering the ground reality, it is proposed to have a boundary maintenance Cycle of 5 years. The Maintenance Cycle suggested is as follows.

Table No 2.13 Boundary Maintenance Cycle

Year	RF Blocks	PRF Blocks	DPF Blocks	PF	VF
2021-22 & 2026-27	Kholgarh (A) Landakot (A) Landimal (A) Tal (B) Suani (B)	Berhampura Kalia Koilpadar	Amjhari Amjhari- Dhadrakhol Bad- Hindol		
2022-23 & 2027-28	Kholgarh (A) Landakot (A) Landimal (A) Sagmalia (B) Rengali-Badmal(B)	Mochibahal Purunapani Sagjori Podabalanda	Bahaljharan Balikiari Budbuda	Khajuri Jharan	
2023-24 & 2028-29	Kholgarh (A) Landakot (A) Landimal (A) Rail (A) Rahan (A)	San-Rengali Satasama Siaripani	Dhadrakhol Hintrei Jarasingha		Bindpur
2024-25 & 2029-30	Kholgarh (A) Landakot (A) Landimal (A) Nadia (B) Hatidhara(A)	Talab Goudpali Chadchadi	Kusumbahali Lampaphuli Penthabahal		
2025-26 & 2030-31	Kholgarh (A) Landakot (A) Landimal (A) Chargarh (B) Bindhybasini (B)	Rasibeda Rohinigadia Hemantkhol	Phulkusum Podamal Terbeda		

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

As per District Statistical Handbook published during 2015, the land use pattern has been described as follows.



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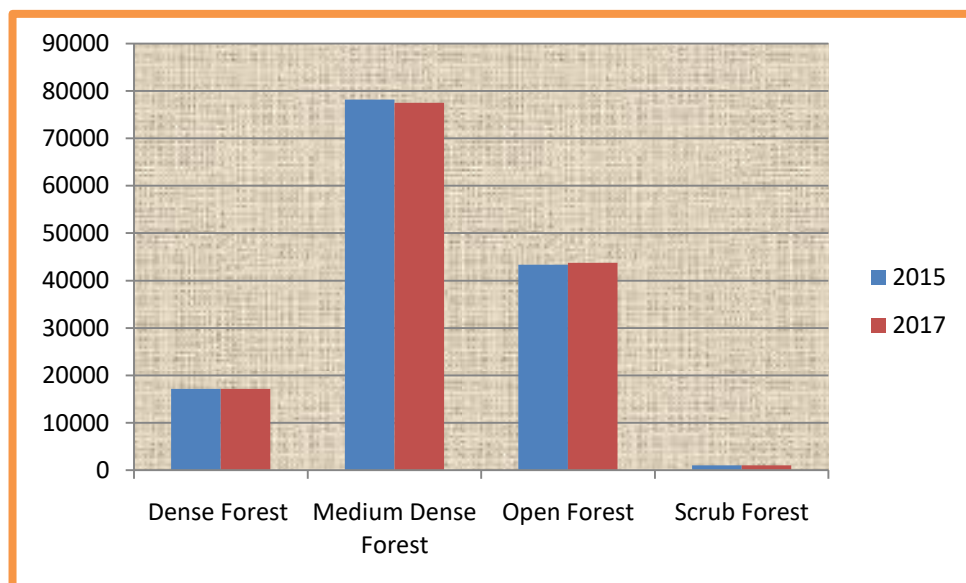
Table No 2.14 Land use pattern of the division.

Name of Block	Various Land use in Ha						
	Forest	Agriculture	Non agriculture	Barren (Non agriculture)	Pasture Permanent	Misc Tree crop / Groves	Total
Naktideul	28886	9973	3429	1221	1646	337	45492
Rairakhol	22127	20694	3353	943	1952	134	49203
Total	51013	30667	6782	2164	3598	471	94695
Percentage	53.9	32.4	7.2	2.3	3.8	0.5	100.0

The land utilization pattern and change in forest cover has been indicated in the FSI Report 2017 and Division wise position has been elaborated in the Publication made by Office of the Principal Chief Conservator of Forests, Odisha Bhubaneswar. As per the report the change in forest matrix is furnished below.

Table No 2.15 Change of Forest Matrix. (Density Class) in ha

Type of Forest	Area as per FSI Report 2015	Area as per FSI Report 2017	Change	Remark
Dense Forest	17151.27	17124.97	-26.30	Total Forest area has been reduced by 286.21 ha
Medium Dense Forest	78172.99	77540.82	-632.18	
Open Forest	43354.89	43759.43	404.54	
Scrub Forest	1014.31	982.04	-32.27	
Total	139693.5	139407.3	-286.21	



2.4.1 ToF Change Matrix & Analysis:

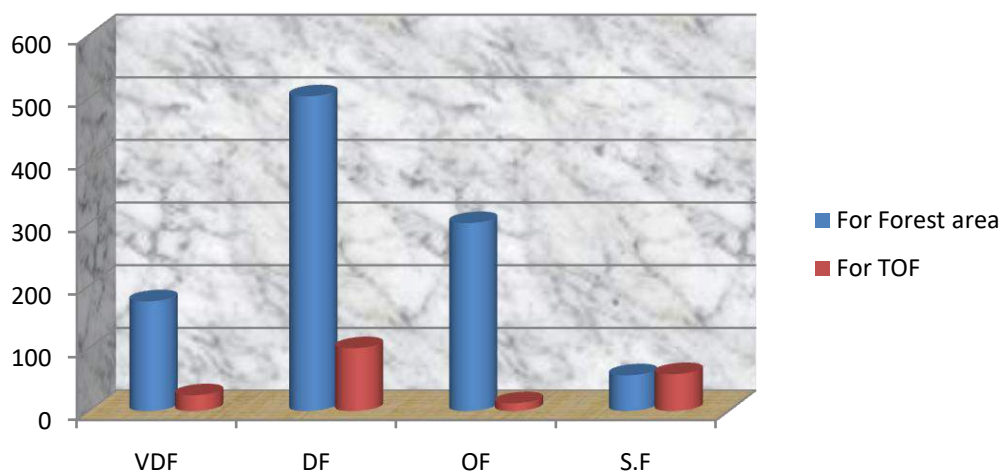
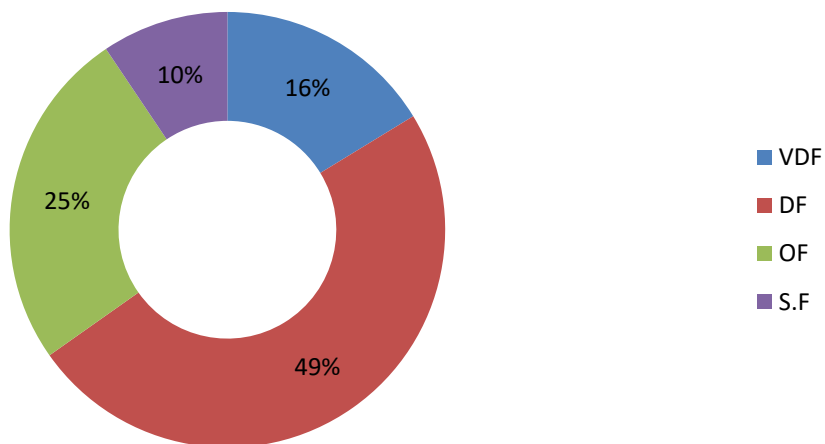
The Land use pattern has been analysed through Satellite imagery study and the Range wise distribution of Forest / non forest used is as follows.

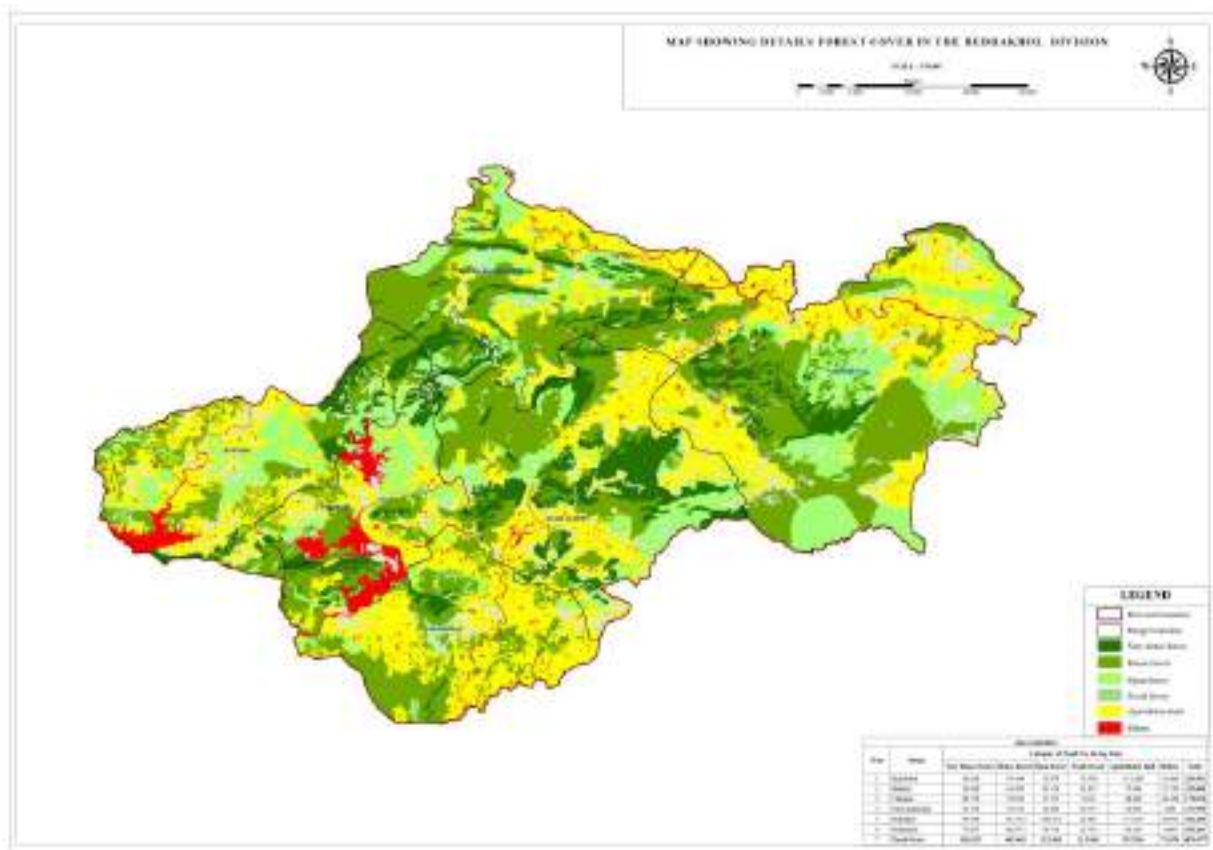
Range	Table No. : 2.15(A)Category of Land Use (in Sq. Km)						
	Very Dense Forest	Dense Forest	Open forest	Scrub Forest	Agricultural land	Others	Total
Badabahal	10.62	93.444	15.870	13.599	112.908	13.06	259.501
Badmal	18.62	61.650	43.118	21.027	75.666	15.519	235.6
Charmal	20.719	55.821	37.155	3.163	38.089	24.129	179.076
GCPur	34.552	91.911	52.909	19.537	70.009	4.081	272.999
Naktideul	39.958	197.333	108.572	25.861	171.585	10.991	554.3
Redhakhoh	75.883	102.471	54.759	32.743	99.246	4.099	369.201
Total	200.352	602.630	312.383	115.93	567.503	71.879	1870.677



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Category of Forest	For Forest area (NRSC Data)	For TOF Area (Satellite Study)	Total Area in Sq. Km (Satellite Study for Div.)	Percent age (%)
VDF	175.20	25.15	200.35	16.27
DF	502.38	100.25	602.63	48.94
OF	299.98	12.4	312.38	25.37
S.F	57.02	58.91	115.93	9.42
Total	1034.58	196.71	1231.29	100.00





2.5 Treats to the Forest:

The forests of the division are subjected to treat from Natural Calamities as well as from Biotic Factors.

2.5.1 Threat from Natural Calamities:

The treats from Natural Calamities are from

i) Cyclonic Storm.

The Division is a part of western Odisha away from Sea. Cyclonic storm is seldom faced in this part of the State. Some damage has been caused due to effect of **Phailin** occurred during October, 2013. Cyclone Phani also occurred on 2nd & 3rd May 2019. The damage caused is also very limited. The damaged caused to flora & fauna due to Cyclonic Storm in Bay of Bengal is very limited. Cyclonic storm is not common in this tract.



ii) Heavy Flood.

There is no major River System in the division. There is no threat to forest from flood. There are natural perennial nalla flowing in the forests. There is nala bank erosion which uproots the nearbystanding tree. This is a natural phenomenon. It cannot be taken as a threat but geological transformation.

iii) Drought.

The annual rainfall in this tract is above 1300 mm. Drought like condition is not experienced in during last decade. The number of rainy days is being reduced year after year which may result in drought like condition.

2.5.2 Threat from Biotic Factors:

The forests are under very much pressure due to population rise and increase in demand for land, recreation, Forest Produce, Grazing etc. The threats from biotic factors are

i. Population Explosion.

Exploding human population coupled with rapid urbanization and industrialization in and around this Division is the main cause of degradation of forest resources. Human beings are directly as well as indirectly responsible to a great extent for depletion and degradation of valuable forest of this Division to illicit felling and removal, uncontrolled grazing, girdling and lopping, setting fire in forests with vested interest, encroachment of forestland and the like. Poverty and unemployment is very common in the villages around forests. The demand for agricultural implements, small timbers for house hold requirements and firewood are increasing day-by-day. This is the major cause and danger to Forest & Forest land.

ii. Illegal collection of timber and firewood.

Forest is being damage due to illicit felling. Regular theft is not in practice in this area. However for own consumption the inhabitants are felling the trees and removing some portion of the felled tree as per their requirement and leaving the balance part on the stump site. During summer the balance part burnt due to forest fire and damages the forest to a great extent. Bija trees are illicitly cut in all over the forest areas of this Division

iii. Encroachment of forest.

Encroachment for cultivation and construction of temporary house by the outsiders coming from Sundargarh and Ranchi area has created problems. Dangteka, Sahajabahali,



Sankhabhanguni and Churiabani etc like small villages have been established by clear felling forest area in Landakot Reserve forest. An area of 227.59 ha has been encroached by 230 numbers of encroachers. The details of encroachment are furnished at Table No 2. 16. At present local encroachment is not a problem to this tract.

Table No 2. 16 Encroachment cases				
Year	Forest block	Status	Area encroached in ha	No. of encroachers
Pre-80	Landakot	R.F	13.345	7
Post-80	Landakot	-do-	114.38	126
1	Rahan	-do-	0.78	1
2	Tal	-do-	0.37	1
3	Rail	-do-	17.62	8
4	Nadia	-do-	0.15	1
5	Kholgarh	-do-	21.8	37
6	Purunapani	P.R.F	12.38	6
7	Sagjori	-do-	26.25	25
8	Koilipadar	-do-	7.8	5
9	Satsama	-do-	10.2	6
10	San-Rengali	-do-	0.5	1
11	Talab	-do-	2.85	5
12	Siaripani	-do-	1.0	1
13	Hinterei	D.P.F	5.0	1
14	Phulkusum	-do-	3.21	2
15	Bahaljharan	-do-	0.6	1
16	Jaresinga	-do-	2.0	2
17	Penthabahal	-do-	0.5	1
	Total		227.39	230

Encroachment during the plan:

Enchroachment during the outgoing Plan is furnished at Table No 2.17



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Table No 2.17 Encroachment during Outgoing Plan Period- Rairakhol Division.

Sl. No.	Details of encroachment	Prosecution against persons	P.C. No. / O.R. No.
1	Encroachment of 15 Acres in Compt. No.6 of Landakot R.F- (Ratakhandi)	Prosecution against 4 persons	P.C.No.4 of 09-10(OR NO.29G of 09-10) Dt.10.6.09,four persons were arrested and produced before the SDJM, Rairakhol
2	Encroachment of 6.80 Acres forest land in Kholagarh R.F. compt.No.5 Dhalataila (near village Betjharan)	Prosecution against 6 persons.	P.C.No. 17 of 09-10/ O.R.No. 46G of 09-10, Dt. 18.09.2009, 6 persons were arrested and produced before the SDJM, Rairakhol
3	Encroachment of 15 Acres in Compt. No.6 of Landakot R.F-(Ratakhandi)	Prosecution against 38 persons	P.C.No.20 of 09-10(OR NO.70G of 09-10) Dt.10.1.2010, 38 persons were arrested and produced before the SDJM, Rairakhol
4	-do-	Prosecution against 6 persons	P.C.No.13of 10-11, (OR NO.45G of 10-11) Dt.22.11.2010, 6 persons were arrested and produced before the SDJM, Rairakhol
Total	21.80 Acer= 8.822 hect.	52 persons	

iv. Grazing.

Cattle, Goat and sheep use the forest land as a grazing ground. No area could be closed to grazing due to public pressure. Due to grazing compacting of soil, damage of plantations and spreading of contagious disease to wild animals have been observed. Lack of ground flora, invasion of weeds due to heavy grazing pressure affects the maturity of soil and plant succession expected in open / degraded soil where secondary plant succession could have been noticed. Lopping of fodder species in forest has also leave poles / saplings and trees branchless and seriously affects the growth and quality of forest.

v. Forest fire.

The dry season in the area extends from the month of October to June and experiences hot summer during April to June. Due to the prolonged hot weather, not a single forest block is free from forest fire. The occurrence of repeated forest fire year after year prevents



regeneration of many valuable tree species. As a result of this phenomenon, many fire hardy species found to replace the economically important species in the forests. Annual repeated fires are causing a series of damages both directly and indirectly to the forests. It burns leaves and other residue lying on the forest floor and destroys the microbial population of the soil and thus prevents the formation of humus. The humus is very vital for the soil fertility and its absence adversely affects the growing stock. Forest fire is also one of the main factors responsible for the mortality of seedlings, sapling even of pole of size crop. It also causes desiccation and hardening of the soil which accelerate the process of soil erosion. Setting of forest fire is invariable intentional and rarely accidental.

Causes of Forest Fire: Following are the major causes of fire, which may be intentional as well as unintentional:

- Burning of forest floor for good growth of grass or mushrooms in the next season
- Hunting
- Un-extinguished campfires, charcoal panniers
- Un-extinguished cigarettes or bidi butts being thrown in the under bush etc.
- For collection of Minor Forest Produce, local villagers sometimes set fire.
- To prevent movement of wild elephants people of adjoining villages set fire
- Encroachers set fire to clean the encroached area of debris
- Some cultivators set fire to get ashes into their cropland through runoff water

Though the matter has been dealt in detailed under Forest Protection Overlapping Working Circle it needs more emphasis. The implementation of the Orissa Forest (Fire protection) Rules 1979 has been very poor and fire continues to be the major threat to forest regeneration and establishment in this Division. At present, mitigation measures are undertaken as per the SOP (Standard Operating Procedure) to tackle the forest fire in different forest blocks of the Division.

i. Insects & Borer:

The damage caused to the natural forest vegetation as well as the conditions by defoliators, borers and other insects is quite insignificant. The Sal heartwood borers (*Hoplocerambyx spinicornis*) only heartwood borers found in dead and deceased Sal trees and in unbarked logs. Green healthy trees are seldom attacked by this insect. There is no major damage due to insects / borers.



ii. Fungi:

The presence / abundance of fungi attach to dead trees / logs are seen in sal forests. In dry localities, heart rot disease caused due to fungi has been greatly noticed.

2.6 Distribution of Different Forest Types:

The Rairakhol Forest Division comprises mostly moist tract to dry tracts to a certain extent. Various types of soil to bear different vegetation, different degree of biotic pressure to restrict the plant succession in a pre climax stage. Due to varied regions the tract bears dry hardy species to moist luxuriant species in most of the part of the division.

Forest type is 'a category of forest defined with reference to its geographical location, climatic and edaphic features, composition and condition'. Champion and Seth define it as 'a unit of vegetation which possesses (broad) characteristics in physiognomy and structure sufficiently pronounced to permit of its differentiation from other such units. This is irrespective of physiographic, edaphic or biotic factors. It is selected in the first place subjectively from the ever-varying cover of vegetation, with boundaries arbitrarily imposed on what are in fact gradual changes'.

2.6.1 Base of Classification:

The forests can be classified into forest types on the basis of:—

Physiognomy--Physiognomy means the general appearance of a forest community and, therefore, forms an easy basis for rough differentiation of very broad classes. It is described by dominant growth-form (e. g., trees, shrubs, grasses, etc.), the seasonal changes (e. g., evergreen and deciduous habit) and such other features as may be associated with very dry or very wet sites.

Structure—Structure of a forest is described by stratification (i.e., the way in which different species are aligned in different layers of the forest) and dimensions of trees including height and spacing. It is generally observed that more favourable the site to tree growth the greater is the number of strata and the less favourable the site, the lesser is the number of strata in which the forest is divided. Therefore, structural stratification gives good basis for classifying forest types.



Function- Function refers to the most common morphological characters of the species such as leaf character, leaf size, stem and root characters, e.g., buttress formation development of stilt roots, etc., which form the basis of classification.

Floristic--Floristic refers to the species present in a particular forest. While this forms an important basis, for delimiting a forest type, there is a great difference of opinion as to whether the frequency of the species should be used as a basis or not. However, this can be used to distinguish sub-types.

Dynamics—As a result of interaction between vegetation and the site, there is continual change between the two. This results in succession and development of climax communities. Though the general view favours Whittaker's theory of vegetation gradients, it is convenient for the time being to classify the relatively stable types as climax, those still developing as seral, the stable community resulting from the special soil peculiarities as edaphic climax and that resulting from the biotic interference as biotic climax.

Habitat—Habitat refers to the effective environmental conditions in which a forest community exists. Thus, climate and edaphic factors often form the basis of classifying forest vegetation.

Physiography—Physiography refers to the natural features of the earth surface. As it modifies the micro climate and results in different vegetation occurring in the same climate on different aspects of the hill slope, it forms a good basis for classifying vegetation.

History- History refers to past biotic influences on a site and its vegetation. Though these are very important in determining the present condition and future potentialities in vegetation communities, it is often difficult to assess these factors correctly.

2.6.2 Forest Types:

The forest types observed in this division as per **Revised Champion & Seth Classification** are as follows.



Table No 2.18 Forest Types observed in the Division.

Sl No	Group	Sub Group	Type	Sub Type	Variety
1	3-Tropical Moist Deciduous Forest	3C-North Indian Tropical Moist Deciduous Forest	3C/C ₂ – Moist Sal Bearing Forest	3C/C _{2e} - Moist Peninsular Sal Forest.	3C/C _{2e(i)} – Moist Peninsular High level Sal
					3C/C _{2e(ii)} – Moist Peninsular Low level Sal
					3C / C _{2e(iii)} Moist peninsular valley Sal
2	4-Littoral and Swamp Forest	4C- Tropical freshwater swamp forest	4C / FS ₂ Tropical hill valley swamp forest		
3	5-Tropical Dry Deciduous Forest.	5B-Northern Tropical Dry Deciduous Forest	5B/C ₁ - Dry Sal Bearing Forest	5B/C _{1c} – Dry Peninsular Sal	
			5B/C ₂ –Northern Dry Mixed Deciduous Forest		
			Edaphic sub type.		Butea forest – 5B / E ₅
					Dry bamboo brakes – 5B / E ₉

The forest of Rairakhol Division comes under the major group Tropical Forest on the basis of “**Champion and Seth revised classification**”. Three Varieties of sub-type 3C/C_{2e} (Moist peninsular Sal) occur in different blocks and compartments. One Type of sub-group 4C (Tropical fresh water swamp forest) occurs in both the side of perennial and semi perennial Nala flowing in this Division. Four Types of sub-group 5B (Northern tropical dry deciduous forest) occur in different blocks and compartment.

Moist Peninsular High Level Sal- 3C / C_{2e}(i):

This forest type is commonly seen in the division. Sal is mainly associated with *Syzygium cumini* with *Dentrocalamus strictus* in the middle story. The *Phoenix acaulis* is seen as under growth. Other associates , *Xylia xylocarpa* *Saraca indica*, *Mangifera indica*, *Amoora rohituka*, *Alstonia scholaris*, *Anogeissus acuminata*, *Boswellia serrata*, *Bridelia retusa*, *Bauhinia racemosa*, *Salmalia malabarica*, *Cassia fistula*, *Canthium didymum*, *Cleistanthus collinus*, *Dillenia pentagyna*, *Diospyros montana*, *Diospyros chloroxylon*, *Diospyros sylvatica*, *Dalbergia paniculata*, *Syzygium cumini*, *Emblica officinalis*, *Elaeodendron glaucum*, *Ficus glomerata*,



Gelonium lanceolatum, *Gelonium multiflorum*, *Grewia disperma*, *Grewia tiliaefolia*, *Holopteica integrifolia*, *Lannea grandis*, *Mangifera indica*, *Melia composita*, *Mallotus philippinensis*, *Pterospermum heyneanum*, *Pongamia glabra*, *Putranjiva roxburghii*, *Strychnos nuxvomica*, *Strychnos potatorum*, *Schleichera Oleosa*, *Streblus asper*, *Terminalia tomentosa*, *Terminalia belerica*, *Webera corymbosa*, *Wrightia tomentosa*. Sal regeneration is good sometimes damaged by fire and grazing.

Typical example of Moist peninsular high level Sal are found in Kholgarh, Rail, Podabalanda and Landimal blocks, where Sal extends right up to the top of hills. Here it is ascending up to 400 mt elevation above mean sea level. The quality of crop is generally III / IV.

3C/C_{2e(ii)} – Moist Peninsular Low level Sal:

In these forests the Characteristic associates of Sal in over wood are *Pterocarpus marsupium* and *Terminalia tomentosa* with *Emblica officinalis* in middle story. Natural regeneration is satisfactory. Quality Class I/II

3C / C_{2e(iii)}–Moist peninsular valley Sal:

This Forest Type is seen in the valleys in the Division. The Characteristic associates of Sal are *Terminalia tomentosa*. *Dillenia pentagyna* is absent. The excellent quality Sal forest of the division is under this type. Quality Class is I/II The regeneration is excellent. Density is above 0.5 to 0.8

4C / FS₂ Tropical hill valley swamp forest:

This type of Forests is seen on banks of perennial running or moving water. The site is continuously wet or at least moist. The main species are *Eugenia*, *Malotus* with *Pandanus* as under growth. *Treva nudiflora*, *Syzygium cumini*, *Pterocarpur acerifolium*, *Toona ciliate*, *Bischofia javanicain* the middle story. *Dyospyros* , *Puntranjiva* *Desmodium* are also noticed.

5B/C_{1c} – Dry Peninsular Sal Forest:

Dry peninsular Sal forests covers the largest area of this zone and it is found extensively in all most all blocks. The entire block comes under this Sub-type except its steep slopes and ridges, where miscellaneous crop exists. The low moisture retaining capacity of the soil and drier condition prevailed by repeated annual ground fire stabilizes the forest of this Sub-



type. Sal is the principal species, which often constituting about 65 % and the quality varies from Q-III to Q-IV. Regeneration of Sal is inadequate and high percentage of unsoundness of trees of all girth classes is the peculiar feature in this area. This is due to poor soil, continues annual ground fire. The associates of Sal are *Terminalia tomentosa*, *Terminalia arjuna*, *Pterocarpus marsupium*, *Terminalia belerica*, *Lagerstromia sp*, *Terminalia chebula*, *Adina cardifolia*, *Bridelia retisa*, etc. In the middle story *Emblica*, *Dyospyrus melanoxylon*, *Beutea mosperma*, *Madhuca indica* are noticed.

5B/C₂ –Northern Dry Mixed Deciduous Forest:

Northern Dry Mixed Deciduous Forest is scattered throughout the hill tracts having poor humus contain soil. This Type of forest occurs in all most all blocks exist towards the southern part of the Division. The culmination stage of plant succession is noticed in this locality, where the existing Sal crop has been replaced by miscellaneous species owing to excess illicit felling, fire and over grazing. The crop is less open and trees are stunted. The trees remain leafless for a longer period and the forests give a desolate look in summer season. *Dendrocalamus strictus* is seen in these forests.

Sal with *Sterculia*, *Linea coromondelica*, *Dalbergia latifolia*, *Acacia chatechu*, *Acacia nilotica* *Buetea monosperma*, *Vuchnania lanzena* are seen in the forest. The ground flora is damaged dur to fire and gives a ugly look during summer.

Dry bamboo brakes – 5B / E₉

Dry Bamboo Brakes is seen in different blocks in sporadic manner. It occurs in dry soil both on the hills as well as on the alluvium. Mainly three species of bamboo occur in this tract out of which *Dendrocalamus strictus* (Salia Bamboo) is in abundance and of commercial importance. *Cephalostachyum pergracile* (Dungi) occurs in very small pockets in the bank of nala.

2.6.3 Forest Blocks & Forest Type.

The forest type and forest blocks in which it is noticed are furnished at Table No 2.19

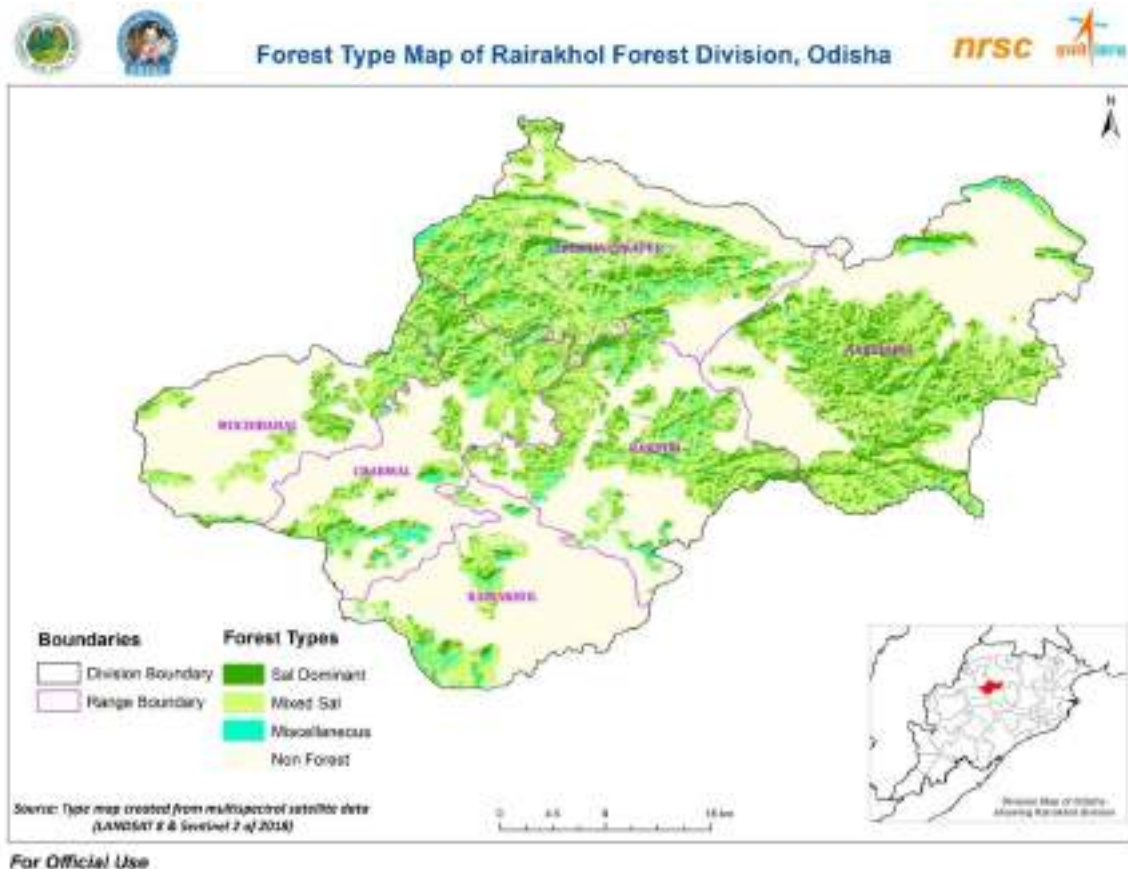


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Table No 2.19 Forest Type and Forest blocks of Rairakhol Division.

Sl No.	Name of classification	Area in ha	Name of forest block and its compartment No.
1	3C / C _{2e(i)}	3489.09	Kholgarh (Comp. No 19,23), Landimal (Comp. No 2,3,14), Rail (Comp. No 16) and Podabalanda.
2	3C / C _{2e(ii)}	9845.94	Hatidhara (Comp. No 13,15,17), Kholgarh (Comp. No 1,3,5), Rail (Comp. No 17,18) Landimal (Comp. No 1,2,3,4,18) and Purunapani.
3	3C / C _{2e(iii)}	7429.67	Rail (Comp. No 1,2,4), Landimal (Comp. No 9,10,12), Landakot (4,5,10), Hatidhara(Comp. No 3,5,6), Kholgarh (Comp. No 2,7,8), Talab.
4	4C / FS ₂	20.00	Kholgarh (6 Comp. No,12,14).
5	5B / C _{1c}	51219.16	Landakot, Landimal, Kholgarh, Hatidhara, Tal, Rail, Rahan, Suani.
6	5B / C ₂	8637.00	Rahan, Sagjori, San-Rengali, Tal.
7	5B / E ₅	1693.09	Hatidhara
8	5B / E ₉	25706.00	Hatidhara, Kholgarh, Rahan, Sagmalia and Bindhybasini.

2.7 Tree Cover outside Forest Area: (TOF).





Besides the notified forest areas of the Division (RF, PRF, DPF and VF) there are many revenue forest areas, Avenue plantations, and fuel & Fodder plantations raised by department contribute to Tree Outside the Forests (TOF). From Social Forestry Project period; Farm Forestry is being patronized by the Govt. by free distribution of seedlings.

The TOF are integrated contribution of

- Plantations taken up outside the conventional Forest area by Forest Department, Horticultural plantation and other department.
- Plantations raised by private individuals in their fellow land and back yard.
- Agro Forestry practices.
- Avenue Plantations.
- Institutional Plantations.

The plantations raised during last plan period are furnished below (Table No 2.20).

2.7.1 Avenue Plantations:

Table No: 2. 20 List of Avenue Plantations Raised during last plan period& beyond.				
Sl No	Year	Name of Road	RKM Planted	No of Seedlings Planted.
1	2008-09	NIL	NIL	NIL
2	2009-10	NIL	NIL	NIL
3	2010-11	NIL	NIL	NIL
4	2011-12	NIL	NIL	NIL
5	2012-13	Charbati-Angarpada	5.88	1470
		Laiza-Gugua	2.12	530
		Giripur-Kisinda	7.0	1750
6	2013-14	Kisinda to Panimura	16.7	4175
		Kisinda to Dhalpur	3.30	825
7	2014-15	Tandabira to Champalinala	20.0	5000
		Hemamura to Jhinkidadar	6	1500
		Daincha to Hinteri	4	1000
		Chudapud to Bhatrapur	16	4000
		Saradhapur to Badtaila	8	2000
		Dhalpur to Machhadihi	6	1500
		Jamjori to Bindpur	4	1000
		Batgoan to Keotberni	8	2000



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 2. 20 List of Avenue Plantations Raised during last plan period& beyond.

Sl No	Year	Name of Road	RKM Planted	No of Seedlings Planted.
		Sahebi to Rengali	5	1250
		Jamujori to Bagbar	4	1000
		Hatibahal to Kankandpada	7	1750
		Tribanpur to Rahan	7	1750
		Khandahatachhato	6	1500
		Khandahata	5	1250
		Rengali to Sonapur border	5	1250
		Saiberni to Satsama	5.0	1250
		Kusunda to Sagjori	11	2750
8	2015-16	Rengali Badmal-Gobindpur	20	5000
9	2016-17	Naktideul-Sahebi	14	2500
		Madhupur-Bhatra	03	750
		Kankanpada-Kukudabahali	03	750
		Muturumunda-Daincha	06	1500
		Daincha-Laiza	06	1500
		Badhindol-Gambhariberni	06	1500
		Dhunkchhali-Brahamani	06	1500
		Gugua –Giripur	10	2500
		NH Road-Rasibeda	04	1000
		NH Road-Nuapada	04	1000
		Badmal-Bantaloi	08	2000
		Jamjori-Angabira	10	2500
		Kello RD road-Ranja	4	1000
		RD road to Kasibahal	6	1500
		RD road to Hatibahal	4	1000
		Tribanpur RD road to Sarapal	6	1500
		Kusurda to Gopalpur	10	2500
11	2017-18	Sahebi-Jamjori	16	4000
		Charbati-Betgarh	6	1500
		Charmal-Berihassahi	4	1000
		Tribanpur-Sarapal	4	1000
		Buromal-Balikiary	10	2500
		Bandhupali-Saradhapur	4	1000



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 2. 20 List of Avenue Plantations Raised during last plan period& beyond.

Sl No	Year	Name of Road	RKM Planted	No of Seedlings Planted.
		Buromal-Kholgarh village	4	1000
		Keutberni-Basaloi	6	1500
		Ranchi -Vijaybada NH to Dimirimunda village	4	1000
		Rengali to Chakamunda	3	750
12	2018-19	Amjhari to Tribanpur	4	1000
		Sanhindol to Musakata	7	1750
		Rengali to Chakamunda	3	750
		Kasanda to Sunamudi	3	750
		Lusura to Ghosramal	4	1000
		Kholgarh to Mangalpur	4	1000
		Balikiary to Fulkusum	12	3000
		Kalindar to Badmal	04	1000
13	2019-20	Balikiary to Talab	07	1750
		Podabalanda to Barbank	03	750
		Kasibahal to Karadapal	03	750
		Tribanpur to Amjhari	04	1000
		Kadalipali to Sangrampur	03	750
		Total	414	102500

2.7.2. Plantations outside the Forest area by Forest Department.

Table No 2.21 List of Plantations Raised Outside the Forest Area

Sl No	Name of Range	Name of Plantation Site	Year of Plantation	Area in Ha.
1	Redhakhol	Maulabhanja K.F	2014-15	30.00
2	Redhakhol	Terbeda K.F	2014-15	50.00
3	Redhakhol	Brahmani K.F	2014-15	70.00
4	Redhakhol	Sandimunda K.F	2014-15	5.00
5	Redhakhol	Laiza K.F	2015-16	40.00
6	Redhakhol	Chhatrapur K.F	2015-16	30.00
7	Redhakhol	Kalindra K.F	2015-16	6.50
8	Redhakhol	Paikmal K.F	2016-17	30.00
9	Redhakhol	Dalkhaman K.F	2016-17	7.80



Table No 2.21 List of Plantations Raised Outside the Forest Area

Sl No	Name of Range	Name of Plantation Site	Year of Plantation	Area in Ha.
10	Redhakhol	Daincha K.F	2017-18	40.00
11	Girishchandrapur	Gaudpali K.F	2010-11	50.00
12	Girishchandrapur	Dimirikuda KF	2010-11	50.00
13	Girishchandrapur	Dhalpur KF	2010-11	50.00
14	Girishchandrapur	Balikiari KF	2014-15	50.00
15	Girishchandrapur	Badbahal KF	2014-15	10.00
16	Girishchandrapur	Tileimal KF	2015-16	30.00
17	Girishchandrapur	Kaunsipal KF	2016-17	50.00
18	Girishchandrapur	Pithauguda KF	2016-17	20.00
19	Girishchandrapur	ChardaposhiKF	2017-18	25.00
20	Girishchandrapur	Jaresingha KF	2017-18	25.00
21	Girishchandrapur	Jaresingha KF	2018-19	20.00
22	Girishchandrapur	Tikilipada KF	2018-19	30.00
23	Redhakhol	Sampur	2010-11	50.00
24	Redhakhol	Baishnabajhuli	2010-11	55.00
25	Redhakhol	Khajurijharen	2010-11	50.00
26	Charmal	Chudapudug	2010-11	50.00
27	Charmal	Dimirikuda	2010-11	50.00
28	GCPur	Dhalpur	2010-11	50.00
29	Naktideul	Gadadharpur	2010-11	65.00
30	Naktideul	Lusura	2010-11	50.00
31	Naktideul	Arkhakud	2010-11	55.00
32	Badbahal	Dhaurakhaman	2010-11	55.00
33	Badmal	Badmal	2010-11	60.00
34	Badmal	Suliadadar	2011-12	20.00
35	Naktideul	Kunjamura	2011-12	40.00
36	Badmal	Lamtidadar KF	2012-13	35.00
37	Naktuideul	Ghosramal PF	2012-13	25.00
38	Naktuideul	Jharbeda	2012-13	40.00
39	Naktuideul	Hitasara	2012-13	10.00
40	Redhakhol	Daincha	2013-14	15.00
41	Badbahal	Tal-Kholgarh (AR)	2013-14	10.00
42	Naktuideul	Bhetiaberni	2014-15	10.00
43	Naktuideul	Gadakhol	2014-15	25.00



Table No 2.21 List of Plantations Raised Outside the Forest Area

Sl No	Name of Range	Name of Plantation Site	Year of Plantation	Area in Ha.
44	Redhakhol	Tandabira KF	2014-15	15.00
45	Redhakhol	Maulabhanja VF	2014-15	30.00
46	Redhakhol	Brahamani KF	2014-15	70.00
47	Redhakhol	Buruda KF	2014-15	100.00
48	Charmal	Sarapal KF	2014-15	50.00
49	Redhakhol	Saradhapur KF	2014-15	80.00
50	GCPur	Balikiary KF	2014-15	50.00
51	Naktuideul	Sahebi VF	2014-15	100.00
52	Naktuideul	Liburi VF	2014-15	70.00
53	Naktuideul	Kadobahali VF	2014-15	50.00
54	Naktuideul	Govindpur KF	2014-15	85.00
55	Badbahal	Badkuda KF	2014-15	50.00
56	Badbahal	Laindmal KF	2014-15	20.00
57	Badbahal	San-Rengali KF	2014-15	50.00
58	Badmal	Rengali-Badmal KF	2014-15	50.00
59	Badmal	Kasanda VF	2014-15	20.00
60	GCPur	Badbahal KF	2014-15	10.00
61	GCPur	Jatesingha KF	2014-15	10.00
62	GCPur	Fulkusum KF	2014-15	10.00
63	Naktideul	Bhalugadia KF	2014-15	10.00
64	Naktuideul	Koing KF	2014-15	10.00
65	Naktuideul	Nevrapal KF	2014-15	10.00
66	Badmal	Pipilikani KF	2014-15	20.00
67	Badmal	Kasanda KF	2014-15	10.00
68	Badmal	Sunamudi KF	2014-15	10.00
69	Badmal	Balbaspur KF	2014-15	10.00
70	Badmal	Ladlada KF	2014-15	10.00
71	Badmal	R-Badmal to Govindpur	2015-16	20.00
72	Naktideul	Tileimal KF	2015-16	30.00
73	GCPur	Podamal KF	2015-16	20.00
74	Naktideul	Penthabahal KF	2015-16	10.00
75	Badmal	Budhikhamar KF	2015-16	20.00
76	Badmal	Kusurda KF	2015-16	20.00
77	Redhakhol	Laiza	2015-16	40.00



Table No 2.21 List of Plantations Raised Outside the Forest Area

Sl No	Name of Range	Name of Plantation Site	Year of Plantation	Area in Ha.
78	Redhakhol	Chhatrapur KF	2015-16	30.00
79	Naktideul	Ghosramal KF	2015-16	35.00
80	Naktuideul	Hitasara KF	2015-16	20.00
81	Naktuideul	Dhatukimal KF	2015-16	40.00
82	Badmal	Tudabahal KF	2015-16	30.00
83	Badmal	Sunamudi KF	2015-16	30.00
84	Badmal	Mochibahl KF	2015-16	30.00
85	Badmal	Badpati	2015-16	15.00
86	Badmal	Kaudiapali	2015-16	40.00
87	Badbahal	Khajurijharen	2015-16	5.00
88	Badbahal	Khajurijharen	2015-16	33.39
89	Redhakhol	Dalki VSS	2016-17	20.00
90	Redhakhol	Charbati VSS	2016-17	40.00
91	Redhakhol	Paikmal KF	2016-17	30.00
92	Charmal	San-Hindol KF	2016-17	30.00
93	Charmal	Bandhantaila KF	2016-17	40.00
94	GCPur	Kausipal KF	2016-17	50.00
95	GCPur	Pithaguda KF	2016-17	20.00
96	Naktideul	Lusura KF	2016-17	100.00
97	Badbahal	Chhandpur KF	2016-17	50.00
98	Badbahal	Gadakhhol KF	2016-17	50.00
99	Badmal	Chhelibahal KF	2016-17	20.00
100	Badmal	Balbaspur KF	2016-17	30.00
101	Redhakhol	Daincha KF	2017-18	40.00
102	Charmal	Berhampura KF	2017-18	25.00
103	Charmal	Bansajal KF	2017-18	25.00
104	Naktideul	Sahebi KF	2017-18	50.00
105	Naktideul	Bindpur	2017-18	50.00
106	Badmal	Mochibahal KF	2017-18	50.00
107	Badmal	Telighana KF	2017-18	40.00
108	GCPur	Jaresingha KF	2017-18	25.00
109	GCPur	Saradhapur KF	2017-18	25.00
110	Badbahal	Pankimal KF	2017-18	50.00
111	Badbahal	Gadakhhol KF	2017-18	50.00



Table No 2.21 List of Plantations Raised Outside the Forest Area

Sl No	Name of Range	Name of Plantation Site	Year of Plantation	Area in Ha.
112	Badbahal	Samsingha KF	2018-19	25.00
113	Badbahal	Dimirimunda KF	2018-19	25.00
114	Badmal	Patupali KF	2018-19	40.00
115	Naktideul	Lampafuli KF	2018-19	35.00
116	Charmal	Rasibeda KF	2018-19	25.00
117	GCPur	Jaresingha KF	2018-19	20.00
118	GCPur	Tikilipada KF	2018-19	30.00
119	Redhakhhol	Sadhumunda VSS	2019-20	5.00
120	Badmal	Telighana VSS	2019-20	25.00
Total				4157.69

Table No 2.22: Abstract of Plantation raised outside the Forest area.

Range / Year	Redhakhhol	Badmal	Charmal	Badbahal	Naktideul	GCPur	Total
2010-11	155	60	100	55	170	200	740
2011-12		20			40		60
2012-13		35			75		110
2013-14	15			10			25
2014-15	450	130	50	120	370	140	1260
2015-16	146.5	205		38.39	135	50	574.89
2016-17	127.8	50	70	100	100	140	587.8
2017-18	80	90	50	100	100	100	520
2018-19		40	25	50	35	100	250
2019-20	5	25					30
Total	979.3	655	295	473.39	1025	730	4157.69

2.7.3. Distribution of seedlings.

For creation of tree cover in private holdings, outside the forest area and various industrial land, seedlings are being distributed to public every year. The year wise seedlings distributed in division are furnished below (Table No 2.23).



Table No: 2.23 Year wise number of seedlings distributed in Rarakhol Division.

Year	Number of seedlings distributed	Area of coverage in ha.
2008-09	Nil	
2009-10	Nil	
2010-11	Nil	
2011-12	Nil	
2012-13	500000	312.50
2013-14	740000	462.50
2014-15	740000	462.50
2015-16	550000	343.75
2016-17	400000	250.00
2017-18	800000	500.00
2018-19	415000	259.38
2019-20	705300	440.81
Total	4850300	3031.44

During the plan period and beyond 2019-2048.50 lakh Seedlings have been distributed. The area covered is estimated to be 3031.44 ha.

2.8 Shifting Cultivation (Jhumming).

Shifting Cultivation is not in practice in this tract of forest.





CHAPTER-3

MAINTENANCE, CONSERVATION AND ENHANCEMENT OF BIODIVERSITY

3.1 Forest Composition & Distribution:

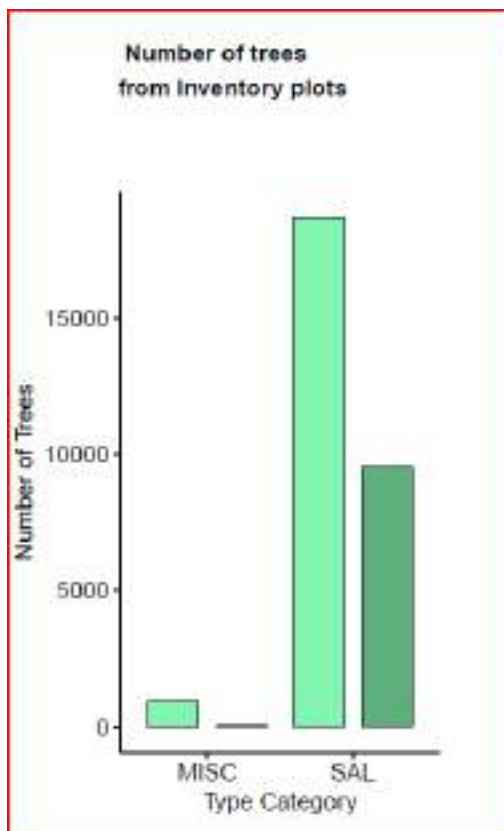
The Rairakhol Forest Division comprises mostly moist tract to dry tracts to a certain extent. Various types of soil to bear different vegetation, different degree of biotic pressure to restrict the plant succession in a pre climax stage. Due to varied regions the tract bears dry hardy species to moist luxuriant species in most of the part of the division.

The forest of this Division comes under the major group Tropical Forest on the basis of “**Champion and Seth revised classification**”. Three Varieties of sub-type 3C/C_{2e} (Moist peninsular Sal) i.e. high level Sal, Low Level Sal and Valley Sal occur in different blocks and compartments. One Type of sub-group 4C (Tropical fresh water swamp forest) occurs in both the side of perennial and semi perennial Nala flowing in this Division. Four Types of sub-group 5B (Northern tropical dry deciduous forest) occur in different blocks and compartment. These are dry Sal Forest, Mixed Forest (Buettia Forest and Bamboo Break)

Composition of various Forest Type have been described at Para 2.6.2 of this Plan.

3.2 Plant Species Diversity:

The Forests of Rairakhol Division are mostly Sal Forests. Due to biotic interference and reduced number of rainy days vegetation is marching towards dryer tract. Mixed vegetation with Sal as a primary Species are observed in many forest blocks. Bamboo is also occurring in a greater extent of the division. The Species diversity varies from Pure Sal crop to dryer mixed vegetation. For working Plan purpose enumeration has been taken up on Sample Point basis as per National Working Plan Coad-2014. The NRSC / (ORSAC) have provided 970





Sample points. At each Sample point 0.1 ha area (mostly a Square Plot) have been enumerated and analyzed. The prominent species recorded are Sal, Asan, Kendu, Dhaura. The Sal and Miscellaneous share in the sample points is depicted in the graph.

3.2.1 Principles of Biodiversity Index Calculation:

A **diversity index** (also called **phylogenetic or Simpson's Diversity Index**) is a quantitative measure that reflects how many different types (such as species) there are in a dataset (a community) and that can simultaneously take into account the phylogenetic relations among the individuals distributed among those types, such as *richness, divergence or evenness*. These indices are statistically representations of biodiversity in different aspects (richness, evenness and dominance).

Richness R simply quantifies how many different types the dataset of interest contains. For example, species richness (usually noted S) of a dataset is the number of different species in the corresponding species list. Richness is a simple measure, so it has been a popular diversity index in ecology, where abundance data are often not available for the datasets of interest. Because richness does not take the abundances of the types into account, it is not the same thing as diversity, which does take abundances into account. However, if true diversity is calculated with $q = 0$, the effective number of types (0D) equals the actual number of types (R).

3.2.2 Shannon Index:

The Shannon index has been a popular diversity index in the ecological literature, where it is also known as Shannon's diversity index, the Shannon–Wiener index, the Shannon–Weaver index and the Shannon entropy. The measure was originally proposed by Claude Shannon to quantify the entropy (uncertainty or information content) in strings of text. The idea is that the more different letters there are, and the more equal their proportional abundances in the string of interest, the more difficult it is to correctly predict which letter will be the next one in the string. The Shannon entropy quantifies the uncertainty (entropy or degree of surprise) associated with this prediction. It is most often calculated as follows:

$$H' = - \sum p_i \ln p_i$$

Where p_i is the proportion of characters belonging to the i^{th} type of letter in the string of interest. In ecology, p_i is often the proportion of individuals belonging to the i^{th} species in the



dataset of interest. Then the Shannon entropy quantifies the uncertainty in predicting the species identity of an individual that is taken at random from the dataset.

Although the equation is here written with natural logarithms, the base of the logarithm used when calculating the Shannon entropy can be chosen freely. Shannon himself discussed logarithm bases 2, 10 and e , and these have since become the most popular bases in applications that use the Shannon entropy. Each log base corresponds to a different measurement unit, which have been called binary digits (bits), decimal digits (decits) and natural digits (nats) for the bases 2, 10 and e , respectively. Comparing Shannon entropy values that were originally calculated with different log bases requires converting them to the same log base: change from the base a to base b is obtained with multiplication by $\log_b a$.

It has been shown that the Shannon index is based on the weighted geometric mean of the proportional abundances of the types, and that it equals the logarithm of true diversity as calculated with $q = 1$:

$$H' = - \sum_{i=1}^R p_i \ln p_i = - \sum_{i=1}^R \ln p_i^{p_i}$$

This can also be written

$$H' = -(\ln p_1^{p_1} + \ln p_2^{p_2} + \ln p_3^{p_3} + \dots + \ln p_R^{p_R})$$

which equals

$$H' = -\ln p_1^{p_1} p_2^{p_2} p_3^{p_3} \dots p_R^{p_R} = \ln \left(\frac{1}{p_1^{p_1} p_2^{p_2} p_3^{p_3} \dots p_R^{p_R}} \right) = \ln \left(\frac{1}{\prod_{i=1}^R p_i^{p_i}} \right)$$

Since the sum of the p_i values equals unity by definition, the denominator equals the weighted geometric mean of the p_i values, with the p_i values themselves being used as the weights (exponents in the equation). The term within the parentheses hence equals true diversity 1D , and H' equals $\ln(^1D)$.

When all types in the dataset of interest are equally common, all p_i values equal to $1/R$, and the Shannon index hence takes the value $\ln(R)$. The more unequal the abundances of the types, the larger is the weighted geometric mean of the p_i values, and the smaller the corresponding Shannon entropy. If practically all abundance is concentrated to one type, and the other types are very rare (even if there are many of them), Shannon entropy approaches



zero. When there is only one type in the dataset, Shannon entropy exactly equals zero (there is no uncertainty in predicting the type of the next randomly chosen entity).

3.2.3 Renyi entropy:

The Renyi entropy is a generalization of the Shannon entropy to other values of q than unity. It can be expressed:

$${}^qH = \frac{1}{1-q} \ln \left(\sum_{i=1}^R p_i^q \right)$$

which equals

$${}^qH = \ln \left(\frac{1}{\sqrt[q-1]{\sum_{i=1}^R p_i p_i^{q-1}}} \right) = \ln({}^qD)$$

This means that taking the logarithm of true diversity based on any value of q gives the Rényi entropy corresponding to the same value of q .

3.2.4 Simpson Index:

The Simpson index was introduced in 1949 by Edward H. Simpson to measure the degree of concentration when individuals are classified into types. The same index was rediscovered by Orris C. Herfindahl in 1950. The square root of the index had already been introduced in 1945 by the economist Albert O. Hirschman. As a result, the same measure is usually known as the Simpson index in ecology, and as the Herfindahl index or the Herfindahl–Hirschman index (HHI) in economics.

The measure equals the probability that two entities taken at random from the dataset of interest represent the same type. It equals:

$$\lambda = \sum_{i=1}^R p_i^2,$$



Where R is the richness i.e. the total number of types in the dataset. This equation is also equal to the weighted arithmetic mean of the proportional abundances p_i of the types of interest, with the proportional abundances themselves being used as the weights. Proportional abundances are by definition constrained to values between zero and unity, but it is a weighted arithmetic mean, hence $\lambda \geq 1/R$, which is reached when all types are equally abundant.

By comparing the equation used to calculate λ with the equations used to calculate true diversity, it can be seen that $1/\lambda$ equals 2D , i.e. true diversity as calculated with $q = 2$. The original Simpson's index hence equals the corresponding basic sum.

The interpretation of λ as the probability that two entities taken at random from the dataset of interest represent the same type assumes that the first entity is replaced to the dataset before taking the second entity. If the dataset is very large, sampling without replacement gives approximately the same result, but in small datasets the difference can be substantial. If the dataset is small, and sampling without replacement is assumed, the probability of obtaining the same type with both random draws is:

$$\ell = \frac{\sum_{i=1}^R n_i(n_i - 1)}{N(N - 1)}$$

where n_i is the number of entities belonging to the i th type and N is the total number of entities in the dataset. This form of the Simpson index is also known as the Hunter–Gaston index in microbiology.

Since mean proportional abundance of the type's increases with decreasing number of types and increasing abundance of the most abundant type, λ obtains small values in datasets of high diversity and large values in datasets of low diversity. This is counterintuitive behavior for a diversity index, so often such transformations of λ that increase with increasing diversity have been used instead. The most popular of such indices have been the inverse Simpson index ($1/\lambda$) and the Gini–Simpson index ($1 - \lambda$).¹ Both of these have also been called the Simpson index in the ecological literature, so care is needed to avoid accidentally comparing the different indices as if they were the same.



3.2.5 Inverse Simpson index

The inverse Simpson index equals:

$$\frac{1}{\lambda} = \frac{1}{\sum_{i=1}^R p_i^2} = {}^2D$$

This simply equals true diversity of order 2, i.e. the effective number of types that is obtained when the weighted arithmetic mean is used to quantify average proportional abundance of types in the dataset of interest.

The index is also as a measure of the effective number of parties.

3.2.6 Gini–Simpson index:

The original Simpson index λ equals the probability that two entities taken at random from the dataset of interest (with replacement) represent the same type. Its transformation $1 - \lambda$ therefore equals the probability that the two entities represent different types. This measure is also known in ecology as the probability of inter-specific encounter (*PIE*) and the Gini–Simpson index. It can be expressed as a transformation of true diversity of order 2:

The Gibbs–Martin index of sociology, psychology and management studies, which is also known as the Blau index, is the same measure as the Gini–Simpson index.

The quantity is also known as the expected heterozygosity in population genetics.

3.2.7 Berger- Parker Index:

The Berger–Parker index equals the maximum p_i value in the dataset, i.e. the proportional abundance of the most abundant type. This corresponds to the weighted generalized mean of the p_i values when q approaches infinity, and hence equals the inverse of true diversity of order infinity ($1/{}^\infty D$).

3.2.8 Effective number of Species or Hill numbers:

When diversity indices are used in ecology, the types of interest are usually species, but they can also be other categories, such as genera, families, functional types or haplotypes. The entities of interest are usually individual plants or animals, and the measure of abundance can be, for example, number of individuals, biomass or coverage. In demography, the entities



of interest can be people, and the types of interest various demographic groups. In information science, the entities can be characters and the types the different letters of the alphabet. The most commonly used diversity indices are simple transformations of the effective number of types (also known as 'true diversity'), but each diversity index can also be interpreted in its own right as a measure corresponding to some real phenomenon (but a different one for each diversity index).

Many indices only account for categorical diversity between subjects or entities. Such indices however do not account for the total variation (diversity) that can be held between subjects or entities which occurs only when both categorical and qualitative diversity are calculated.

True diversity, or the effective number of types, refers to the number of equally abundant types needed for the average proportional abundance of the types to equal that observed in the dataset of interest (where all types may not be equally abundant). The true diversity in a dataset is calculated by first taking the weighted generalized mean M_{q-1} of the proportional abundances of the types in the dataset, and then taking the reciprocal of this. The equation is:

$${}^qD = \frac{1}{M_{q-1}} = \frac{1}{\sqrt[q-1]{\sum_{i=1}^R p_i p_i^{q-1}}} = \left(\sum_{i=1}^R p_i^q \right)^{1/(1-q)}$$

The denominator M_{q-1} equals the average proportional abundance of the types in the dataset as calculated with the weighted generalized mean with exponent $q-1$. In the equation, R is richness (the total number of types in the dataset), and the proportional abundance of the i th type is p_i . The proportional abundances themselves are used as thenominal weights. The numbers are called Hill numbers of order q or effective number of species.

When $q = 1$, the above equation is undefined. However, the mathematical limit as q approaches 1 is well defined and the corresponding diversity is calculated with the following equation:



$${}^1D = \frac{1}{\prod_{i=1}^R p_i^{p_i}} = \exp\left(-\sum_{i=1}^R p_i \ln(p_i)\right)$$

Which is the exponential of the Shannon entropy calculated with natural logarithms (see above). In other domains, this statistic is also known as the *perplexity*.

The value of q is often referred to as the order of the diversity. It defines the sensitivity of the diversity value to rare vs. abundant species by modifying how the weighted mean of the species proportional abundances is calculated. With some values of the parameter q , the value of M_{q-1} assumes familiar kinds of weighted mean as special cases. In particular, $q = 0$ corresponds to the weighted harmonic mean, $q = 1$ to the weighted geometric mean and $q = 2$ to the weighted arithmetic mean. As q approaches infinity, the weighted generalized mean with exponent $q-1$ approaches the maximum p_i value, which is the proportional abundance of the most abundant species in the dataset. Generally, increasing the value of q increases the effective weight given to the most abundant species. This leads to obtaining a larger M_{q-1} value and a smaller true diversity (qD) value with increasing q .

When $q = 1$, the weighted geometric mean of the p_i values is used, and each species is exactly weighted by its proportional abundance (in the weighted geometric mean, the weights are the exponents). When $q > 1$, the weight given to abundant species is exaggerated, and when $q < 1$, the weight is given to rare species. At $q = 0$, the species weights exactly cancel out the species proportional abundances, such that the weighted mean of the p_i values equals $1/R$ even when all species are not equally abundant. At $q = 0$, the effective number of species, 0D , hence equals the actual number of species R . In the context of diversity, q is generally limited to non-negative values. This is because negative values of q would give rare species so much more weight than abundant ones that qD would exceed R .

The general equation of diversity is often written in the form

$${}^qD = \left(\sum_{i=1}^R p_i^q\right)^{1/(1-q)}$$



3.2.9 Methods adopted to calculate Bio diversity:

There are Six Ranges in the division. Each Range is taken as strata. There are 970 Sample plots of 0.1 ha (31.62 m Sq) in each range. Data for four Sample Plots from each Range have been analyzed for Bio Diversity index) to find out Shannon-Weiner Species Diversity Index, Evenness Index, Index of Dominance using the formula furnished below.

A) **Shannon-Weiner Species Diversity Index** has been calculated as per the following expression:

$$\bar{H} = -\sum \frac{n}{N} \log_e \frac{n}{N}$$

where,

\bar{H} = Shannon-Weiner Species Diversity Index

n = No. of individuals per species

N = Total number of individuals of all species

B) **Evenness Index** has been calculated by the following expression:

$$e = \frac{\bar{H}}{\log_e S}$$

where,

e = Evenness Index

\bar{H} = Shannon Weiner Species Diversity Index

S = No. of species

C) **Index of Dominance** has been calculated by the following expression

$$c = \sum \left(\frac{n}{N} \right)^2$$

where,

c = Index of Dominance

n = No. of individuals per species

N = Total number of individuals of all species



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

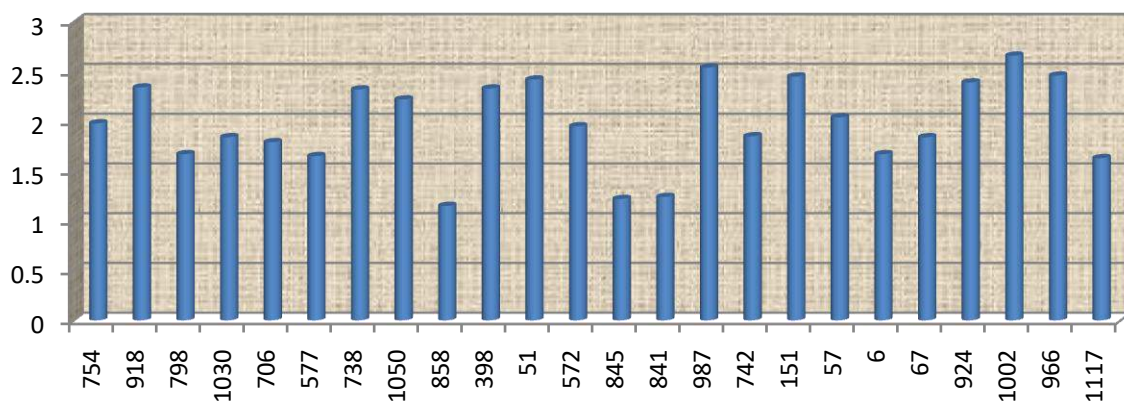
Table No 3.1 Bio Diversity Index for different Sample points.

Sl No	Name of Range	Sample Point no	Name of Forest Block	Shannon -Weiner SDI	Evenness Index	Index of Dominance	Simpson index	Inverse Simpson index
1	Mochibahal	754	Mochibahal PRF	1.98	0.71	0.265	0.265	3.774
2	Mochibahal	918	Chargarh RF	2.34	0.77	0.154	0.154	6.494
3	Mochibahal	798	R.Badmal RF, C-2	1.67	0.63	0.348	0.348	2.874
4	Mochibahal	1030	Chargarh RF, Sagjoree beat	1.84	0.68	0.300	0.3	3.333
5	Charmal	706	Berhampur PRF	1.79	0.70	0.262	0.262	3.81
6	Charmal	577	Landakot RF	1.65	0.75	0.292	0.292	3.42
7	Charmal	738	Rasibeda PRF	2.32	0.80	0.105	0.105	9.52
8	Charmal	1050	Sagmalia RF, C-4	2.22	0.80	0.160	0.160	6.25
9	Naktideula	858	Block Rail RF	1.15	0.41	0.11	0.110	9.09
10	Naktideula	398	Chadchadi RF, C-2	2.33	0.88	0.129	0.129	7.75
11	Naktideula	51	Dhadrakhol DPF	2.42	0.94	0.101	0.101	9.94
12	Naktideula	572	Lampaphuli DPF	1.95	0.81	0.187	0.187	5.35
13	Rampur	845	Hatidhara RF, C-17	1.22	0.63	0.440	0.440	2.27
14	Rampur	841	Bandhidhol DPF	1.24	0.64	0.437	0.437	2.29
15	Rampur	987	Bindhyabasani RF	2.54	0.90	0.100	0.100	10.00
16	Rampur	742	Hatidhara RF, C-7	1.85	0.89	0.195	0.195	5.13
17	Girishchandrapur	151	Landakot RF, C-28	2.45	0.93	0.104	0.104	9.615
18	Girishchandrapur	57	Kholgarh RF, C-1	2.04	0.82	0.175	0.175	5.714
19	Girishchandrapur	6	Landakot RF, C-1, Hiralo Beat	1.67	0.76	0.251	0.251	3.984
20	Girishchandrapur	67	Talab PRF	1.84	0.74	0.234	0.234	4.274
21	Rairakhol	924	Hemantakhol PRF	2.39	0.88	0.135	0.135	7.407
22	Rairakhol	1002	Rahan RF, C-1	2.66	0.90	0.090	0.09	11.111
23	Rairakhol	966	Tal RF, C-1	2.46	0.87	0.126	0.126	7.937
24	Rairakhol	1117	Rahan RF, C-1, Tribanpur Beat	1.63	0.62	0.386	0.386	2.591

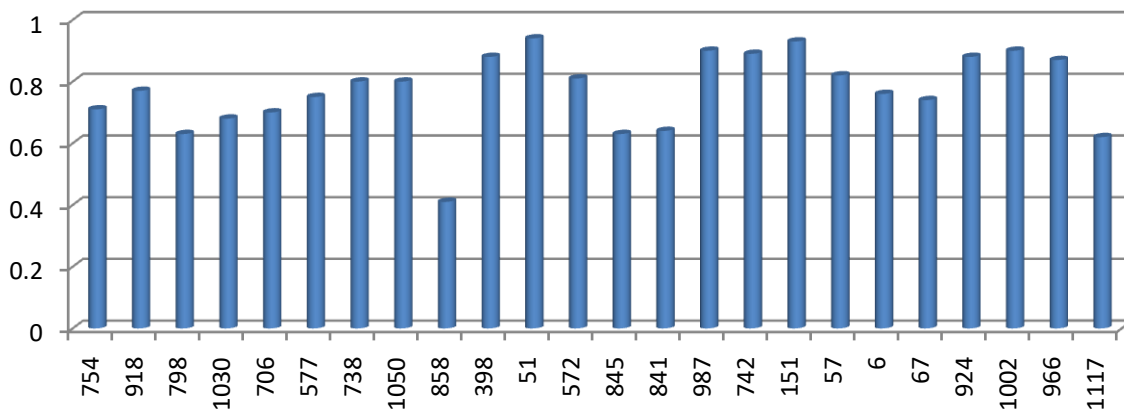
The sample point enumeration information is at Annexure-V for reference.



Shannon-Weiner SDI

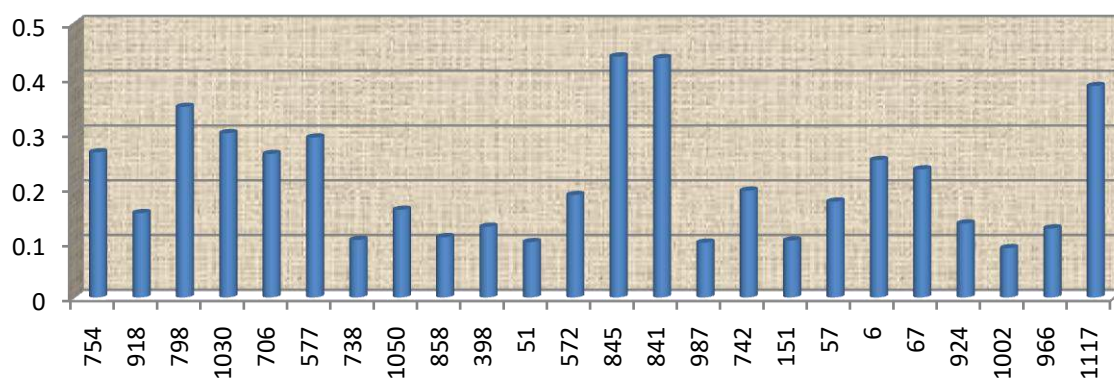


Evenness Index

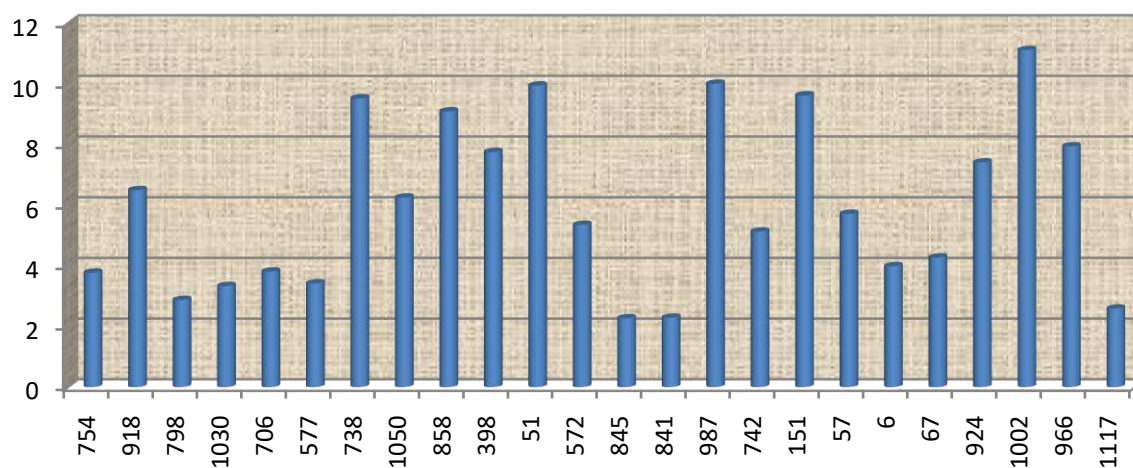


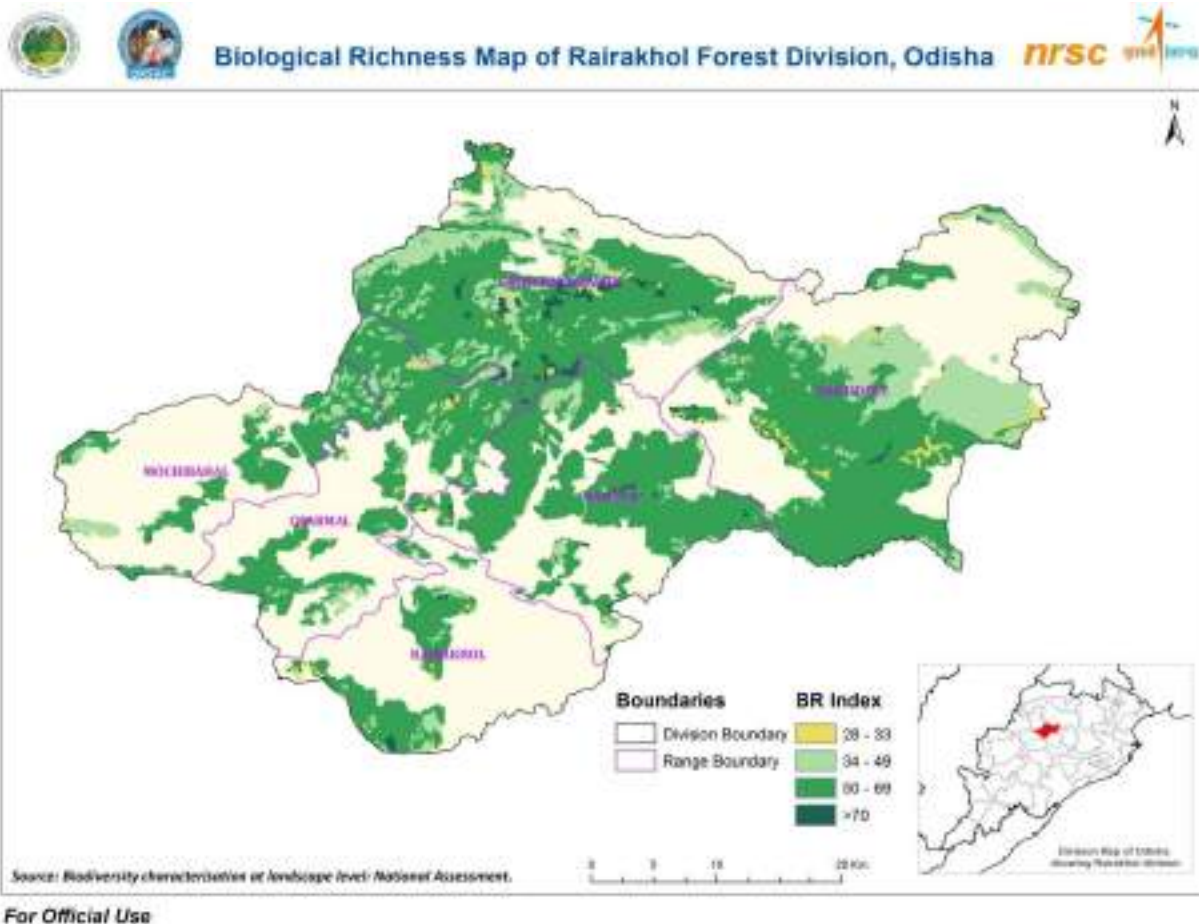


Simpson index



Inverse Simpson index





3.3 Status of Biodiversity Conservation in Forests:

Rairakhol Forest Division is not in limelight on Bio Diversity Conservation point of view. The forests are mainly a Sal Forest. Due to high Density prevalence of other species is low. No specific steps have been taken on Bio Diversity Conservation Measures. Steps have been initiated to prepare Peoples Bio Diversity Register in various Panchyats after constitution of Bio Diversity Committee in Panchyat / Blocks.

3.3.1 PBR (People's Biodiversity Register) formulation & Access of benefit sharing (ABS):

PBR (People's Biodiversity Register) formulation & Access of benefit sharing (ABS) Regulation is being controlled by Odisha Bio Diversity Board independently and separately over which this division has no regulatory jurisdiction. As suggested the format for describing {7. ACCESS BENEFIT SHARING (ABS) 7.1 Details of Tradeable Biological



resources available (Quantitative/ value / Market status) as extracted from **PEOPLE'S BIODIVERSITY REGISTER (PBR) Technical and Administrative Manual** is furnished below.

"7. ACCESS BENEFIT SHARING (ABS)

7.1 Details of Tradeable Biological resources available

No	Items	Biological Resources	Illustrative trade or common name	Plant part	Source

3.4 Status of Species prone to over exploitation:

The forest of Rairakhol Division is prone to over exploitation due to heavy demand on timber and building materials. Sal, Bija, Pahadi sisoo, Kuruma, Kashi has been exploited beyond the delivery capacity. Now Bija, Pahadi sisoo are becoming rare species in forests. Sal due to its vigorous coppicing capacity and fire hardy nature is surviving the threat. Due to unscientific collection methods of NTFP, Species like Barun, Kochila, Manjusha, Panki, Paldhua, Sunamukhi, Tamul, Bal Harida, Bhumi Kusmanda etc. are becoming rear and species like Amla, Kuturi, Gudmari, Chhatiana, Meda, Bidanga are on the verge of being threatened one. Over exploitation of Bamboo has resulted in degraded bamboo forests commercially harvestable bamboo forests have been reduced substantially.

- (a) **Sal (*Shorea robusta*):** The forests of the Division are rich in Sal. The over exploitation is not noticed to a common eye. Due to high demand for good Sal timber, besides removal of timber during Coupe Working, good quality trees are illegally removed. It has skewed the distribution of Sal trees in different Girth Class.
- (b) **Bija (*Pterocarpus marsupium*):** Bija the uncrowned prince of forest is well known for its timber value as "Furniture Wood". It's selective removal by villagers for illegal trade / to meet furniture requirement left forest devoid of Bija trees. Though its regeneration is very good, few trees above 120 cm and above girth class is noticed in forests.
- (c) **Pahadi Sisoo (*Dalbergia latifolia*):** *Dalbergia latifolia* commonly known as rose wood is well known for its timber value and its luster. Its over exploitation in past has made it difficult to spot a tree in a patch of one sq. km good forest.



- (d) **Kashi (*Bridelia retusa*):** Kashi tree bears impotence next to teak for making furnisher. Due to its over exploitation its abundance has been greatly reduced.
- (e) **Bamboo (*Dendrocalamus strictus*):** Bamboo is well known in every house hold. Due to over exploitation for raw material, the clump size has been reduced and number of culms have been drastically reduced. Removal of kardi for food purpose in this region and first year Karadi removed by artisans for basket making had its deteriorating effect on bamboo forests.
- (f) Besides the above species many hers, shrubs and fodder species have been over exploited.

3.4.1 Rare Endangered & Threatened (RET) Species of the Locality:

There is no Rear and Endangered species in the forests of Rairakhol Division. Due to over exploitation Bandhan, Pahadi Sissoo, Bija, Kuruma are seems to be pushed to a tight corner and can be remarked as threatened. Time has reached to be careful about propagation & conservation of these species from being extinct in this area.

3.5 Conservation of Genetic Resource:

3.5.1 Objectives, priorities and approaches:

The first step in genetic conservation is to specify the objectives of the conservation program. This is of the utmost importance, since it is possible to conserve ecosystem properties and still lose species entities. It is also possible to conserve a species and still lose genetically distinct populations, and therefore, genes that may be of value in disease and pest resistance, and in future adaptation. They could also be important in species deployment through breeding program, if that becomes a need or necessity. Many forest genera and species around the world provide goods and services, such as timber, wood, food, fodder, environmental stabilization, shade, shelter, and cultural and spiritual values. However, fewer than 1000 tree species have been systematically tested for their present-day utility, and less than 100 are the subject of intensive genetic research program. Evidently, therefore, many different forest species are being used in situ to provide important goods and services, without any active genetic management. Worldwide, the conservation of forest genetic resources has as its overall objective the maintenance of genetic diversity in the thousands of tree species of known or potential socioeconomic and environmental importance. Moreover, the levels and distribution of genetic variation in any given species are expected to be in a process of constant natural change resulting from the main forces of evolution. Therefore,



the central concern of conservation should be the evolutionary processes which **promote** and maintain genetic diversity, and not the endeavour to preserve the present distribution of variation as an end in itself. Assessing species' priorities for conservation action within any given country or local area, there may be divergent opinions on priorities among tree species. Forestry departments are likely to have a somewhat different emphasis and priorities from those of local forest dwellers and users, which can be different again from those of farmers and various other users of trees. It is apparent that insitu conservation programmes will be more successful if they target species of direct interest, use or concern to the land management authority and/or landowner(s). This will have major implications for the planning of in situ conservation programmes. A participatory rural appraisal approach can be useful for helping local communities whose land is communally owned to better identify their priority tree genetic resources and to develop appropriate in situ conservation responses. It is also important to consider the case for species and provenances which are of major economic importance when planted as exotics, but currently of much less significance in their native range and habitats. In such cases it is not unreasonable to expect that the likely beneficiaries of in situ conservation should contribute, financially or otherwise, to conservation. Given that there will be limited financial resources available for specific conservation programmes for forest genetic resources, it is necessary to consider which of the priority species are also in most need of, or warrant, conservation interventions and actions. This can be conveniently undertaken for different species by comparing the extent of the resource (level of genetic diversity or intraspecific variation) with the vulnerability or threats to the populations and/or ecosystems of which they are a part. Priorities for conservation of tree species in different sites in tropical semi-deciduous forests in the state are required to be identified. The decision tree approach is based on the use, ecological and threat values, scored by a spectrum of stakeholders including scientists and researchers, farmers, local peasants and business people. The species with the final highest scores are those which should be given priority for conservation. In general, conservation strategies of genetic resources have been grouped into in situ and ex situ categories.

In situ conservation strategies In the case of non-domesticated species, in situ conservation is probably the most important strategy and sometimes the only viable approach. In the tropics, where extinction rates of species are high because of land-use changes, setting conservation priorities is critical. In situ conservation is usually the preferred conservation strategy for most wild plant species, including some of the wild relatives of crop species,



because, as mentioned previously, it allows the populations of interest to continue to be exposed to evolutionary processes. Alternatively, for many domesticated species (crop and livestock), on-farm conservation of traditional varieties is now widely supported as an important practice for conservation of genetic diversity. Molecular genetic studies, carried out on many forest tree species around the world, are contributing to a better understanding of patterns of variation to support the development of improved management practices, and to monitor changes of species turnover in time and in space. Ex situ conservation is considered to be the foundation that ultimately allows the use of genetic diversity in plant breeding and conservation. The essential elements of ex situ conservation are related to the need to identify, then conserve and manage the range of variability within the species, primarily through the development and management of regeneration, in various forms, in the field. Molecular genetic techniques, primarily with genetic markers, can also help in some of the management tasks for ex situ populations, by confirming the identity of accessions and monitoring genetic changes in collections. However, the allocation of resources in genetic conservation should be need-driven rather than technology-driven. Biotechnology can also make contributions to the management of germplasm banks by providing better tools to assess levels of genetic diversity, and providing new alternatives to maintain genetic stocks. New molecular techniques avoid redundancy and duplication within collections through fingerprinting analysis and genetic diversity studies.

Genetic processes: evolutionary versus static conservation strategies –

The focus on whether or not to maintain genetic processes as part of the conservation strategy is important when deciding the choices of options for conservation.

Genetic processes typically deal with changes of gene frequencies and genotypic distributions.

All activities that reduce population size will generally increase the rate of inbreeding. Management and/or use of natural populations that influence the behavior of pollinators and seed disperses that can lead to changes in the amounts of inbreeding and/or change fertility, or alter microclimate and/or species composition, thus inducing new competitors.



Intended or unintended selection due to the use and/or management of natural stands, or during propagation and management of plantings—both can favor or disfavor certain alleles and thereby change allelic frequencies.

Continued natural selection to the prevailing environment that affects allele frequencies (as well as natural selection against inbred offspring in species with a mixed mating system, i.e. species that under natural conditions produce a mixture of selfed and out crossed progenies).

It is therefore important in the planning process to consider to what extent these processes are unacceptable, acceptable or even desirable. This will of course depend on the objective of conservation. Roughly speaking, conservation strategies can also be separated into three categories in terms of the evolutionary process.

Static conservation strategies, where genetic processes are typically not considered important are required to be defined. The aim is to keep gene frequencies or genotypic distribution/properties Description Properties, Applications Polymorphism, Isozymes Protein expression, Co-dominant Population Low to medium.

Strict evolutionary conservation strategies, where protection of genetic processes is considered as important as the conservation of the actual gene frequencies in the population, or more so are to be recorded. One can say that the objective of evolutionary conservation is to protect populations that can maintain fitness through long-term adaptation, so there is the expectation that gene frequencies should change.

Evolutionary conservation for utilized populations, where the objective is to conserve genetically diverse, viable populations growing under conditions that reflect the managed and used forests or planting became paramount important.

3.5.2 Static conservation:

Clonal archives, seed banks and Cryopreservation: Static conservation activities are characterized by the fact that genotypes are the targets for conservation. Therefore, vegetative propagation is in general preferred to propagation by seed. Vegetatively propagated clones can be planted and protected in clonal archives. The grafted or rooted trees will often be able to grow to a considerable age if the grafting has been a success. Of course, at some future date, the trees have to be re-grafted on new rootstock. It is important to maintain the archives carefully in the early years in order to avoid shoots or sprouts of the



rootstock taking over the grafted scion material. Constant weeding and tending is required, and good labeling and maps are essential. Static conservation thus requires continual, fairly intense, human management. Static conservation is also applied to conserve seed lots in seed banks, where seed is kept in cold storage, or under otherwise favorable conditions. Seed banks can only be used for conservation of species with storable seed. A large number of tropical tree species have so-called recalcitrant seed, which dies within a few years of storage. The vast majority of species have seed that can only maintain a high germination rate for relatively few years compared to the lifetime of the living tree, and the seed lots therefore need to be regenerated from time to time. This will include germinating the seed, producing the seedlings, growing the trees until they start flowering, and collecting new seed for storage. These 'rejuvenation' activities allow for new genetic recombination and new selection pressures during propagation and growth. For most species, seed banks should probably be seen as a short-term conservation activity. Seeds from endangered populations can be collected and stored in the seed bank for an interim period until they can be sown, seedlings grown and gene conservation plantings (the so-called ex situ conservation stands) established.

Evolutionary conservation: Evolutionary conservation in protected and designated reserve areas Evolutionary conservation activities are characterized by programs where the trees produce progeny in successive generations: genes are generally 'conserved', but genotypes are not. Natural selection takes place among trees with new allelic combinations that either favor or disfavor different genotypes. This process ensures that gene frequencies will change in the population: alleles with positive influence on fitness will increase, and alleles associated with low fitness will decrease. If the population size is sufficient, neutral genes should, in general, be maintained, but some genes will inevitably be lost by genetic drift; new genetic variation will arise by mutation after several generations. Human interventions (if any) are designed to facilitate moderate genetic processes rather than to avoid them. Genetic variation between populations is generally maintained when they are growing in different environments, and is even expected to increase over time. A typical example of a conservation population capable of evolutionary processes is a protected area in a natural forest. In a protected area, the species occupies its natural habitat (it is said to be in situ conserved), typically with a wide range of other species. Natural selection for general fitness is therefore largely related to competition among species, as well as to adaptation within species to current and future environmental conditions. However, evolutionary conservation can also take place in a planted stand, if natural selection is



allowed to work, and if the planted trees are regenerated from seed, rather than by vegetative techniques, for the next generation. In such programmes, plantations will preferably be established and managed in ways that mimic the natural processes that will support natural selection. Of course, in most situations the mixture of species (if any) is largely artificial, and the selective forces may therefore favour different genes than would be the case in true in situ conservation. However, this reflects the fact that selection and fitness always depend on the degree of human influence in any ecosystem. Directional selection in favour of commercial traits—including characters such as good stem form or ease of establishment in plantations—is typically avoided in strict evolutionary conservation programmes, but of course this again depends upon the local objectives of the programme. In summary, various factors will influence the success and relative suitability. During last plan period no substantial steps have been taken for conservation of Genetic Resource in the Division.

3.6 Fauna and their habitats:

The forests of Rairakhol Division is adjacent to Khalasuni Wildlife Sanctuary (Before reorganization of Forest Department it is with Rairakhol Division). Forests of this division is well stocked with crown density more than 60%. It gives a good shelter to animals. Animal from Sanctuary freely comes to this division. Animal concentration is quite good in the division.

The most commonly observed fauna of this region are Elephant, Leopard, Sloth Bear, Jungle cat, Hyena, Wild boar, Spotted Deer, Barking Deer, Sambar, Porcupine, Fox, Jackal, Mongoose etc. The common birds found are Peafowl, Jungle fowl, Green Pigeon, Grey Partridge, and Golden Oriole etc.

3.6.1 Sambalpur Elephant Reserve:

Project Objectives: With the following Objectives the Elephant Reserve has been constituted. The objectives are

- To conserve and protect elephant populations and to ensure that any population remains healthy and viable within its ecosystem.
- To conserve and protect the habitat of the elephant, and to reverse the deterioration of these habitats.



- To conserve, protect, and open up traditional migration corridors linking the different habitats.
- To create conditions, through eco-development activities, welfare measures and mitigation of elephant depredation for nurturing the traditional compassion and tolerance of the people living in and around elephant habitats.
- To take concrete measures to protect the elephant from poaching and other threats.
- To create viable mechanisms to ensure inter-state and inter regional coordination in protecting and conserving the elephant and its ranges.
- To create infrastructure and facilities, including training of manpower, for conservation support activities, veterinary care, humane methods of tranquilizing and translocation, etc
- To encourage, and create facilities for research related to the ecological significance of elephant and veterinary care of the animal.
- To educate people about the ecological significance of conserving the elephants and to revive the historical reverence and compassion for elephants.
- To devise strategies and programmes of providing alternative source of livelihood to craftsmen and communities adversely affected due to ban on the trade of ivory products.

Description of Sambalpur Elephant Reserve:

Location

Districts of: Sambalpur, Sundargarh, , Jharsuguda, Sonepur Forest Divisions: (Parts) of : Bamra (Wildlife), Bonai, Sambalpur (N), Sambalpur (S), Rairakhol.

Latitude: 20° 5'N and 22° 12'N

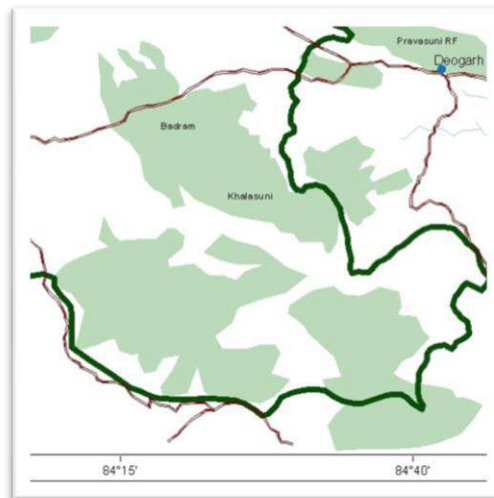
Longitude : 83° 13'E and 84° 58'E

Area of Sambalpur ER (as in 2004):

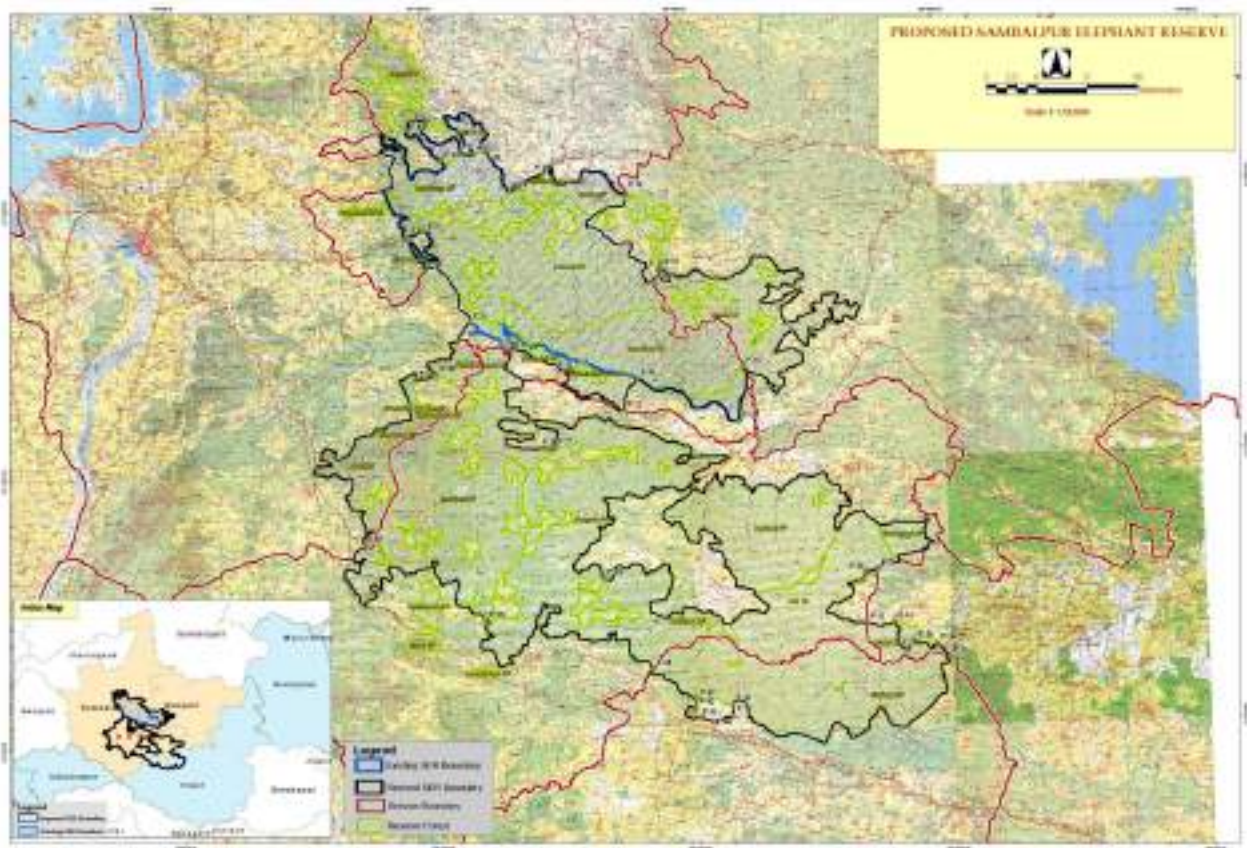
Name of Division	Area of Elephant Habitat in Sq. km	Area of Zone of Influence in Sq.km.	Total Area in Sq.km.
Bamra WL	573.27	1576.0197	2149.2897
Sambalpur (S)	402.45	828.06	1230.51
Sambalpur (N)	76.55	151.4200	227.97
Bonai	693.56	295.54	989.10
Rairakhol	813.54	436.4600	1250.00
Total	2559.37	3287.4997	5846.8697



Revised working plan of Rairakhol Division (2021-22 to 2030-31)



The Elephant Reserve Notification No8F (W) 10/2002/ 5840/F&E Dated 27th March 2002 is at Annexure-VI.





3.6.2 Tal Kholgarh Elephant Corridor.

Elephants are big migratory animals and move a long distance in search of food and require substantial areas. But habitat loss, expansion of human habitation and fragmentation of traditional elephant corridors has forced the elephants to split into a number of meta-populations or herds and move to new areas in search of food and shelter. As a result of this, the interface of elephant and man has increased manifold. This results in conflicts with humans due to elephants raiding or destroying of agricultural fields/ crops. And as retaliation by villagers, there is killing of elephants either by electrocution or poisoning. In order to protect the animals and its habitat there is a need to connect these fragmented patches of forest, which is called a corridor. This corridor will not only help the animals move without any disturbances, but also increase the chance of genetic interchange. As the risk of inbreeding within the localized patch of forest will be reduced, it will result in a healthy population.

Traditionally fourteen corridors have been identified in the State which was to be used by elephants during course of their migration. These corridors need to be protected. All round development like human settlements, roads, railway line, electric lines, canal and mining etc is the main cause of corridor fragmentation.

For preparation of Corridor Management Plan, survey of each of the fourteen corridors has been done by the DFOs in the field. First task in this regard has been to know the extent of width of corridors. Generally the areas around the old corridor up to which elephants have reached during past has been tentatively taken as width of the corridor with due rationalization to see the extent of problem which has to be faced while securing the corridor. Then in this width, broad land use survey has been done using Satellite imageries and ground truthing. Demographic survey has also been done to know the no. of villages, and households, village population along with other administrative units like Name of district, Thana and Tahasil covering the area. House hold survey has not been taken up at this stage. Due to fragmentation of traditional Corridors and degradation of habitat these elephants are in search of new habitat and corridors. Presence of elephants has been noticed in places where elephants have never been found before. It is being noticed that few elephants are using new corridors. The identified elephant corridors in the Sate are as follows.



Table No 3.2 Elephants Corridors of Odisha.

S/no	Name of the Corridor	Extends over Districts	Name of the Divisions	Length of corridor (km)	Width of corridor (km)	Total area (Sq.km)
1	Badampahar(Mayurbhanj)-Dhobadhobin(Jharkhand) INTERSTATE	Mayurbhanj	Karanjia, Rairangapur	16	0.5 - 1.5	24.3
2	Badampahar(Mayurbhanj)-Karida(Jharkhand) INTERSTATE	Mayurbhanj	Rairangapur	43	0.2 - 2.6	26.09
3	W.Bengal-Deuli-Suliapada(Passage) INTERSTATE	Mayurbhanj, Balasore; (West Bengal)	Baripada	72	0.1 - 0.7	39.5
4	Similipal-Hadagarh-Kuldiha INTER-DISTRICT	Mayurbhanj, Keonjhar, Balasore	Baripada, Balasore WL, Keonjhar WL	41.7	0.7 - 3.5	91.39
5	Telkoi-Pallahara INTER-DISTRICT	Keonjhar; Angul	Keonjhar, Deogarh	30.4	0.2 - 0.6	13.24
6	Karo (Keonjhar)-Karampada (Saranda, Jharkhand) INTERSTATE	Keonjhar, (Jharkhand)	Keonjhar	15	0.3 - 2.3	17.3
7	Maulabhanja Jiridamali-Anantapur INTER-DISTRICT	Dhenkanal	Dhenkanal	6.5	0.25 - 0.28	1.55
8	Kahneijena-Anantapur INTER-DISTRICT	Angul; Dhenkanal	Angul	6.6	0.4 - 1.1	5.22
9	Buguda-Central RF of Rairakhol Divn	Rairakhol	Rairakhol	2.6	0.8 - 0.6	0.76
10	Nuagaon-Baruni	Angul	Athmallik	4.5	0.4 - 4.6	20.7
11	Tal-Kholgarh	Sambalpur	Rairakhol	6.3	0.5 - 0.08	4.56
12	Barpahad-Tarava-Kantamal INTER-DISTRICT	Sonpur, Boudh	Rairakhol	24.2	0.38 - 1.5	21.7



Table No 3.2 Elephants Corridors of Odisha.

S/no	Name of the Corridor	Extends over Districts	Name of the Divisions	Length of corridor (km)	Width of corridor (km)	Total area (Sq.km)
13	Kotagarh-Chandrapur INTER-DISTRICT	Kandhamal, Rayagada	Balliguda, Rayagada	77	2.0 - 22.4	575.4
14	Karlapat-Urladani INTER-DISTRICT	Kandhamal, Rayagada	Kalahandi(S), Kalahandi(N), Rayagada	75	0.2 - 0.5	28.9

11. Tal-Kholgarh Corridor

This corridor connects Tal RF with Kholgarh RF and Landakot RF thereby maintains connectivity of elephant population between Khalasuni WLS with Satkosia WLS through Baruni, RF (East & West) and Raun RF. National Highway-55 and railway track connecting Angul and Sambalpur districts pass through the corridor. Heavy traffic on NH-55, infrastructure development along the highway has been affecting elephant movement. Proposed expansion of highway for four lanes and railway for double lanes will aggravate the condition. Elephants cross the railway track between Kuhi and Purunagarh villages

Alternate Name	---
State	Odisha
Connectivity	Satkosia WLS and Khalasuni WLS
Length and Width	Length 5 km and Width 0 – 1 km
Legal status of the corridor	Reserved Forest, Khesara Forest
Major land use	Forest, agriculture, human habitation,
Major habitation/Settlements in Corridor	highway, railway
Forest type	Purunagarh, Kuhi, Barsikia
Frequency of Corridor usage by elephants	Tropical Dry Deciduous Forest
Development activities/ infrastructures	Regular and seasonal
	National Highway-55, Railway, infrastructure along the highway



Forests and Elephants Habitat quality:

Status of plant species: Total 18 plant species were recorded in the sampled area. Of these eight species were palatable food species to elephants. Maximum average GBH (in cm) was found in *Bombax ceiba* (137 cm), followed by *Lagerstroemia parviflora* (101), *Buchanania lanzan* (82cm), *Lannea coromandalica* (75.33cm). Maximum average height was found in *Buchanania lanzan* (15m), followed by *Bombax ceiba* (12.9 m) and *Lannea coromandalica* (12.5 m). Tree frequency was found high value in *Terminalia tomentosa* (14m), followed by *Cleistanthus collinus* (9m), *Mitragyna parvifolia* (8m) and *Anogeissus latifolia* (4m). More than 50% of the total trees found in the sampled plot were chopped for wood which showed a great threat to the habitat status of the corridor. Enumeration of ground cover resulted high value of barren ground (39.38%) followed by shrub (33.13%), grass (18.75%) and herb (8.75%).

Forest/Land use

1. Legal status of forest: Khesara forest,
2. Human habitation: Kuhi, Purunagarh, Barasikiya
3. Agriculture field
4. Highway and Railway
5. Infrastructure development along the highway



Human Dimension:

Threats

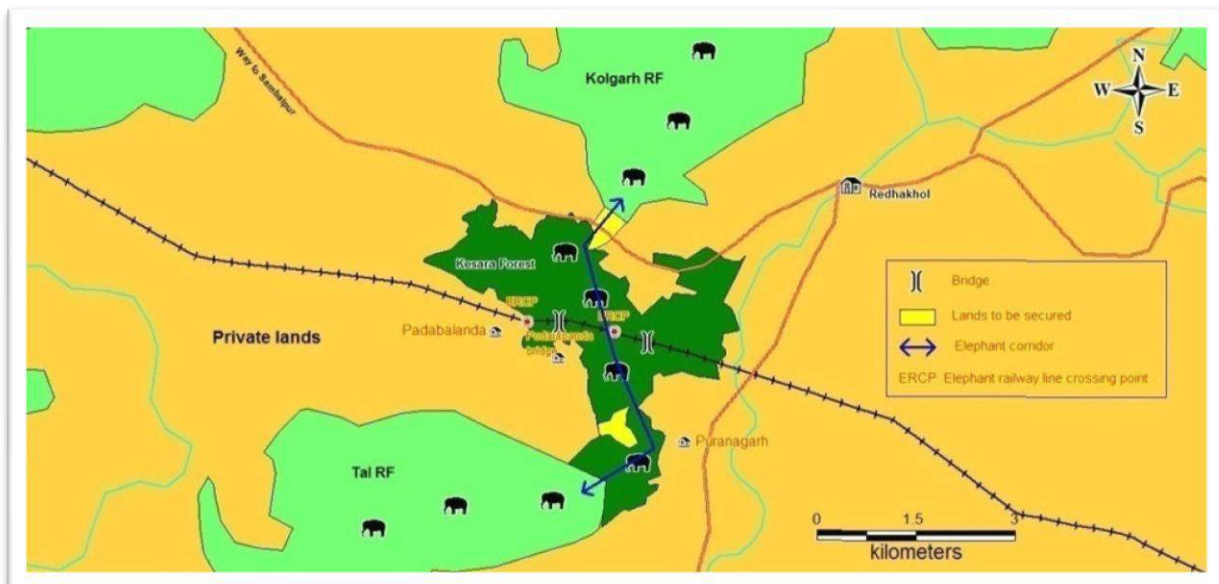
- 1. National Highway:** National highway-55 connecting Sambalpur and Cuttack passes through the corridor. Average vehicle traffic was found to be 258.29/hr during 6:00 AM to 6:00 PM and 105.87/hr during 6:00 PM to 6:00 AM.
- 2. Private nursery and Industry:** A private nursery with 20 acres of land and an industry namely Meerabasanti Industry (P) Ltd. situated near Barsikia village on either side of NH-55 has obstructed the corridor.
- 3. Railway:** Three km stretch of Sambalpur-Angul railway track passes through the corridor. Elephants cross the track between Podabalanda and Purunagarh village. There is a proposal for expansion of this track, which will deteriorate the corridor.
- 4. Construction along Highway:** Construction of industries, hotels, engineering college and expansion of settlements near NH-55 has been fragmenting the corridor.
- 5. Encroachment:** Encroachment of corridor forest by Purunagarh, Kuhi and Chiriginipal villages has reduced the corridor width significantly.
- 6. Power lane:** High tension power lanes are passing through the corridor thus clearing the corridor forest.

Socio – economic details

A total of 11 villages are located in and around the corridor. Of these four villages namely Puruagarh, Kuhi, Barasikia and Birachandrapur are located very close to the corridor.

Corridor dependent villages:

Barsikia, Podabalanda, Kuhi, Purunagarh, Damagarh, Tal, Tumbamal, Ambjhari, Bijakhaman, Kendumunda and Chiriginipal



Elephant Census: Elephant census

Elephant Census have been carried out during 2012,2015 and 2017. The elephant counted in Rairakhol Division are furnished below.

Table No 3.3 Elephant Census in Rairakhol Division.

Year	Male	Female	Unknown	Young	Total
2012	2	2	0	3	6
2015	4	3	0	2	9
2017	5	8	0	3	16

3.6.3 Elephant Movement Path:

The elephant movement paths as recorded in the division are as follows

Table No 3.4 Identified Movement paths of Elephants in Rairakhol Division.

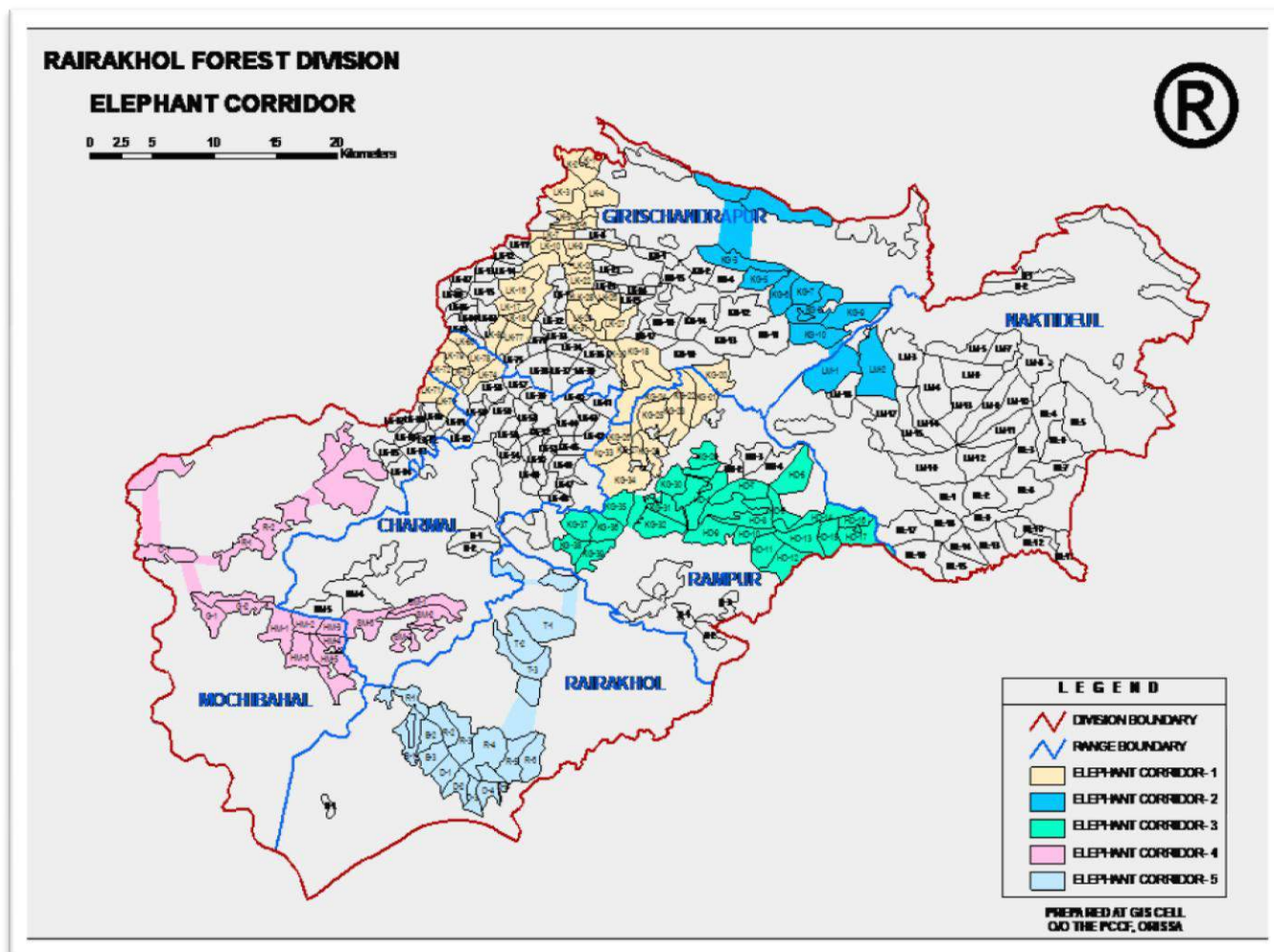
Sl No.	Forest Blocks/ Villages	Length in km
1	Landakot,Kholgarh,Tal	49.5
2	Kholgarh, Landimal,Giripur,Tikira	26
3	Hatidhara,Kholgarh,Terbeda	36.5
4	Kalia,Chargarh,Sagjori, R.Badmal,Mochibahal,Satsama,Sagmalia	67
5	Rahan,Sanrengali,Tal,Podabalinda,Hemantakhol	57



Revised working plan of Rairakhol Division (2021-22 to 2030-31)



Redhakhol Division		Athamallik Division	
Badbahal Range		Madhapur Range	Bamur Range
Bisipali, Dhaurakhman	↔	Beltaila, Tasarbeda	
Gariamunda	↔	Jhurikata	
Pattakhman, Jhainkidadar, Khajurijharan	↔		Balijaran, Dadarpali
Kankanpada, Badkasibahal	↔		Guapada
Sannuapada	↔		Taparsingha
Kukudabahali, Jhinkidadar	↔		Badibahal
Mahulmunda, Samsingha	↔		Urda
Kandhara Ghunginali	↔		Tipamunda



Tiger / Leopard Census:

Tiger and Leopard Census was carried out during 2016. During census no RBT (Tiger) was recorded. Four male Leopards and 10 Female were recorded in the division.

Tiger Landscape

This landscape has a network of Tiger Reserves interspersed with forest patches or corridors. These corridors fall outside the definition of Protected Areas (PAs) thus making them highly susceptible to degradation, fragmentation and increasing poaching pressure. Increasing urbanization and developmental activities on corridors threaten the long-term viability of tigers in India.



“A wildlife corridor is a link of habitat, which connects two or larger wildlife habitats. They are vital for movement of animals between the two areas for resources like food, water, shelter and breeding.”

In Rairakhol division Tiger landscape has been identified in Naktideul Range. The forest area coming within 1.5km on both sides of Central line has been identified for maintaining Tiger landscape. The coordinate of Central line is furnished in the table no 3.5 below.

Table No 3.5 Coordinate of Central line

Point No	Latitude (N)	Longitude (E)	Point No	Latitude	Longitude	Remark
00	21°05'21.53"	84°38'33.51"	09	21°09'41.93"	84°39'45.47"	Chadchadi PRF, rail RF Comp. No 3,4,5,6,8,10 and 12. Coming within Chadchadi, Kudanali, Koing Beat in Naktideul Range.
01	21°05'54.08"	84°38'31.80"	10	21°09'50.50"	84°40'30.01"	
02	21°06'28.34"	84°38'30.08"	11	21°10'04.21"	84°41'12.84"	
03	21°07'02.61"	84°38'28.37"	12	21°10'16.20"	84°41'53.96"	
04	21°07'38.58"	84°38'31.80"	13	21°10'23.05"	84°42'28.22"	
05	21°08'12.85"	84°38'28.37"	14	21°10'33.33"	84°43'04.20"	
06	21°08'47.11"	84°38'28.37"	15	21°10'41.90"	84°43'38.46"	
07	21°09'09.38"	84°38'35.22"	16	21°10'52.18"	84°44'14.44"	
08	21°09'29.94"	84°39'0.92"	17	21°10'57.62"	84°44'43.63"	

It is in a proposal Stage. It is required to maintain the forests / Tiger landscape in a befitting manner for conservation of Tiger in the region.

Winter Bird Census:

The aim of Winter Birds Census is to Study

- Distribution, Numbers and habitats of winter birds,
- Their population changes during the winter, between successive years and in the long term,
- The factors responsible for fluctuations in annual occurrence, winter mortality and long term population change.



With the winter bird census, it is possible to get a reliable picture of the general distribution of birds throughout the country and in different habitats.

Water birds are one of the key indicators of wetlands health. Wetlands provide feeding, resting, roosting and foraging habitats for these charismatic species. We work with a number of volunteers to assess the status of population of water birds over time. The information so generated is used to identify wetlands of high importance for water birds, and take conservation measures such as designation as Ramsar Sites and Flyway Network Sites, or inclusion as priority wetlands within national programmes.

Every January, thousands of volunteers across Asia and Australasia visit wetlands in their country and count water birds. This citizen science program is the Asian Water bird Census (AWC). The AWC is an integral part of the global water bird monitoring program, the International Water bird Census (IWC), coordinated by Wetlands International. It runs in parallel with other regional program of the International Water bird Census in Africa, Europe, West Asia, the Neo-tropics and the Caribbean.

The census has the following objectives:

- To obtain information on an annual basis of water bird populations at wetlands in the region during the non-breeding period of most species (January), as a basis for evaluation of sites and monitoring of populations
- To monitor on an annual basis the status and condition of wetlands
- To encourage greater interest in water birds and wetlands amongst citizens.

The Water Bird Census helps in

- raising awareness of water birds and water bird conservation issues;
- supporting local conservation activities at wetlands;
- the Ramsar Convention on Wetlands, in identifying and monitoring wetlands of international importance;
- the Convention on Migratory Species (CMS), by monitoring the status of migratory water birds and their habitats;
- the Convention on Biological Diversity's (CBD) goal in conservation and sustainable use of biodiversity.



- implementation of the East Asian-Australasian Flyway Partnership Initiative (EAAFP) and Central Asian Flyway Action Plan through monitoring important and Flyway Network sites;
- Bird Life International's Important Bird Area (IBA) Program;
- IUCN/Bird Life International's Global Species Program (Red List);
- Wetlands International's Water bird Population Estimates program.

The Water Bird Census for Rairakhol Division for last two year (2020 and 2021 is enclosed as **Annexure -VII.**

The other fauna commonly observed in the Division are as follows:

3.6.4 Other Fauna observed & its description:

i) Bear –

It is a medium size animal with long coarse hairs. Limbs have 5 clawed digits; tail short and it can climb trees. Bear is partly carnivorous; also feed on fruits, honey and insects. Mahua flowers are liked by Bear. It can walk upright on hind legs and can be tamed. It is found in maximum number of forest blocks included in the present revision. It is a peace loving animal but become violent when hungry or under attack. Reportedly the bears are found in almost all RFs of Redhakhol Forest Division. The population is high in Rairakhol Sub-division in Kholgarh, Landimal, Landakot, Suani, Rail, Hatidhara, Tal, Rahan RF.

ii) Spotted Deer –

The chital (spotted deer) is the most beautiful of all deer. Its coat is bright rufous-fawn profusely spotted with white at all ages and in all seasons. Old bucks are brownish in colour and darker. It is seen in herds of 10 to 30 numbers or even more which may contain 2 or 3 stags, found in valley & plains preferably in meadows along the perennial nalas flowing in this tract. It attains a height of about 1 mt. Only male has branchy horns. Their number is gradually decreasing. Some times seen in Landakot RF, Kholgarh RF.

iii) Hare –

This animal is about 40 cm in length & 1 kg in weight and is found in almost all peripheral forests in this zone. Its body is covered with fur & hairs. It varies in colour like pure white, black or mixed. Having hind limbs longer makes it powerful for running & jumping. It has a



pair of large movable pinnate ears & a short bushy tail. It feeds mainly on grass. Found in all forest blocks, bushy forests and grass land nearby.

iv) **Monkey / Langurs -**

The common monkey found in this area has a black face with silvery grey colour of the body. Two types of monkeys are seen in this area, the hanuman languor and the red faced monkey (macaque). Hind limbs are longer than fore limbs. Females live in herd headed by one strong male. The red faced monkey is of smaller size with short tail. Males & females irrespective in number live in herds. Some time a strong single male has seen alone.

v) **Fishing Cat –**

It is a fierce beast smaller than a Leopard but capable of mauling one in a fight. They live in forests adjacent to riverbanks and water bodies & hunt fish, crab, frog, birds, insects & some time others infant mammals. Its specialty is to get on to rocks overhanging water & sweep at fish with its paw as they swim by.

vi) **Civet Cat -**

It is a nocturnal cat like animal of forests having a long tail. A small flesh eating animal valued for its fatty substances with strong scent from its pouches close to the tail. It is used in making several kinds of perfumes. It is available in almost all RFs in Division.

vii) **Jungle Cat-**

The **jungle cat** (*Felis chaus*), also called **reed cat** and **swamp cat**, is a medium-sized cat native to all forests of this division. It inhabits foremost wetlands like swamps, littoral and riparian areas with dense vegetation. It is listed as Least Concern on the IUCN Red List, and is mainly threatened by destruction of wetlands, trapping and poisoning.

The jungle cat has a uniformly sandy, reddish-brown or grey fur without spots; melanistic and albino individuals are also known. It is solitary in nature, except during the mating season and mother-kitten families. Adults maintain territories by urine spraying and scent marking. Its preferred prey is small mammals and birds. It hunts by stalking its prey, followed by a sprint or a leap; the ears help in pinpointing the location of prey. Both sexes become sexually mature by the time they are one year old; females enter oestrus from January to March. Mating behavior is similar to that in the domestic cat: the male pursues



the female in oestrus, seizes her by the nape of her neck and mounts her. Gestation lasts nearly two months. Births take place between December and June, though this might vary geographically. Kittens begin to catch their own prey at around six months and leave the mother after eight or nine months.

viii) **Jackal -**

Jackals are medium-sized omnivorous mammals of the genus *Canis*, which also includes wolves, coyotes and the domestic dog. While the word "jackal" has historically been used for many small canids, in modern use it most commonly refers to three species: the closely related black-backed jackal and side-striped jackal of sub-Saharan Africa, and the golden jackal of south-central Eurasia, which is more closely related to other members of the genus *Canis*.

Jackals are opportunistic omnivores, predators of small to medium-sized animals and proficient scavengers. Their long legs and curved canine teeth are adapted for hunting small mammals, birds, and reptiles, and their large feet and fused leg bones give them a physique well-suited for long-distance running, capable of maintaining speeds of 16 km/h (9.9 mph) for extended periods of time. Jackals are crepuscular, most active at dawn and dusk.

Their most common social unit is a monogamous pair, which defends its territory from other pairs by vigorously chasing intruding rivals and marking landmarks around the territory with their urine and feces. The territory may be large enough to hold some young adults, which stay with their parents until they establish their own territories. Jackals may occasionally assemble in small packs, for example, to scavenge a carcass, but they normally hunt either alone or in pairs.

ix) **Fox-**

Foxes are small-to-medium-sized, omnivorous mammals belonging to several genera of the family Canidae. Foxes have a flattened skull, upright triangular ears, a pointed, slightly upturned snout, and a long bushy tail (or *brush*). By far the most common and widespread species of fox is the red fox (*Vulpes vulpes*) with about 47 recognized subspecies. The global distribution of foxes, together with their widespread reputation for cunning, has contributed to their prominence in popular culture and folklore in many societies around the world.



x) **Hyena-**

Hyenas or **hyaenas** are any feliform carnivoran mammals of the family Hyaenidae. With only four extant species (in three genera), it is the fifth-smallest biological family in the Carnivora, and one of the smallest in the class Mammalia. Despite their low diversity, hyenas are unique and vital components of fauna and found in most of the forests. Although phylogenetically they are closer to felines and viverrids, and belong to the feliform category, hyenas are behaviourally and morphologically similar to canines in several elements of convergent evolution; both hyenas and canines are non-arboreal, cursorial hunters that catch prey with their teeth rather than claws. Both eat food quickly and may store it, and their calloused feet with large, blunt, nonretractable claws are adapted for running and making sharp turns. However, the hyenas' grooming, scent marking, defecating habits, mating and parental behaviour are consistent with the behaviour of other feliforms.

xi) **Sambar-**

The **sambar** (*Rusa unicolor*) is a large deer native to the Indian subcontinent is listed as Vulnerable on the IUCN Red List since 2008. Populations have declined substantially due to severe hunting, insurgency, and industrial exploitation of habitat. The appearance and the size of sambar vary widely across their range. They attain a height of 102 to 160 cm (40 to 63") at the shoulder and may weigh as much as 100 to 350 kg. Head and body length varies from 1.62 to 2.7 m (5.3 to 8.9 ft). Females are smaller than males. The shaggy coat can be from yellowish brown to dark grey in colour, and while it is usually uniform in colour, some subspecies have chestnut marks on the rump and underparts. Sambar also has a small but dense mane, which tends to be more prominent in males. The tail is relatively long for deer, and is generally black above with a whitish underside.

xii) **Barking Deer-**

The **Indian muntjac** (*Muntiacus muntjak*), also called barking deer, is a deer species native to forests of this division. This muntjac has soft, short, brownish or greyish hair, sometimes with creamy markings. It is among the smallest deer species. It is an omnivore and eats grass, fruit, shoots, seeds, bird eggs and small animals, and occasionally scavenges on carrion. Its calls sound like barking, often when frightened by a predator and hence the common name "barking deer". Males have canines, short antlers that usually branch just once near the base, and a large postorbital scent gland used to mark territories. The Indian muntjac has a short



but very soft, thick, dense coat that is denser in cooler regions. The face of the muntjac is darker and the limbs are dark to reddish brown and the coat color seasonally varies from darker brown to yellowish and grayish brown and is white ventally. Their ears have much less hair but otherwise are the same color as the rest of the head. Male muntjacs have short antlers, about 10 cm (3-4 inches) long that protrude from long body hair-covered pedicels above the eyes. Females have tufts of fur and small bony knobs instead of antlers. Males also have elongated (2 – 4 cm), slightly curved, upper canines. These canines can be used in male-male conflicts and inflict serious injury. The body length of muntjacs varies from 89–135 cm and height ranges from 40 – 65 cm. The muntjacs, unique among the deer, have large, obvious facial (pre-orbital, in front of the eyes) scent glands used to mark territories or females. Males have larger glands than females.

xiii) Wild Boar-

The **wild boar** (*Sus scrofa*) is a suid native to all forests mostly moist one. Human intervention has spread its distribution further, making the species one of the widest-ranging mammals in the world. Its wide range, high numbers, and adaptability mean that it is classed as least concern by the IUCN and it has become an invasive species in part of its introduced range. The wild boar is a bulky, massively built suid with short and relatively thin legs. The trunk is short and massive, while the hindquarters are comparatively underdeveloped. The region behind the shoulder blades rises into a hump, and the neck is short and thick, to the point of being nearly immobile. The animal's head is very large, taking up to one third of the body's entire length. The wild boar inhabits a diverse array of habitats. The main habitats favored by boars in India are deciduous and mixed forests. Wild boar damages paddy field.

xiv) Squirrel-

It has elongated body covered with fur and has 5 long stripes of dark colour on its back. Its tail is long & bushy. The eyes and ears are large. It is an arboreal, active climber & nests on trees. It feeds on fruits, seeds & nuts.

xv) Rat -

Rats are found in forest areas nearer to villages. They are prolific breeders. They can give birth about 10 to 15 young ones at a time. They are burrowing animals & omnivorous. They have consistently growing teeth for which they bite wood, concrete & rocky soil. They can survive without water for a longer period.



xvi) Mongoose –

Its body is elongated and covered with yellowish gray fur. The head is long with pointed snout eyes, small pinnate ears and a long tail. Limbs have 5 digits with claws. It can fight and kill the snakes and feeds on their blood. It is believed that it is an auspicious creature as per Hindu mythology.

xvii) Pangolin –

They are noticed in dense forests. They are about 5 ft long and their head, body and tail are covered with round horny scales. Its head is small with short pointed snout, eyes and small pinnate ears. Its limbs are strong with 5-clawed digits to dig anthills. It is a tree climber and can roll into ball on feeling danger for self-defense. It is profusely available in Singhijuba RF of Binka Range.

xviii) Porcupine –

Porcupine is a small spine bearing mammal usually found in night in almost all reserve forest of Rairakhol Forest Division.

xix) Bat –

Bats live in clusters of hundreds. Its body is covered with soft fur. It has short snout, large pinnate ears and small eyes with poor vision and concealed tail. In four limbs, only toe is clawed and hind limbs have 5-clawed digits. They produce ultra-sonic sound wave for flight. The fox headed bats are found in the sky at late evening in Rairakhol Forest Division.

xx) Otter –

It is seen near water bodies and forest streams & nalahs. Its body is slender, neck short, tail flattened, small pinnate ears, and claws non-retractile. It is semi-aquatic with short and dense oily furs and webbed digits in both limbs for which it moves faster inside water. It feeds on fish, crabs and frogs. In river Mahanadi / Hirakud reservoir these animal are found in cluster along with their siblings.



3.6.5 Birds:

i. Terrestrial Birds -

The terrestrial birds found in the Division can be broadly grouped into three groups, such as High, Medium & Low, depending on their numbers. The following birds named as Common myna, Jungle fowl, Indian gray Hornbill, Sparrow, Raven myna, various species of Cuckoo, Black drongo, Crow, various species of King fisher, Owl, Pigeon, Parakeet, Dove, Nightingale are seen in maximum number in this locality. These birds are included in High group.

The following birds such as Weaverbird, Falcon, Kite, Chat, and Woodpecker & Hawk are seen in medium numbers in this area. These birds are included in Medium group.

The following birds such as Blue jay, Black bee, Swiftly, Grey crane, Golden oriole, Gander and Brahmin kite are seen in very few numbers in this locality. These birds are included in Lower group.

ii. Aquatic Birds -

The aquatic birds such as little cormorant, Graylag goose and Water fowl are seen in this area.

iii. Aquatic animals.

The aquatic animals such as Turtle, Crab, Leech, Oyster, Snail, Shrimp and Water snake are seen in the ponds, perennial & semi-perennial nalah and dams existing in this area.

3.6.6 Reptiles:

The common reptiles such as Tortoise, Lizard, Garden lizard, all varieties of Snakes and Pangolin are seen in this locality. Besides this, Centipede, Earthworm, Millipede & Galley worm are seen everywhere in this Division.

3.6.7 Worms & Insects:

The common worms and insects noticed in this Division are butterflies, White ant, Dragon fly, Mole, cricket, Tree ant, Back bee, Beetle, Glow worm, Grasshopper, Spider, Wasp, Honey bee, Slug etc.

3.7 Threats and Challenges to wildlife:

The wildlife is facing greater challenge due to



- (i) Fragmentation of Habitat due to construction / widening of Roads, Transmission lines.
- (ii) Depletion of tree cover / Forest crop density.
- (iii) Scarcity of Water in interior & high altitude Forests in summer.
- (iv) Depletion of Food stock and deterioration of quality Food / Fodder.
- (v) Depletion of Pray base / herbivorous.
- (vi) Annual Fire and loss of Ground Flora.
- (vii) Heavy biotic interference and intrusion by domestic animals (Cattle/ Goat/ Sheep)
- (viii) Illegal hunting by putting nets, electric live wire, etc.

3.7.1: Fragmentation of Habitat due to construction / widening of Roads, Transmission lines.

According to the National Transport Development Policy Committee, The demand for road based transport services has dramatically accelerated following economic liberalization, and has provided for as much as 90% of the total passenger traffic, leaving a meager 10% for rail. Rail and road freight traffic is expected to grow at about 12% and 8% per annum respectively, to achieve a 50% share each in the total freight traffic at the end of 15th plan. Accordingly construction of New Roads / up gradation of existing road net work exerts pressure on Forest Land. This depletes forest wealth as well as fragments the habitat leaving the animals in isolation. Similarly the transmission lines are being drawn in all rural / urban areas and it passes through forests. Electrocutions of animals are frequently observed.

3.7.2: Depletion of tree cover / Forest crop density.

From satellite imagery study and experience, it is observed that the crop density is more or less is declining and more forest blocks are being managed under Rehabilitation Working Circle. Reasons for such depletion / thinning of over wood resulted in depletion of cover to animals. Due to lack of camouflaging the animals became ease pray to predators.

3.7.3: Scarcity of Water in interior & high altitude Forests in summer.

Now as it is observed the Forests are more or less confined to Hills / Ridges. Plain Forests are deceasing day by day and are subject to much biotic pressure. Animals are withdrawing from forest fringes and concentrating on inaccessible pockets of Forest. Day by Day the rainfall is



erratic and number of Rainy days in a year is decreasing. The nalla / Rivulets are drying up and in summer it became dry. The animals face water scarcity. Sometimes, in search of water they come to nearby habitation and endangered their life.

3.7.4: Depletion of Food stock and deterioration of quality Food / Fodder.

The forests of the tract are becoming more dryer due to annual fire, reduced rainfall and reduced rainy days, grazing beyond its carrying capacity, compacting of soil, increased runoff, top soil erosion etc. The plant community is gradually regressing towards thorny, unpalatable, stunted seral stage rather than improving towards climax. In the process the forest lacks quality food / fodder to herbivorous. Due to lack of micro organisms, bears, wild boar etc are facing scarcity of food stock.

3.7.5: Depletion of Pray base / herbivore.

Herbivorous animals are mostly the base pray of all Carnivorous. Due to depletion of Grass lands / quality fodder and poaching of animals, their number / population is in a declining tread. It has affected the population of carnivore's animals. In many forest areas, concentration of pray base is at a threshold limit. The health of the forest is also indicated from presence / abundance of carnivorous animals. It is a common observation in all forest blocks of the Division that both pray base and predators are in a rapid declining trend. It is clear signal to all forest managers to act for increase in fodder, water and adequate tree cover for animals.

3.7.6 Annual Fire and loss of Ground Flora.

All the forests of Redhakhhol Division are of deciduous nature mixed with Bamboo in few blocks. Annual Fire is a common occurrence which destroyed the ground flora, regeneration, humus layer and affects the living of animals. Though adequate steps are being taken by department, it is felt the need to associate the VSS, general public in an intensive manner to combat fire menace.

3.7.7: Heavy biotic interference and intrusion by domestic animals (Cattle/ Goat/ Sheep)

The forests are freely assailable to the public throughout the year though it is legally prohibited. Lopping of branches, cutting of trees for fodder for cattle, Goat etc is a common



phenomenon. It always breaks the tranquility of wild animals. It seriously hampered the breeding, movement and always in a state of disturbed environment and grazing related problems.

3.7.8: Illegal hunting by putting nets, electric live wire, etc.

The Forests and agricultural field are intermingling at many places. The villagers / anti-social elements are putting Nets (Phasa), Electric live wires in agricultural field to protect their crop from depredation. These phasa sometimes put threat to animals.

3.8 Protection & Management of Fauna:

In Rairakhol Division there is no National Park, Wildlife Sanctuary or Protected area. The Protection & Management is being practiced within framework of law. The following measures are being taken for Protection & Management of Fauna in this Division.

3.8.1 Management Practices adopted:

A. Deployment of Squad:

In order to strengthen the existing staffs in Ranges, Squads have been deployed under various nomenclatures i.e. Anti-Depredation Squad, Elephant trackers, Anti-Poaching squad, Fire Fighting Squad, Protection Squad.

B: Anti-Poaching Gates:

There is no Anti-poaching gate to prevent poaching of wild life in this Division.

C: Creation of Water Body:

Water bodies have been created to provide water during summer. The list of water body created is furnished at table no 3.6.

Table No. 3.6 Creation of Water Body / WHS												
Name of the Range	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	Total
Girishcharapur	1		1	6	0						1	9
Redhakhol		1	1	7	0	1		1				11
Badmal		1	4	8	0		1	1		2		17
Naktideula		2	2	4	0		1					9
Charmal		1	1	4	0	1					1	8
Badbahal			4	7	0		2	2		1		16
Total	1	5	13	36	0	2	4	4		3	2	70



D. Construction of Watch Towers.

For better management of Wildlife, Fire Protection and observing the movement of Elephants, three watch Towers have been constructed in the Division. These are Inside R.Badmal RF (Badmal Range), Rahana RF (Rairakhol Range) and Tal RF in Badbahal Range.

E. Improved Communication System (VHF Net work).

In the Division extensive VHF network is available and communicating through VHF towers. The list of such Tower Position is furnished at table No 3.7.

Table No 3.7 List of VHF base Station / Towers.			
Sl No.	Name of the Range	Station where fixed	
1	Redhakhol (Office)	Division Office	130' Tower VHF base Station Set
2	Naktideul	Ghosaramal	100'Tower VHF base Station Set
3		Naktideul	100'Tower VHF base Station Set
4		Rail	100'Tower
5	Naktideul	Batgaon	100ft.Tower
6		Kadobahali	100ft.Tower
7	Girishchadrapur	Girishchadrapur	VHF base Station Set
8		Balikiary	100ft.Tower
9	Badbahal	Rahan Watch Tower	60' Tower
10		Tal Watch Tower	60' Tower
11	Charmal	Range Office	10m Tower
12		Bansajal	100'Tower
13	Badmal	Seizer yard Mochibahal	100'Tower
14		Rengali	Tower
15		Kuakhhol	100ft.
16		Badmal Watch Tower	20ft.
17	Redhakhol	Bantaloi Watch Tower	100ft.

F. Maintaining Salt licks:

There are ten salt licks being maintained in the division. The location of Salt Lick is furnished at table No 3.8



Table No. 3.8 Salt Lick Location Rairakhol Division

Sl No	Name of Forest Block	Range
1	Sagmalia RF	Charmal
2	Landakote RF near Balikiary Village	Girischandrapur
3	Landimal RF	Naktideul
4	Mahaling	Redhakhol
5	Sirini Mandir	Badmal
6	Seizureyard	Naktideul
7	Bantalo	Charmal
8	San- Rengali	Badbahal
9	Sudmunda	Badbahal
10	Rengali-Badmal	Badmal

G. Public Awareness camps:

Regular Public awareness camps on various occasion like Wildlife week, World Forest Day, national Wetland day are being conducted at division level and range level.

H. Legal action:

To have deterrent effect of criminals involved in wildlife related crime, appropriate legal action is being taken.





CHAPTER-4

MAINTENANCE AND ENHANCEMENT OF FOREST HEALTH & VITALITY

4.1 Status of Regeneration:

Regeneration survey has been conducted during point sampling enumeration. The procedure followed is as per Para 74 of the National Working Plan Code-2014. As per the guideline the following steps are taken.

- Young plants of tree species up to 10 cm diameter are taken into consideration for assessment of regeneration status of a particular species as practiced in National Forest Inventory by FSI.
- Data collected from the square plots of 3x3m for saplings (2cm to 10 cm collar diameter) and from the square plots of 1x1m for seedlings are used to assess the regeneration status of species in the management unit i.e. compartment/ blocks.
- The phyto-sociological data from plot level enumeration, the regeneration status of the sampled species have been assessed in the following categories as follows.

Category	Guiding Principle
Good regeneration	If seedlings are more in numbers than the saplings and likewise saplings is more than that of adults.
Fair regeneration	If seedlings are more in numbers than the saplings but the saplings are equal or less than that of adults.
Poor regeneration	If a species survives in only sapling stage, but not as seedlings (though sapling may be less, more or equal to adults).
No regeneration	If a species is absent both in sapling and seedling stage, but present as adult.
New regeneration	If a species has no adults but only sapling and/or seedlings.

For study of Regeneration status some species common to all forest blocks and of economic importance are taken in to consideration.



Species taken for Consideration:

- I. Sal (*Shorea robusta*)
- II. Asan (*Terminalia tomentosa*)
- III. Dhaura (*Anogeisus latifolia*)
- IV. Bija (*Pterocarpus marsupium*)
- V. Phasi (*Anogeissus latifolia*)

On analysis of sample survey data, the regeneration status of these species in various blocks is inferred as follows.

Table 4.1 : Regeneration status of species

Sl No	Species	Regeneration Status (Name of Forest Blocks)				
		Good	Fair	Poor	No Regeneration	New Regeneration
1	Sal (<i>Shorea robusta</i>)	S1	S2	S3	S4	S5
2	Asan (<i>Terminalia tomentosa</i>)	A1	A2	A3	A4	A5
3	Dhaura (<i>Anogeisus latifolia</i>)	D1	D2	D3	D4	D5
4	Bija (<i>Pterocarpus marsupium</i>)	B1	B2	B3	B4	B5
5	Phasi (<i>Anogeissus latifolia</i>)	P1	P2	P3	P4	P5

Besides the above, there is no regeneration which can be categorized as “**in plenty / abundant**” for any specific species in the division confined to specific forest blocks noticed during Regeneration Survey. The overall status of regeneration is good to fair. Suitable strategy is required to be incorporated in management practices to achieve establishment of regeneration.

Forest Block wise regeneration Status as observed after analysis by NRSC is furnished below for reference.



Table No 4.2 Regeneration status of important Forest blocks.

Sl No	Name of Forest Block	Regeneration Status	Sample Point no	Crop Composition
1	Bad-Hindol	S5	841	Moist peninsular high level Sa
2	Berhampura		706	Dry mixed deciduous forest
3	Bindhyabasini		987	Moist peninsular high
4	Hatidhara	S1	845	Moist peninsular high level Sal
5	Burbuda			
6	Chadchadi	S3	398	Moist peninsular high level Sal
7	Chargarh	S2	919	Moist peninsular low level Sal
8	Kholgarh	S1	945	Moist peninsular valley sal forest
9	Kusumbahali	S2	1133	Dry mixed deciduous forest
10	Lampaphuli	S3	572	Dry peninsular sal forest
11	Landakot	S3	577	Dry mixed deciduous forest.
12	Landimal	S2	319	Moist peninsular low level Sa
13	Mochibahal	S2	671	Moist peninsular low level Sal
14	Nadia	S3	78	Moist peninsular low level Sal
15	Rahan	S3	1002	Northern dry mixed deciduous forest
16	Rail	S2	801	Moist peninsular low level Sal
17	Rasibeda	S2	738	Dry mixed deciduous forest
18	Rengali-Badmal	S2	798	Moist peninsular low level Sal
19	Rohinigadia	S2	124	Moist peninsular low level Sal
20	Sagmalia	S2	1050	Dry mixed deciduous forest
21	San-Rengali	S1	1000	Northern dry mixed deciduous forest
22	Siaripani	S2	928	Dry mixed deciduous forest
23	Suani	S1	1097	Dry mixed deciduous forest
24	Tal	S2	967	Northern dry mixed deciduous forest
25	Talab	S1	65	Dry peninsular sal fores
26	Hemantakhol	S4	924	Northern dry mixed deciduous forest

Other Sample points data were analysed and the regeneration Status is as furnished below (Table No 4. 3)



Table No 4.3 Regeneration statuses of important Forest blocks.

Sl No	Name of Forest Block	Regeneration Status	Reference Sample Point No	Crop Composition
1	Mochibahal PRF	Regeneration – Sub whippy	754	The crop composition is, Moist peninsular low level Sal Canopy density –Moderate dense Crop Density-Under stocked
2	Chargarh RF	Regeneration Whippy	918	The crop composition is, Moist peninsular low level Sal Canopy density –Moderate dense Crop Density-Under stocked
3	R.Badmal RF, C-2	Regeneration Whippy	798	The crop composition is, Moist peninsular low level Sal Canopy density –Moderate dense Crop Density-Under stocked
4	Chargarh RF, Sagjoree beat	Regeneration Whippy	1030	The crop composition is, Moist peninsular low level Sal Canopy density –Open Crop Density Under stocked
5	Berhampur PRF	Established , woody shoot ,whippy, Sub whippy, recruit	706	Dry mixed deciduous forest Canopy density:- Moderate dense Crop density :- Under stocked
6	Landakot RF, C-42, Bantalo Beat	Established , woody shoot	577	Dry mixed deciduous forest Canopy density:- Moderate dense Crop density :- Under stocked
7	Rasibeda PRF	Established , woody shoot	738	Dry mixed deciduous forest Canopy density:- Moderate dense Crop density :- Under stocked
8	Sagmalia RF, C-4	Established , woody shoot , recruit	1050	Dry mixed deciduous forest Canopy density:- Moderate dense Crop density :- Under stocked
9	Block Rail RF, C-12	Regeneration Established	858	Forest type is- Moist peninsular low level Sal Canopy density –Open Crop Density-Under stocked
10	Chadchadi RF, C-2	Regeneration Woody shoot	398	the forest type is, Moist peninsular high level Sal Canopy density –Open Crop Density-Under stocked
11	Dhadrakhol DPF, Salebhata beat	Regeneration Whippy	51	Open Crop Density Under stocked Open Crop Density-Under stocked
12	Lampaphuli DPF	Regeneration Woody shoot	572	Forest type is - Dry peninsular sal forest Canopy density –Moderate dense Crop Density- Under stocked



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13	Hatidhara RF, C-17	Established and Recruit	845	Moist peninsular high level Sal , Canopy density – Moderate dense , Crop Density Under stocked
14	Bandhidhol DPF, Rampur west beat	Recruit	841	Moist peninsular high level Sal , Canopy density – Moderate dense , Crop Density Under stocked
15	Bindhyabasani RF, C-1	Recruit	987	Moist peninsular high level Sal , Canopy density – Moderate dense , Crop Density Under stocked
16	Hatidhara RF, C-7	Established and Recruit	742	Moist peninsular high level Sal , Canopy density – Moderate dense, Crop Density Under stocked
17	Landakot RF, C-28, Luhabir beat	4. Regeneration - Woody shoot, Whippy	151	1. Forest Type - Dry peninsular sal forest 2. Canopy density - Open 3. Crop Density - Under stocked
18	Kholgarh RF, C-1	Woody shoot, Whippy	57	1. Forest Type - Moist peninsular low level sal forest. 2. Canopy density - Open 3. Crop Density - Under stocked
19	Landakot RF, C-1, Hiraloi Beat	Woody shoot, Whippy	6	1. Forest Type - Dry peninsular sal forest 2. Canopy density - Open 3. Crop Density - Under stocked
20	Talab PRF	Woody shoot, Whippy	67	1. Forest Type - Dry peninsular sal forest 2. Canopy density - Open 3. Crop Density - Under stocked
21	Hemantakhhol PRF	Woody shoot regeneration	924	The crop composition is Northern dry mixed deciduous forest Canopy cover-Moderate dense
22	Rahan RF, C-1	Recruit Current year seedling poor regeneration	1002	The crop composition is Northern dry mixed deciduous forest Canopy density – Moderate dense
23	Tal RF, C-1	Recruit Current year seedling poor regeneration	966	The crop composition is Dry peninsular sal forest Canopy density –Open forest
24	Rahan RF, C-1, Tribanpur Beat	Recruit Current year seedling poor regeneration	1117	The crop composition is dry mixed deciduous forest Canopy density –Open forest

From the above data it is observed that the regeneration is good but in whippy stage for Sal and moderate for other important species. Bamboo is available to a greater extent.



4.1.1 Regeneration Survey of Bamboo (Rattans).

All culms occurring in the clump has been enumerated as per different classes of National Forest Inventory and these data has been used to assess the availability of bamboo/rattan using post stratification for a management unit as per the methodology adopted by FSI. Data from plot enumeration has been used to estimate the number of clumps per management unit (compartment, village or any other unit) and inference has been derived basing on the following criteria

Table No 4.4 Regeneration Survey of Bamboo

Inference	Condition of Bamboo / Rattans	Name Forest Blocks
Luxuriant	All healthy, un-congested, undamaged and in good condition	Sagmalia, Kholgarh (P) Comp 21 to 39
Degraded	Not capable of being rehabilitated and of attaining normal productivity	Bindhybasini, Hatidhara Rahana,
Culturable	Not included in above category.	NIL
Non-clump forming bamboos	Single Culm	NIL

Status of Regeneration of Bamboo has been depicted above. The overall inference is fair.

4.2 Area affected by Forest Fire:

Forest Fire is of common occurred in forests of this division during fire season. The dry season in the area extends from the month of October to June and experiences a very hot summer during April to June. Due to the prolonged hot weather, not a single forest block is free from forest fire. Almost all instances of forest fire are man-made. The occurrence of repeated forest fire year after year prevents regeneration of many valuable tree species. As a result of this phenomenon, many fire hardy species found to replace the economically important species in the forests. Annual repeated fires are causing a series of damages both directly and indirectly to the forests. It burns leaves and other residue lying on the forest floor and destroys the microbial population of the soil and thus prevents the formation of humus. The humus is very vital for the soil fertility and its absence adversely affects the growing stock. Forest fire is also one of the main factors responsible for the mortality of



seedlings, sapling even of poles in forests. It also causes desiccation and hardening of the soil which accelerate the process of soil erosion.

4.2.1 Causes of Forest Fire:

The major causes of fire in forests of Rairakhol Division are enumerated below to have a better understanding of the nature of the fire and how to Control & Manage. Normally the forests experience Ground Fire in general. No Crown fire has been noticed in forests of this division.

- Burning of forest floor for local people / cultivators / cow herd boys etc. for good growth of grass.
- During winter (November to February), people of locality and far places visit important places in Forest & do their picnic. After Picnic Un-extinguished and unattended fires sometimes caused accidental fire.
- Burning of fallen woods / Green timber for preparation of Charcoal, sometimes spread to nearby Forest, if not properly attended.
- Un-extinguished cigarettes or bidi butts being thrown by passerby leads to break out of ground fire.
- Collectors of NTFP sometimes set fire to get better harvest / yield.
- To prevent movement of wild elephants to a particular region / part, people may set fire to scar them. This fire became wild and causes Forest Fire.
- Encroachers set fire to clean the encroached area free from debris.
- Some cultivators set fire to get ashes into their crop land through runoff water to provide organic manure to nearby agricultural field.

4.2.2 Damage Caused to Forests by Fire:

Though Forest fire has a better role in management of Grass Land, induce regeneration of species having hard coat seeds, Reduce thickness of un-decomposed coraceous leaf litters, control weeds, burning of seeds of unwanted species. Fire as a good servant has some role in forest management in this division. Forest fire occurs annually and the damage caused is enumerated as follows.

- It adversely affects the establishment of seedlings / Saplings. The most affected species is Sal.
- It results in degradation of forests, loss of soil fertility and accelerates soil erosion.



- In Bamboo forests, the rhizomes are badly affected. In case of such fire spreads to bamboo forests devastates the clumps.
- Fire destroys the organic elements and micro fauna in the soil and its nutrient content. Repeated fire in the Dry Deciduous Forests causes retrogression of the vegetation towards a more xerophytic condition.
- It causes imbalance in the entire ecosystem.
- It has an adverse effect on insects, amphibians and reptiles.
- It affects the movement of animals; also affect the corridors, habitat for the bigger animals.
- Germination capacity of seeds is badly affected.
- Repeated Fire results entry of intrusive species like Lantana, Eupatorium etc.

The occurrence of fire recorded during plan period is furnished below.

Table No 4. 5 Incidence of Forest Fire in Rairakhol Division			
Year	Total no of incidences	Total area covered in ha	Remarks
2012-13	NA	600.00	Forest fire was extinguished by the staff with help from local EDC /VSS members and Fire service.
2013-14	NA	582.00	
2014-15	NA	450.00	
2015-16	NA	63.65	
2016-17	NA	171.95	
2017-18	709	152.31	
2018-19	618	643.43	

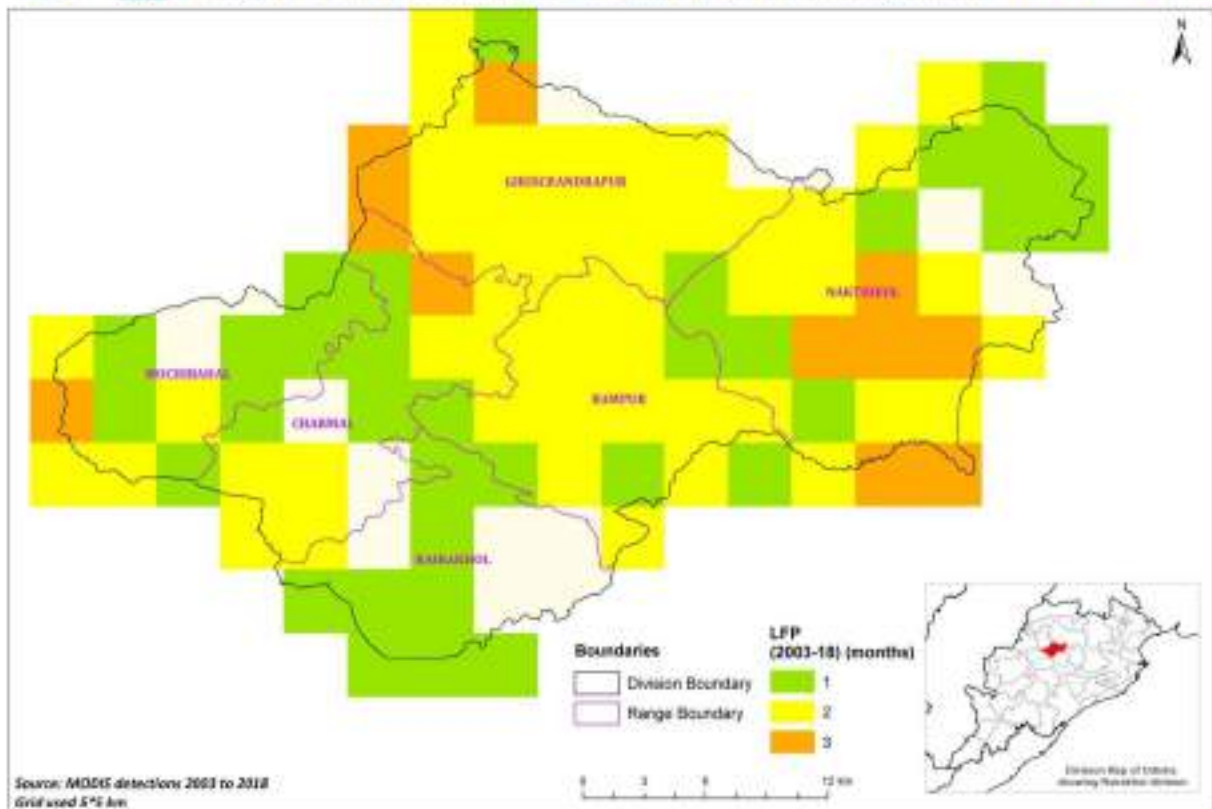


Revised working plan of Rairakhol Division (2021-22 to 2030-31)



Length of Fire Period Map of Rairakhol Forest Division, Odisha

nrsc



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4.3 Area damaged by Natural Calamities:

4.3.1 Drought:

The drought is considered as a natural calamity which is moderate in this division. No serious damage has been reported. Due to erratic rainfall plantations have been affected. The growth expected has not achieved. Moderate Drought occurs in a cycle of 3 to 4 years. No severe drought has been recorded during the last plan period.

4.3.2 Cyclone:

During the ongoing plan period Cyclone Phalline occurred on 12th & 13th October, 2013 and Hud Hud on 11th to 13th October, 2014 and Fani on 2nd / 3rd May, 2019. Due to Cyclone Phailin some damages have been occurred to forests in this Division. The damage has been assessed and found to be limited to uprooting of some trees in different Reserved Forests. The damage caused has been illustrated below (Table No 4.6)

Table No 4.6 Damage caused by Cyclone in Rairakhol Division				
Name of the storm	Name of the Forest Block	No of trees uprooted	Outturn in cum	Action taken
Phailin	Kholgarh	6	8.047	The uprooted trees are salvaged and the materials are handed over to OFDC.
	Rail	2	0.885	
	Rengali-Badmal	3	1.453	
Total		11	10.385	
Hudhud	Nil	-	-	-

4.3.3 Area under Encroachment:

Encroachment of Forest land is very much prevalent in the Locality. This has been indicated in Chapter 2 (para 2.5.1).

4.4 Area Protected from Grazing:

The forests of Rairakhol Division are having 415 villages [Rairakhol Block- 214 village – habitated 188, unhabitaed26, Naktideul Block- 201 village habitated172, Unhabitated- 29] The Cattle , Goat population is high. The livestock used to graze in forests and have an adverse effect on regeneration and establishment of tree crop.



The plantations raised under various schemes are protected against grazing. The area treated under ANR (Aided Natural Regeneration) is supposed to be closed to grazing for three years as per prescriptions of Working Plan. No formal Orders have been issued to this effect.

4.5 Lopping Practices:

The buffalo and goats usually like to eat from lopped branches of trees. The cowherd boys while let their cattle / goats in the forest for food / grazing, they used to lop the branches. The species mostly affected due to lopping are Kanchan, Bija, Bamboo, Babool, Aamba, Panasa (Jack Fruit), Sirisa, Bada Chakunda, Kumbhi, Zyziphus, Kusuma, Kendu, Anla, Bahada, Neem, Gambhari, Sisoo, Sal etc. The trees not only lopped for fodder, in many a time many NTFP trees are lopped for collection of fruits / leaf/ flowers.

4.5.1 Effect of lopping:

Lopping in some species retarded the growth. Fruit / flower bearing capacity also reduced due to frequent lopping. In some first growing species and fodder species lopping is part of management practice. In forest lopping of Sisoo, Ghambar, Bija, Kubhi, Zyziphus for fodder and Sal, Siali, Bela for leafs, Amnla, Char, Kendu, Harida and Bahada for fruits have serious retarding effect on growth.

4.5.2 Precautionary Measures:

Lopping of secondary and tertiary branches can be lopped to encourage new branches to have new flush of leafs and to induce good flowering and fruiting. In case primary and secondary branches are lopped it will hamper the growth. Lopping resistance species may be given a light to medium lopping for good flush of leafs.

4.6 Area infested by invasive weed species in Forests:

The forests those are severely affected by Fire, having permanent opening of canopy, heavy grazing or permanent blank space are occupied by weeds. Eupatorium, Lantana and Bana tulasi are seen in major part of open space and periphery of forest blocks. Sometimes it became an impenetrable ground flora. The Forest Blocks invaded by weeds and extent of area under weeds are furnished below (table No 4.7)



Table No 4.7 Forest Blocks invaded by Weeds

Sl No	Name of Forest Block	Invading weeds (Major Species)	Extent of Area in Ha (Apprx.)
1	Sagmalia RF	<i>Eupatorium Odoratum</i>	500.0
2	Suani RF	<i>Eupatorium Odoratum</i>	400.0
3	Landakot RF	<i>Eupatorium Odoratum</i>	1000.0
4	Rasibeda PRF	<i>Eupatorium Odoratum</i>	200.0
5	Bermapura PRF	<i>Eupatorium Odoratum</i>	500.0
6	Siaripani PRF	<i>Eupatorium Odoratum</i>	300.0
7	Koilipadar PRF	<i>Eupatorium odoratum</i>	500.0
8	Landimal RF	<i>Eupatorium odoratum</i>	250.0
9	Kholgarh RF	<i>Eupatorium odoratum</i>	50.0
10	Rail RF	<i>Eupatorium odoratum</i>	200.0
11	Nadia RF	<i>Eupatorium odoratum</i>	45.0
12	Cdcdi PRF	<i>Eupatorium odoratum</i>	150.0
13	Rohinigadia DPF	<i>Eupatorium odoratum</i>	45.0
14	Lampaphuli DPF	<i>Eupatorium odoratum</i>	35.0
15	Baljran DPF	<i>Eupatorium odoratum</i>	25.0
16	Amjri DPF	<i>Eupatorium odoratum</i>	30.0
17	Ddrakhol DPF	<i>Eupatorium odoratum</i>	25.0
18	Amjri – Ddrakhol DPF	<i>Eupatorium odoratum</i>	20.0
19	Bindupur VF	<i>Eupatorium odoratum</i>	20.0
20	Kholgarh RF	<i>Eupatorium Lantana</i>	500.0
21	tidra RF	<i>Eupatorium Lantana</i>	450.0
22	Bindhyabasini RF	<i>Eupatorium Lantana</i>	150.0
23	Landakot RF	<i>Eupatorium Lantana</i>	500.0
24	Ran RF	<i>Lantana Camara</i>	205.0
25	Ran RF	<i>Eupatorium Spp</i>	155.0
26	Tal RF	<i>Lantana Camara</i>	120.0
27	Tal RF	<i>Eupatorium Spp</i>	85.0
28	Sagmalia RF	<i>Lantana Camara</i>	103.0
29	Sagmalia RF	<i>Eupatorium Spp</i>	95.0
30	Landakot RF	<i>Poka Shung</i>	35.0
31	Rengali Badmal RF	<i>Poka Shung</i>	10.0
32	Crgarh RF	<i>Poka Shung</i>	8.0
33	Sagmalia RF	<i>Poka Shung</i>	5.0
34	Kalia PRF(Compt No 5)	<i>Poka Shung</i>	20.0



Table No 4.7 Forest Blocks invaded by Weeds

Sl No	Name of Forest Block	Invading weeds (Major Species)	Extent of Area in Ha (Apprx.)
35	Mochibal PRF	Poka Shung	10.0
36	Satsama PRF	Poka Shung	8.0
37	Sagjoree PRF	Poka Shung	15.0
	Total		6769.0

The weeds affected area is very high and constitutes about 6.7 % of the total forest area under RF/ PRF & DPF combine. It is in alarming stage. Immediate precautionary measures are required to be initiated.

4.6.1 Effects of Weeds on Forest Management:

Weed growth in forest blocks put hindrance in management. The effects are

- Bringing the area under Plantations became difficult and weeds suppress the planted seedlings.
- Regeneration due to seed becomes extremely difficult as the recruits are suppressed if not attended.
- Removal of weeds become cost prohibitive.
- Weed seeds dispersed through by wind / animals and spreading to nearby forest area.
- Weeds when dry became fire hazards.
- It increases Rodent population in nearby area.

4.6.2 Practices to Control the weeds:

Controlling of weeds is of paramount importance to allow natural regeneration to establish and check invasion. It may be of Physical method, Chemical method and combination of both.

4.6.2 (a) Physical Method:

Controlling the weeds can be possible by uprooting the weeds when it is green (in case of weeds those dies in summer and reappear during rains i.e. annual weeds). Cutting of weeds in green stage / before flowering is also practiced under which no seed formation or seed dispersal is allowed. There are weeds like lantana, those can be controlled / eradicated by cutting followed by controlled burning and uprooting the species. After uprooting, the area



must be covered under plantation with extra weeding in first two years. Under tree cover the weeds growth will be substantially checked.

4.6.2(b) Chemical Method:

There are Chemicals / Weedicides available in the market which suppresses the weeds to a greater extent. Application of such chemicals at pre-monsoon period is more effective. These chemicals trade name along with its main constituents (Components) and application practices are furnished below.

i) Glyphosate 41% SL: It is an Amino Acid synthesis inhibitor. It inhibits the EPSP synthase enzyme, which leads to depletion of key amino acids that are necessary for protein synthesis and plant growth. This should be applied @0.5 Kg active ingredient+200 ltr water/acre or 1.2 Ltr formulation+ 200 ltr water/acre during growth phase. The plant can be pruned and applied with this solution after first rain. The soil must remain moist. Avoid inhalation, skin or oral contact with the weedicide. Do not chew tobacco, eat food or smoke during spraying. Follow normal precautions – keep away from food stuff containers and animal food; avoid contact with mouth, eyes and skin; avoid inhalation of the spray mist; spray in the direction of wind; wash thoroughly the contaminated cloths and parts of body after spraying; do not smoke, drink, eat or chew while mixing and spraying; and wear full protective clothing while mixing and spraying.

ii) 2,4-D Dimethyl Amine salt 58% SL: It affects weeds by causing uncontrolled cell division in vascular tissue. This should be applied @1 Kg active ingredient+120 ltr water/acre or 1.8 Ltr formulation+ 120 ltr water/acre during growth phase. The plant can be pruned and applied with this solution after first rain i.e. during active growth phase. Follow normal precautions – keep away from food stuff containers and animal food; avoid contact with mouth, eyes and skin; avoid inhalation of the spray mist; spray in the direction of wind; wash thoroughly the contaminated cloths and parts of body after spraying; do not smoke, drink, eat or chew while mixing and spraying; and wear full protective clothing while mixing and spraying.

Precautions: Chemical weedicides are poisons and it should not be used in wildlife concentrated area, near to water source where it is likely to be leached / washed to water body. This chemical method may be applied to area where physical control is difficult and not supported by financial provision.



4.7 Incidence of pest & Diseases:

No massive infestation by pests is recorded during last plan period. In dry tract Sal heart rot disease has been noticed.

Sal borers, Teak defoliators, Teak Skeletonizer and termite attack to seedlings at early stage are noticed.

a) Sal Borer:

Sal (*Shorea robusta*) is the prime species of the division. Unfortunately, Sal has been the victim of heartwood borer, *Hoplocerambyx spinicornis*. Ever since it was noticed as a pest on sal in 1899, its 20 epidemic outbreaks have been recorded in India causing extensive damage to sal forests. During the latest 1996-2001 epidemic, the borer affected more than 3.5 million sal trees in an area of around 5 000 km². The emergence of beetles takes place immediately on the onset of monsoon. This pest is immune to all known forms of control measures as most of its year-long life cycle passes in the tree, except for 20-30 days of adult beetle stage. Natural regeneration and the establishment of sal have been the other major problems, which are compounded by the borer attacks.

Although there have been considerable studies on this pest, there has been no breakthrough as its outbreak in epidemic forms is governed by weather conditions. Despite cyclic outbreaks, the latest epidemic had to be confronted with the previously known silvicultural and mechanical measures only.

Control Measures adopted.

The following control measures which have been tested in many epidemic situations in different countries may be adopted in case of outbreak of epidemic.

(i) **Catching and killing** of insects through Trap-Tree method. In this Operation, one to two trees per ha of 60-90 cm girth are felled, cut into 2-3 m long logs and the bark near cut ends is beaten up to provide shelter for the beetle. The beetles gets attracted to the smell of sap, gets intoxicated after consuming it and become sluggish, rendering their collection and killing easier. Beetles are collected from traps every morning and evening. Dey (1999) observed that the total catch during the night hours was over three times the total catch of insects during



the day hours which are contrary to the observations of Beeson (1941). Trap tree operation starts on the onset of monsoon and that continued till the day the insect catches are nil.

(ii) **Felling and removal** of affected trees away from the sal forests. Based on different intensities of infestation, the affected trees are classified into seven categories as under (Beeson 1941)

Table No 4.10 Symptoms & sign of Sal borer in forests.	
Category	Description of tree
I	Crown foliage fallen, epicormic branches leafless, wood dust thrown out by larvae from trunk deposited in heaps more than 7 cm. deep at base of the tree.
II	Crown foliage brown, epicormic branches dead or brown, wood dust more than 7 cm. deep.
III	Crown brown or dead, epicormic branches or bark dead in upper parts but alive in lower parts of the trunk, wood dust more than 7 cm. deep.
IV	Crown partly alive, green and partly dead or brown, epicormic branches green and dust deposition is less than 7 cm. deep.
V	Crown alive, green epicormic branches green, wood dust in heaps more than 7 cm. deep.
VI	Stumps with heaps of wood dust.
VII	Crown alive, green epicormic branches, resin abundant, wood dust scanty.

Infested trees of category I to V are to be felled and removed from forests. Stumps of category VI are burned before next rains and category VII trees are not felled.

(iii) **Burning of debris** and stumps after harvesting of trees.

(iv) **Stacking of infested timber** in depots five km away from sal forests in order to prevent the beetles from flying back to forests.

b) Teak defoliator:

Hyblaea puera, the **teak defoliator**, is a moth native to south-east Asia. The species has also been recently reported to be present in Central America and Africa. The caterpillar feeds on teak and other trees. It is considered to be one of the major teak pests around the world.



The teak defoliator is present year round in teak plantations, but in varying population densities. During the period of natural defoliation of teak (November, December, and January), the pest density is very low (endemic). Every year high-intensity outbreaks of teak defoliator occur immediately after the pre-monsoon showers in late February or early March. These centers are highly localized outbreaks which represent the transitional stage between very sparse endemic population and high density outbreak population. These centers will be 5,000 to 15,000 square meters in area and are characterized by heavy tree top infestation. The months of April, May, June, and July witness a series of large outbreaks. During late July or September, the population declines to the endemic level. In some years, there will be fresh outbreaks during October. From then on until the next year, the population remains at the endemic level.

Control Measures:

i) Parasitoids

The main parasitoids attacking teak defoliator include the tachinid *Palexorisa solennis*, a eulophid *Sympiesis hyblaeae*, the chalcid *Brachymeria lasus* and the three ichneumonids, *Eriborus gardneri*, *Stictopisthus* sp. and *Echthromorpha agrestoria notulatoria*. *B. lasus* is a pupal parasitoid and all others are larval parasitoids. The overall parasitism by all species is about 9%.

ii) Predators

Wasps, spiders, birds, and bonnet macaques eat *H. puera*. Forty-eight species of birds have been recorded as feeding on teak defoliator larvae during large-scale outbreaks.

iii) Pathogens

The bacteria *Enterobacter aerogenes*, *Bacillus thuringiensis*, *Pseudomonas aeruginosa* and *Serratia marcescens* are identified as causing mortality to the teak defoliator. A synnematus fungus of the genus *Hirsutella* is found to be pathogenic to this pest. An absolutely specific virus with refractile polyhedral inclusion bodies, staining blue in Giemsa and thick blue in Buffalo Black, named as *Hyblaea puera* nucleopolyhedrovirus (HpNPV) is found to be very effective in the biological control of this pest.



c) Teak Skeletonizer:

Teak skeletonizer, *Eutectona machaeralis* is a serious pest of *Tectona grandis* (Teak). Teak is one of the important plantation tree species being utilized in many industries. During the field visit of Western Ghats in Maharashtra during November–December of 2018, *E. machaeralis* was found to be infesting the leaves of *Vitex negundo*. Most of the twigs were found infested by *E. machaeralis*. *V. negundo* is an important medicinal plant, available in various regions of India. The inclusion of this alternative host of *E. machaeralis* may be due to climatic variation.

From various observations / researches it is concluded that the teak skeletonizer, *E. machaeralis* can be managed by spraying any one of the following bio – products at the respective concentration i.e. *B. thuringiensis* @ 1.5%, Grub kill @ 2 % , *B. bassiana* 2.5% , *M. anisopliae* 3% , , Neem oil 6% and five leaves extracts @ 6 %. Normally two sprays are needed to reduce the population with an interval of 15 days. It was observed that a few of the pupae in the soil under the trees treated with grub kill, found infected and dead. This should be investigated thoroughly; because, the positive results in this line may turn the application technique easier. Instead of foliar application, soil application can be recommended so as to kill the pupae which normally pupate inside the soil under the tree. This may reduce the application rate and cost of protection.

d) Termite Control:

Termite attack to plants in young stage causes lot of damage especially in plantations. Normally chemicals like Aldine, Gramacsin (BHC 50%) are used during planting operation. Due to proximity to water body, it is not advisable to use bob degradable pesticides in plantations. Non Chemical methods are suggested.

Non-chemical control of termites in agriculture and forestry is attracting renewed interest following increasing restrictions on the use of persistent organochlorine (cyclodiene) insecticides. Non-chemical control involves methods which attempt, without using commercial pesticides, to (i) prevent termite access to the plants, (ii) reduce termite numbers in the vicinity of the plants or (iii) reduce susceptibility/increase resistance of the plants themselves. There have been few adequate trials of any of these methods. Numerous cultural procedures have been suggested, including measures to enhance plant vigour, to manipulate termite numbers and behaviour, and others whose mode of action is unclear.



Many are simply part of good agricultural/silvicultural practice and to be recommended. Biological control by predators or pathogens is unlikely to be successful due to the termites' social structure and behavioral responses to infected individuals and to loss of individuals to predators. The use of 'natural' insecticides from locally available plant products may be effective in some cases but, as they are not subject to the same rigorous safety and environmental evaluation as commercial pesticides, their use cannot be sanctioned unconditionally. Other locally available products, e.g. wood ash, have not been adequately evaluated. Removal of reproductives from the nest and construction of physical barriers may have limited applications, but resistant species and varieties, combined with appropriate cultural methods and, perhaps, minimal use of modern pesticides in an integrated approach, offer the greatest potential for a long term solution. The lack of critical scientific evaluation of non-chemical control makes it a field wide open for research.

4.7.1 Parasites:

Parasites like loranthus- Some species of *Loranthus*, in the broad sense, are troublesome parasites. These plants grow strongly on ageing trees particularly somewhere in the middle of old branches. Once established, it steals minerals and water, as well as block sunlight by covering the encroached place. The flowers of *Loranthus europaeus* are small, green, usually have four to six parts and may be either unisexual or bisexual. Other species of a broader *Loranthus* have very large, showy flowers, with blooms in lively colours. The fruits are berries, usually containing a single seed, that are dispersed by birds.

The floral characteristics indicate that it is ornithophilous in nature and has moderate quantity nectar stored in its perianth tube. The mature buds require external factors like tripping to ensure that they open up. In the absence of this, the buds fall off without opening. Birds help in this process and mature buds eject a cloud of pollens which sticks to the head or beak of the probing bird. The birds seen visiting these flowers in India are Tickell's flowerpecker, purple-rumped sunbird, purple sunbird and spider.

4.8 Forest degradation & its drivers:

Forest degradation is mainly due to illegal removal of Forest Produce i.e. timber & Fire wood. Due to Biotic pressure & interference like heavy grazing, Ground fire and above all pressure from increasing population which exert pressure on land resulting encroachment. The nature of degradation & its driver are summarized below.



4.11 Forest Degradation & its drivers.

Forest degradation:	Drivers of Degradation.	Remedial measures.
Loss of Tree cover	Collection of Firewood and timber for local consumption.	To provide alternate fuel, timber substitute. To have strict enforcement of protection & legal action.
Loss of Bamboo Forest	Collection food standard "Karadi". Non implementation of Bamboo Cutting Rules. Elephant prone area and consumed by wild elephants.	It is difficult to prohibit collection of Karadi completely. A particular area may be set aside for Karadi and motivate people to collect from assigned area than from entire area. Management practices to be designed to include bamboo forests in Revenue Forest for Karadi purpose. Intensive Simultaneous Silvicultural Operation in bamboo forest.
Loss of Ground Flora	Forest fire.	Regulating Picnic party entering in to Forest / Plantations. Maintaining Fire Lines on chess board pattern ie along the contour and across the contour by using Fire Blower. Strict vigilance on Forest Fire detection & combating. Taking help of nearby Fire stations / brigades/VSS .
	Heavy Grazing.	Regulating Grazing, Practicing Rotational grazing. Development of Grass lands.
Reduction in Forest area.	River Bank erosion.	Planting of Soil binding species on River banks. Resorting to construction of structures to prevent bank erosion in extreme cases of importance.
	Land grabbers / Encroachers.	Appropriate legal action, Motivate the encroachers to resort to Agro Forestry.
Bio diversity.	Loss of Bio diversity.	Introduce / protect less known species. Educate students / villagers regarding importance of Bio Diversity. Control use of pesticides in agriculture. Protect Riverine plant succession. Introduction of creation of adequate SMC work over the Forest



4.9 Pollution Control and Protection of Environment:

4.9.1 Pollution Related to Tourism:

No places of interest are located in Rairakhol Division. The National Highway No55 passes through Rairakhol and another important Road i.e. Ranchi Vijaywarda Corridor passes through Rairakhol- naktideul. Lot of traffic is noticed in these Roads. There is Khalasuni Wildlife Sanctuary adjacent to Girischandrapur. People usually travel through Rairakhol to visit the sanctuary. But the tourism pressure is very less in this division.

4.9.2 Mining / Industries within the Division:

At present there are no mining / industrial projects in the division. Minor minerals are allowed at many places. There are stone crossers within the division. It is not a mining related area.

There is no industry also in the Division. The Division is mostly a forested and agriculture based.

4.9.2.1 Availability of Gem Stone in Rairakhol Area:

Aquamarine: Gem grade aquamarines are recovered from the extensively developed colluvial zones on either side of the pegmatites intruding into the older metamorphic rocks. The localities of aquamarine occurrences are Telighana and Badmal. Minor incidence of aquamarine is reported from Bansajal, Bhaluchua, Hatia Joypur, Palsamal, Burhiakata and Chamakhunda.

Goshenite: Transparent, colourless beryl better known as Goshenite are found around Jaripani near Redhakhhol and Charbati area in pegmatites intruding into khondalitic rocks. The incidence is erratic.

Garnet: Different variety of gem garnet like rhodolite, almandine, pyrope are found to be associated with khondalite suite of rocks. Rhodolite garnets which are purplish red in colour but shattered are found as pockets around Baghdapa, Deojharan under Jujumura Block. Almandine garnets of red and deep red in colour are found to occur around Baghdapa, Deojharan, Badmal in the Redhakhhol Sub Division. In addition to these garnets, small pockets

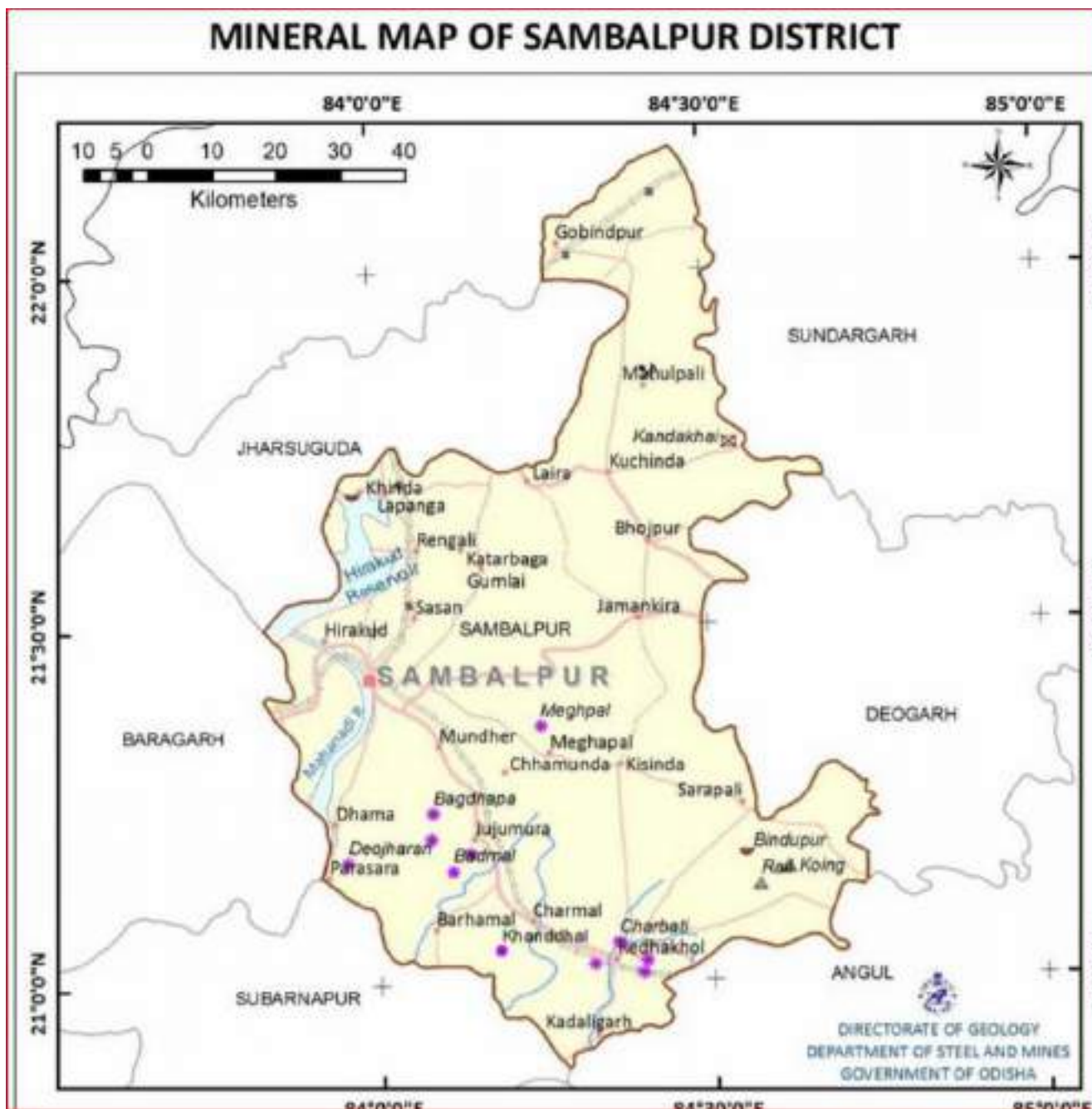


of pyrope garnets are highly fractured and found unsuitable for lapidary units except a few pieces, although brilliant fire and colour are noticed.

Manganese: Low grade manganese ores occur near Khandhal in Sagmalia Reserve Forest under Redhakhol Sub Division in association with khondalite. But it contains high phosphorous.

Coal: Coal seams are encountered in the Gondwana rocks around Rail and Koing area of Redhakhol Sub Division. Exploration data reveals three numbers of coal seams classified under E & F grade.

Fire clay: Fire clay is located about 0.5 km north east of Bindupur in Redhakhol Sub Division, extending intermittently over a distance of 1.5 km. The clay is grayish white to buff in colour. Besides, low grade fire clays are being mined out in Chandli Reserve Forest around Burla over an area of 25 acres.



4.9.2.1 Regulating Activities:

Considering the importance and fragile nature of the eco system, Wildlife many regulations to protect the environment have been in force. These regulations / Notifications are



a) Ban on use of polythene of specified thickness.

The Government of Odisha, Forest & Environment Department has issued notification banning use of polythene , thermo cool etc within the municipal limits or as the case may be within the Municipal Corporation Limits of Bhubaneswar, Cuttack, Berhampur, Rourkela, Sambalpur and Puri, namely:-

- (i) Polythene carry bags of any shape, thickness and size (excluding compostable);
- (ii) Bottled drinking water Polyethylene Terephthalate (PET/PETE) bottles of less than 500 ml. capacity;
- (iii) Single use disposable cutleries made up of thermocol (polystyrene) or plastic such as dish, spoon, cup, plate, glass, fork, bowl, straw, pouch to store liquid and container etc. of any size and shape &
- (iv) Thermocol decorative materials (flowers and the like)

(Note: Compostable plastics shall conform to the Indian Standard: IS 17088:2008. The manufacturers or seller of compostable plastic carry bags shall obtain a certificate from the Central Pollution Control Board before marketing or selling.). The ban order is at Annexure-VIII.





CHAPTER-5

CONSERVATION & MAINTENANCE OF SOIL AND WATER RESOURCES

5.1 Area treated under Soil & water conservation Measures:

In course of implementing working plan prescriptions, ANR (Aided Natural Regeneration), Plantation and various Soil & Moisture Conservation measures are being taken up in the division. In all forest vegetation improvement activities Soil & Water Conservation Measures are being implemented. Forest Block wise SMC measures taken and extent of area is furnished at Table No 5.1 and water body created at Table No 5.1

Table No 5.1: Forest Blocks treated for Soil & Moisture Conservation: Data regarding WHS, LBCD, Check Dam, contour trench, and percolation Pits.

Sl No	Name of Forest block	Year of Activities / Area covered in (Under SMC)					Total area covered (In ha)
		2014-15	2015-16	2016-17	2017-18	2018-19	
1	Sagmalia RF	111.00	0.00	30.00	0.00	0.00	141.00
2	Landakot RF	0.00	0.00	1130.00	1401.77	1201.85	3733.62
3	Suani RF	0.00	25.00	70.00	0.00	0.00	95.00
4	Siaripani PRF	0.00	160.00	0.00	0.00	0.00	160.00
5	Kusumbali DPF	0.00	75.00	0.00	0.00	0.00	75.00
6	Koilipadar PRF	0.00	26.00	0.00	0.00	0.00	26.00
7	Berpura PRF	0.00	0.00	0.00	0.00	50.00	50.00
8	Cdcdi PRF		275.00	300.00		300.00	875.00
9	Landimal RF	861.00	1060.00	1131.00	1282.00	902.00	5236.00
10	Rail RF	633.33	1495.60	990.00	771.00	1115.90	5005.83
	Total	1605.33	3116.60	3651.00	3454.77	3569.75	15397.45

5.1.1 Water Body Created:

Creation of Water body throughout the Division in all RF/ PRF/ DPF has been taken up under various programs especially for wildlife managements. This helps in retention of water and improves moisture regime in the locality. The aquifer is gradually recharged. Due to proximity of River Mahanadi and Rairakhol being a table land, the ground water position is below normal. The water body created during last plan period is furnished at table No 5.2 below.



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 5.2 Water Body created

Sl No	Name of the Range	Name of the Location(40mX30mX3m)	GPS Reading					
			Latitude			Longitude		
			D	M	S	D	M	S
	2010-11							
1	Girischandrapur	Landakote RF near Balikiary village	21	12	52	84	19	39
	2011-12							
2	Redhakhol	Mahaling	21	3	3	84	24	7
3	Mochibahal	Landakote RF	21	8	12	84	10	26
4	Naktideul	Near seizure yard.	21	14	36	84	31	51
5	Naktideul	Landimal RF	21	11	40.78	84	28	40.63
6	Charmal	Bantaloi village	21	11	8	84	17	48.5
	2012-13							
7	Badbahal	San-Rengali	20	58	18.54	84	16	41.11
8	Badbahal	Sudmunda	20	57	17.96	84	17	5.64
9	Badbahal	Telsingh	21	1	16.3	84	15	11.1
10	Mochibahal	Rengali-Badmal	21	4	54.84	84	4	52.32
11	Redhakhol	Bindhayabasini RF	21	2	29.38	84	23	20.82
12	Charmal	Landakote RF near Berhampura	21	9	15.06	84	15	2.15
13	Girischandrapur	Kaunsipal	21	13	58.59	84	27	55.29
14	Naktideul	Landimal RF- No1	21	13	20.94	84	30	3
15	Naktideul	Landimal RF- No.2	21	13	20.94	84	30	3
16	Badbahal	Purunagarh village	21	2	1.4	84	18	25.5
17	Mochibahal	Landakote RF near Barchhal	21	8	56	84	10	53.3
18	Mochibahal	Landakote RF near Barchhat	21	8	56.5	84	10	52
19	Mochibahal	Mochibahal PRF	21	8	39.1	84	9	58.5
	2013-14							
20	Badbahal	Tumbamal	20	57	33.24	84	16	23.73
21	Badbahal	Dhaurakhaman	20	55	55.11	84	16	54.08
22	Badbahal	Tal RF	21	2	3.29	84	17	18.4
23	Redhakhol	Buromal	21	8	45.7	84	20	58
24	Girischandrapur	Sukjhari	21	13	44.94	84	26	49.86
25	Girischandrapur	Luhahir	21	13	43.05	84	19	49.6
26	Girischandrapur	Kanchanpur	21	13	43.05	84	19	49.6
27	Naktideul	Mankunda	21	13	32.57	84	34	11.38
28	Redhakhol	Sampur	21	5	24.4	84	23	52.9
29	Redhakhol	Kutasingha village	21	4	45.8	84	27	37.4
30	Redhakhol	Luhapank	21	5	25.7	84	24	29.3



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 5.2 Water Body created

Sl No	Name of the Range	Name of the Location(40mX30mX3m)	GPS Reading					
			Latitude			Longitude		
			D	M	S	D	M	S
31	Redhakhol	Mahaling	21	2	21.72	84	25	9.35
32	Redhakhol	Badmal	21	6	4	84	19	27
33	Redhakhol	Rathataila	21	5	51	84	21	44.8
34	Charmal	Sagmalia RF near Bandhantaila	21	3	40.8	84	7	45.9
35	Charmal	Landakote RF near Brahamani village	21	11	4.8	84	13	56.4
36	Charmal	Suani RF near San-Hindol village	21	5	2	84	15	0.5
37	Charmal	Sagmalia RF near Badkhol village	21	1	30.3	84	10	42.9
38	Girischandrapur	Kholgarh RF near Similipal(Ranja)	21	16	56.8	84	26	49.47
39	Girischandrapur	Kumunakhol	21	15	28.81	84	19	40.68
40	Girischandrapur	Dadara	21	17	28.7	84	24	49
41	Naktideul	Chadachadi PRF- Pond No.1	21	10	37.4	84	41	25.7
42	Naktideul	Chadachadi PRF- Pond No.2	21	10	36.6	84	41	26.5
43	Naktideul	Landimal RF near Lusura	21	10	37.5	84	30	15
44	Badbahal	Tal RF compt No.5	21	2	3.35	84	17	20.11
45	Badbahal	Tantagarh VF	21	0	8.4	84	17	8
46	Badbahal	Tal RF	20	59	9.4	84	17	7.8
47	Badbahal	Tal RF compt No.5	21	2	3.25	84	17	18.41
48	Mochibahal	Rengali-Badmal	21	4	55.5	84	4	53.4
49	Mochibahal	Landakote RF Churmani	21	10	10.5	84	10	56.8
50	Mochibahal	Landakote RF Pond No.-1	21	9	35.38	84	9	54.38
51	Mochibahal	Landakote RF Pond No.-2	21	9	37.28	84	9	53.99
52	Mochibahal	Landakote RF Khandashi- Pond No.1	21	10	9.43	84	12	37.86
53	Mochibahal	Landakote RF Khandashi-Pond No.12	21	10	10.4	84	12	37.94
54	Mochibahal	Landakote RF Punjipather-1	21	8	5.25	84	8	2.45
55	Mochibahal	Landakote RF Punjipather-2	21	8	5.14	84	8	3.46
	2015-16							
56	Redhakhol	Hatidhara RF	21	6	33.1	84	23	50.6
57	Charmal	Landakote RF	21	11	4.68	84	13	56.14
	2016-17							
58	Badbahal	Tal RF near watch tower Pond No.01	21	1	25.19	84	18	7.6
59	Badbahal	Tal RF near watch tower Pond No. 02	21	1	41.27	84	18	0.43
60	Naktideul	Lampaphuli	21	10	17.37	84	28	31.56
61	Mochibahal	Satsama PRF	21	8	48.12	84	8	4.92



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 5.2 Water Body created

Sl No	Name of the Range	Name of the Location(40mX30mX3m)	GPS Reading					
			Latitude			Longitude		
			D	M	S	D	M	S
	2017-18							
62	Mochibahal	Rengali-Badmal near village Raichuan WHS	21	6	54.72	84	6	3.6
63	Badbahal	Rahan RF near Dhadipathar	20	58	15.84	84	12	4.75
64	Badbahal	Rahan RF Compt. No.6	20	56	32.59	84	16	51.44
65	Redhakhhol	Kholgarh RF	21	10	10.35	84	23	23.99
	2019-20							
66	Mochibahal	Satsama PRF	21	6	24.12	84	5	47.4
67	Mochibahal	R-Badmal RF	21	6	24.12	84	5	47.4
68	Badbahal	Rahan RF	20	57	43.93	84	12	33.12
	2020-21							
69	Giripur	Sado	21	15	6.6	84	24	6.67
70	Charmal	Badberna	21	3	37.63	84	9	18.28
	Total 70 Number							

Table 5.3 Number of Water Body during last 10 years

Name of the Range	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	Total
Girishcharapur	1		1	6	0						1	9
Redhakhhol		1	1	7	0	1		1				11
Badmal (Mochibahal)		1	4	8	0		1	1		2		17
Naktideula		2	2	4	0		1					9
Charmal		1	1	4	0	1					1	8
Badbahal			4	7	0		2	2		1		16
Total	1	5	13	36	0	2	4	4		3	2	70



5.2 Duration of Water flow in Selected Seasonal streams:

There are number of nalla / Stream in the forest & outside the forest. Most of the nalla are of seasonal in nature. Water flows in it mostly up to February / March and thereafter, the nalla dries up. The list of such nalla / Streams are furnished at table No 5.4

Table No 5.4: Name of Seasonal Streams (Nala / Rivulets)

Sl No	Name of Seasonal Streams (Nala / Rivulets)	Forest Blocks involved	Period of Water flow.	Remark. In Month
1	Sankhanala	Kisinda , Landakot, Gaudpada, Bhalukhol, Girishchandrapur	July to Dec	6
2	Ranjana nala	Burbuda, Khandiamunda	July to Dec	6
3	Koili nala	Kholgarh	July to Dec	6
4	Champali Nala	Kholgarh, Hatidhara, Lampaphuli	July to Dec	6
5	Barbank nala	Landimal	July- Dec	6
6	Khalabala nala	Landakot, Rail	July to Dec	6
7	Samundu nala	Amjhari, A.Dhadrakhol, Dhadrakhol	July to Dec	6
8	Khal jhor	Chadchadi, Bindupur	July- March	9
9	Badibahal nala	Rail	July- March	9
10	Arkhai nala	Kendumundi	July- March	9
11	Aunli Jhor	Hatidhara, Kholgarh,Rail	July- March	9
12	Chundra nala	Landakot	July- March	9
13	Ganchhara nala	Satasama	July- March	9
14	Chamti jhor	Mochibahal	July- March	9
15	Bamboojhor, Mauli	Sagjori	July to Dec	6
16	Sian Jhor	Rengali-Badmal	July to Dec	6
17	Pipili nala	Chargarh	July to Dec	6
18	Kurum jhor	Kalia	July to Dec	6
19	Purnapani nala	Goudgad	July to Dec	6
20	Surubali nala	Landakot, Sagmalia, Kholgarh, Mochibahal, Hemantkhol,Koilipadar, Butukhaman	July- March	9
21	Telkani nala	Landakot	July- March	9
22	Bachha nala	Landakot	July- March	9
23	Sukha nala	Landakot	July- March	9
24	Naikni nala	Mochibahal	July- March	9



Table No 5.4: Name of Seasonal Streams (Nala / Rivulets)

Sl No	Name of Seasonal Streams (Nala / Rivulets)	Forest Blocks involved	Period of Water flow.	Remark. In Month
25	Amjharn nala	Tal	July- March	9
26	Dangadar nala	Hatlimunda	July- March	9
27	Baigni nala	Hatlimunda	July- March	9
28	Ghungi nala	Goudgad, Subalaya	July- March	9
29	Bauri jhor	Rahana, Butukhaman, Durdura	July- March	9
30	Daincha nala	Kholgarh, Hatidhara	July- March	9
31	Dhunkchali nala	Kholgarh, Hatidhara	July- March	9
32	Kutinia nala	Tal, Podabalanda	July- March	9
33	Hemamura nala	Bindhyabasini	July- March	9
34	Sankarandi jhor	Bindhyabasini, Purunapani	July- March	9
35	Tantagad nala	San-Rengali	July- March	9
36	Gariakhaman nala	Rahan	July- March	9

Besides the above there are other rivulets inside forests which flow is restricted to 3-4 months i.e. during rains only.

5.3 Wetlands in Forest Areas:

Wetlands are one of the crucial natural resources. Wetlands are areas of land that are either temporarily or permanently covered by water (Westlake & Pratt, 2006). This means that a wetland is neither truly aquatic nor terrestrial; it is possible that wetlands can be both at the same time depending on seasonal variability. Thus, wetlands exhibit enormous diversity according to their genesis, geographical location, water regime and chemistry, dominant plants and soil or sediment characteristics. Because of their transitional nature, the boundaries of wetlands are often difficult to define. Wetlands do, however, share a few attributes common to all forms. Of these, hydrological structure (the dynamics of water supply, throughput, storage and loss) is most fundamental to the nature of a wetland system. It is the presence of water for a significant period of time which is principally responsible for the development of a wetland. One of the first widely used classifications systems, devised by Cowardin et al., (1979), was associated to its hydrological, ecological and geological aspects, such as: marine (coastal wetlands including rock shores and coral reefs, estuarine (including deltas, tidal marshes, and mangrove swamps), lacustrine (lakes), riverine (along rivers and streams), palustrine ('marshy'- marshes, swamps and bogs). Given these characteristics, wetlands support a large variety of plant and animal species adapted to fluctuating water levels, making the wetlands of critical ecological significance. Utility wise,



wetlands directly and indirectly support millions of people in providing services such as food, fiber and raw materials, storm and flood control, clean water supply, scenic beauty and educational and recreational benefits. The Millennium Ecosystem Assessment estimates conservatively that wetlands cover seven percent of the earth's surface and deliver 45% of the world's natural productivity and ecosystem services of which the benefits are estimated at \$20 trillion a year (Source : www.MAweb.org). The Millennium Assessment (MA) uses the following typology to categories ecosystem services:

Provisioning services	The resources or products provided by ecosystems, such as food, raw materials (wood), genetic resources, medicinal resources, ornamental resources (skin, shells, flowers)
Regulating services	Ecosystems maintain the essential ecological processes and life support systems, like gas and climate regulation, water supply and regulation, waste treatment, pollination etc.
Cultural and Amenity services	Ecosystems are a source of inspiration to human culture and education through recreation, cultural, artistic, spiritual and historic information, science and education
Supporting services	Supporting services Ecosystems provide habitat for flora and fauna in order to maintain biological and genetic diversity

Despite these benefits, wetlands are the first target of human interference and are among the most threatened of all natural resources. Around 50% of the earth's wetlands are estimated to have already disappeared worldwide over the last hundred years through conversion to industrial, agricultural and residential developments. Even in current scenario, when the ecosystem services provided by wetlands are better understood, degradation and conversion of wetlands continues. This is largely due to the fact that the 'full value' of ecosystem functions is often ignored in policy-making, plans and corporate evaluations of development projects.

5.3.1 Wetland Classification System:

Modified National Wetland Classification system is used for wetland delineation and mapping comprising of 19 wetland classes which are organized under a Level III hierarchical system. Level one has two classes: Inland and coastal, these are further bifurcated into two



categories as: natural and man-made under which the 19 wetland classes are suitably placed. Two date data pertaining to pre- monsoon and post monsoon was used to confirm the classes. Wetlands put to agriculture use in any of the two dates are not included as wetland class. Definitions of wetland categories used in general is as follows

5.5 Wetland Classification System and coding			
Wetland Code	Level-I	Level-II	Level-III
1000	Inland Wet Lands		
1100		Natural	
1101			Lakes
1102			Ox- Bow lakes / Cut-Off Meanders
1103			High altitude wet lands
1104			Riverine Wet Lands
1105			Waterlogged
1106			River / Stream
1200		Manmade	
1201			Reservoirs / Barrages
1202			Tanks / Ponds
1203			Waterlogged
1204			Saltpans
2000	Coastal Wetlands		
2100		Natural	
2101			Lagoons
2102			Creeks
2103			Sand / Brach
2104			Intertidal Mud flats
2105			Salt marsh
2106			Mangroves
2107			Coral Reefs
2200		Man- made	
2201			Salt Pans
2202			Aquaculture Ponds

The district data on wetland is furnished below



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 5.6 Sambalpur Wet land data as per National Wetland Atlas Report.

Name of District	Geographical area in Km ²	Wetland in ha	% of Wet land	% of Geographical area	Open Water in ha		Seasonal Reduction in open water extent (%)
					Post monsoon	Pre Monsoon	
Sambalpur	67	26511	3.8	0.2	23786	17261	27
Area under aquatic vegetation					954	6842	
Area Under Turbidity Levels							
Low					--	983	
Medium					21912	13676	
High					1874	2602	

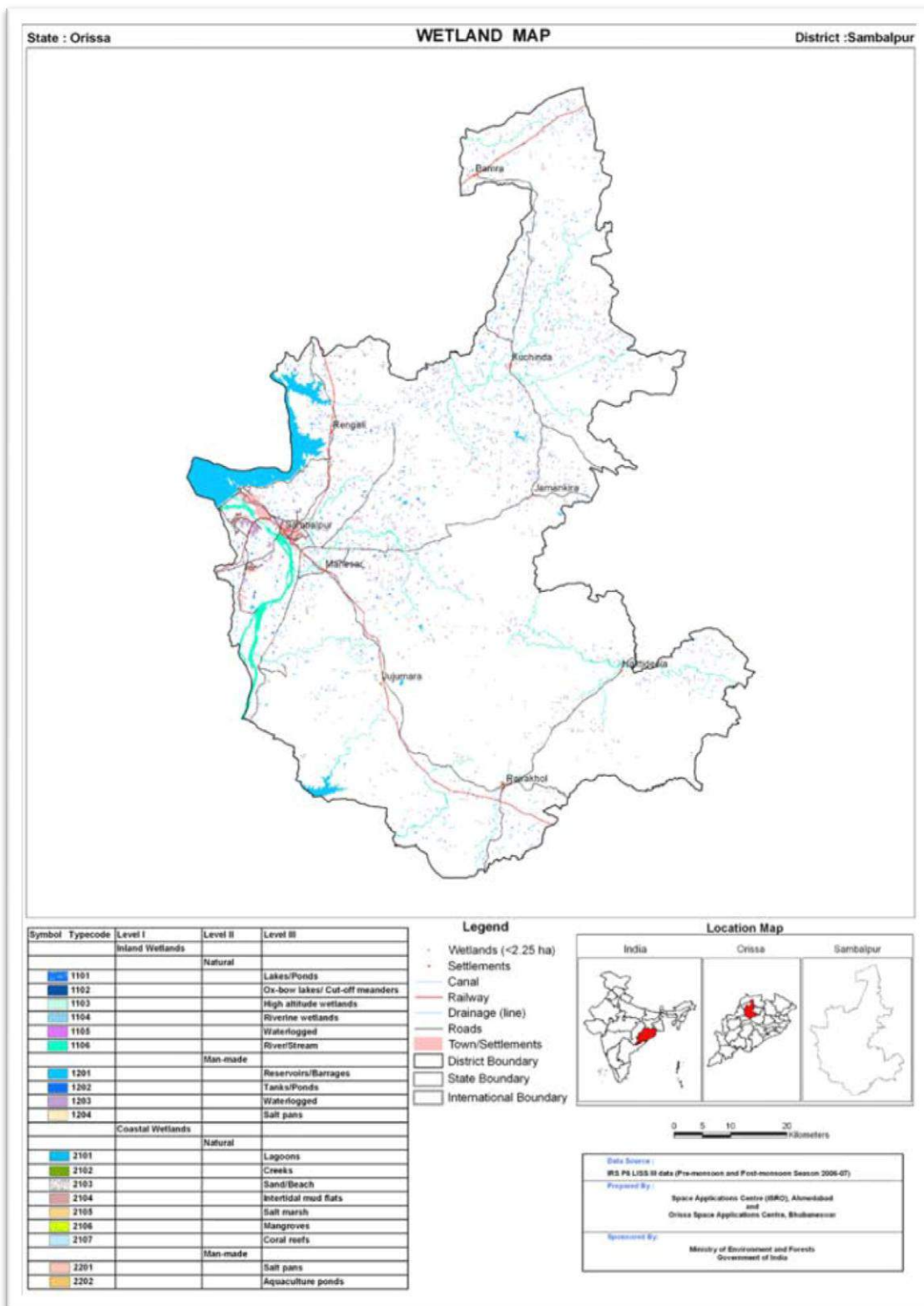
5.3.2 Area Estimates of Wet land in Sambalpur District

Table No 5.7 Area estimates of Wet land in Sambalpur District

Wetland Code	Wetland category	Number of Wetlands	Total Wetland area	% of Wetland area	Open Water	
					Post Monsoon	Pre Monsoon
1000	Inland Wet Lands					
1100	Natural					
1101	Lakes	-	-	-	-	-
1102	Ox- Bow lakes / Cut-Off Meanders	-	-	-	-	-
1103	High altitude wet lands	-	-	-	-	-
1104	Riverine Wet Lands	-	-	-	-	-
1105	Waterlogged	25	156	0.59	42	42
1106	River / Stream	58	8066	30.43	8048	7411
1200	Inland Wetland Manmade					
1201	Reservoirs / Barrages	136	14566	54.94	14203	8330
1202	Tanks / Ponds	332	1384	5.22	943	928
1203	Waterlogged	5	550	2.07	550	550
1204	Saltpans	-	-	-	-	-
	Total In Land					
2000	Coastal Wetlands	556	24722	93.25	23786	17261
2100	Natural	NIL				
2200	Manmade	NIL				
Sub Total		556	24722	93.25	23786	17261
Wetlands (<2.5 ha)		1789	1789	6.75	-	-



Revised working plan of Rairakhol Division (2021-22 to 2030-31)





5.4 Water level in the Wells in the vicinity (Up to 5km) of Forest area:

Table No: 5.8: Ground Water Table Position Near Forest Blocks.

Sl No	Name of Forest Block	Name of CD Block	Location of Well			Pre Monsoon In MBGL.	Monsoon in M BGL	Post Mon Soon in M BGL.	Water Table Fluctuation.
			Land mark	Latitude	Longitude				
1	Resibeda DPF	Rairakhol	Resibeda	21 07 55.17	84 12 01.32	5.1	0.9	3	4.2
2	Rasibeda PRF	Rairakhol	Rasibeda	21 08 05.5	84 12 10.5	4.5	0.9	2.4	3.6
3	Suani RF	Rairakhol	San Hindol	21 04 52.45	84 14 55.33	7.5	0.9	4.5	6.6
4	Suani RF	Rairakhol	San Hindol	21 04 46.99	84 14 55.59	7.8	0.6	4.8	7.2
5	Berhampura PRF	Rairakhol	Berhampura	21 08 23.03	84 14 7.23	2.4	0.6	1.8	1.8
6	Berhampura PRF	Rairakhol	Berhampura	21 08 50.35	84 14 47.05	8.1	0.9	4.5	7.2
7	Landakot RF	Rairakhol	Jhankarpada	21 08 30.81	84 15 28.91	3	0.6	2.1	2.4
8	Landakot RF	Rairakhol	Jhankarpada	21 08 18.91	84 15 32.55	3.3	0.6	2.4	2.7
9	Sagmalia RF	Rairakhol	Badberna	21 03 28.02	84 09 31.05	6	0.9	3.9	5.1
10	Sagmalia RF	Rairakhol	Badberna	21 03 28.40	84 09 30.25	5.7	0.9	3.3	4.8
11	Siaripani PRF	Rairakhol	Siaripani	21 03 57.18	84 08 22.48	4.5	0.6	2.7	3.9
12	Siaripani PRF	Rairakhol	Haldinali	21 05 20.28	84 08 39.31	5.1	0.3	1.8	4.8
13	Koilipadar PRF	Rairakhol	Kandhal	21 03 17.00	84 10 23.34	5.4	1.5	4.2	3.9
14	Koilipadar PRF	Rairakhol	Kandhal	21 03 18.32	84 10 35.12	4.2	1.5	3.6	2.7
15	Kusumbahali DPF	Rairakhol	Kusumbahali	21 05 36.08	84 10 42.30	4.5	1.2	3.9	3.3
16	Kusumbahali DPF	Rairakhol	Mugpal	21 05 45.77	84 11 28.69	3.6	0.6	1.8	3
17	Landimal RF	Naktideul	Landimal	21 09 22.20	84 29 41.12	7.8	2.1	4.5	5.7
18	Landimal RF	Naktideul	Bahaljharan	21 10 20.22	84 30 18.07	5.4	1.8	3	3.6
19	Landimal RF	Naktideul	Kadobahali	21 11 17.62	84 28 27.52	8.1	1.8	4.5	6.3
20	Landimal RF	Naktideul	Rail	21 07 27.73	84 33 29.37	4.5	1.5	3	3
21	Landimal RF	Naktideul	Koing	21 08 15.94	84 36 26.33	6	1.5	3.6	4.5



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 5.8: Ground Water Table Position Near Forest Blocks.

Sl No	Name of Forest Block	Name of CD Block	Location of Well			Pre Monsoon In MBGL.	Monsoon in M BGL	Post Mon Soon in M BGL.	Water Table Fluctuation.
			Land mark	Latitude	Longitude				
22	Landimal RF	Naktideul	Hitasara	21 13 18.38	84 39 08.18	6	1.5	3.6	4.5
23	Landimal RF	Naktideul	Penthabahal	21 14 02.31	84 30 56.90	6.6	2.4	3.6	4.2
24	Landimal RF	Naktideul	Penthabahal	21 14 03.48	84 30 57.01	7.5	1.5	3	6
25	Landimal RF	Naktideul	Podamal	21 13 48.95	84 35 27.03	7.5	3	5.1	4.5
26	Kholgarh RF	Naktideul	Kaunisipal	21 12 59.24	84 28 17.92	9	2.4	4.5	6.6
27	Kholgarh RF	Naktideul	Chardapasi	21 12 19.86	84 28 22.02	8.4	1.8	3.6	6.6
28	Kholgarh RF	Naktideul	Tasbhardi	21 14 47.53	84 28 16.87	6.3	2.4	4.5	3.9
29	Kholgarh RF	Naktideul	Tileimal	21 22 59.36	84 48 01.07	9	2.1	6	6.9
30	Kholgarh RF	Naktideul	Khamanmunda	21 14 45.13	84 31 18.16	5.4	0.6	1.5	4.8
31	Rail RF	Naktideul	Koing	21 08 15.32	84 36 34.98	6.6	2.1	4.5	4.5
32	Rail RF	Naktideul	Kudanali	21 07 01.52	84 39 37.87	7.5	1.8	4.5	5.7
33	Rail RF	Naktideul	Talanali	21 06 06.60	84 39 21.39	6.6	2.4	4.5	4.2
34	Rail RF	Naktideul	Rail	21 07 03.27	84 33 44.68	4.5	1.5	3	3
35	Rahan	Rairakhol	Tribanpur	20.98154	84.24011	2.4	2.055	0.36	0.345
36	Rahan	Rairakhol	Kasibahal	20.97332	84.23402	3	2.4	0.24	0.6
37	Rahan	Rairakhol	Rahan	20.9698	84.23881	2.7	1.95	0.33	0.75
38	Rahan	Rairakhol	Chhandpur	20.97786	84.24805	2.7	2.37	0.54	0.33
39	Rahan	Rairakhol	Khaliamal	20.97606	84.2513	3.3	2.43	0.3	0.87
40	Rahan	Rairakhol	Haripur	20.98597	84.26145	3.6	1.89	0.39	1.71
41	Rahan	Rairakhol	Gobindpur	20.98921	84.20751	2.7	1.8	0.15	0.9
42	Rahan	Rairakhol	Ainlapali	20.00839	84.21102	3	2.64	0.75	0.36
43	Rahan	Rairakhol	Chubkadadar	20.98969	84.21786	3.3	2.25	0.3	1.05
44	Rahan	Rairakhol	Khajurijharan	20.97842	84.22289	3.6	2.52	0.3	1.08
45	Rahan	Rairakhol	Arkhakud	20.99754	84.18555	3.6	2.49	0.36	1.11



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 5.8: Ground Water Table Position Near Forest Blocks.

Sl No	Name of Forest Block	Name of CD Block	Location of Well			Pre Monsoon In MBGL.	Monsoon in M BGL	Post Mon Soon in M BGL.	Water Table Fluctuation.
			Land mark	Latitude	Longitude				
46	Tal	Rairakhol	Kusapali	21.01217	84.24034	4.2	2.52	0.6	1.68
47	Kholgarh	Naktideul	Sado	21.258662	84.40319	8.7	1.5	4.5	7.2
48	Kholgarh	Naktideul	Gaudpali	21.1747	84.219.96	7.2	1.2	4.5	6
49	Landakot	Naktideul	Luhabir	21.1443.35	84.1926.22	8.1	0.9	3.9	7.2
50	Landakot	Naktideul	Balikiari	22.1225.75	84.20 4.53	26	4	20	22



5.5 Status of Aquifers:

5.5.1 Hydrology:

Hydrogeology Sambalpur district can divide into two major hydrogeological units, viz; (1) Consolidated formations comprising of hard rocks of Precambrian age occupying 85% of the area and (2) Semi consolidated rocks of Gondwana Super Group occurring in pockets in northern and southern eastern parts. Consolidated formations include Granite Gneisses, Khondalites, Charnockites, Schistose rocks and Epidorites. Secondary porosity forms the conduits for movement of groundwater and also act reservoir of groundwater. Groundwater occurs under pheratic conditions in upper weathered residium of rock masses at shallower depths. At deeper levels in fractured and joined rocks it occurs under semi confined to confined conditions. The hydrogeological map of the district is depicted in plate II. Ground water regime conditions of the district are monitored through 46 National hydrograph stations for quantity and quality during January, April, August and November months. Depth to water levels during pre-monsoon period (April) range from 5 to 10 meters below ground levels in most parts of the districts. Whereas in limited western canal irrigated parts shallow depth to water levels of the order of 2 to 5 meters below ground levels are also observed. A deeper water level of the order of more than 10 mbgl is observed in the southwestern part of the district. During the post monsoon period (November) most parts of the district have depth to water levels in the range of 2 to 5 meters below ground levels with shallow depth to water levels of the order of 0 to 2 meters below ground levels in the same period in some limited isolated pockets in western parts having canal irrigation network. Long term water levels trend over the last ten years from 2001 to 2011 do not show any perceptible significant changes, as deciphered by the ground water regime monitoring through hydrograph stations.

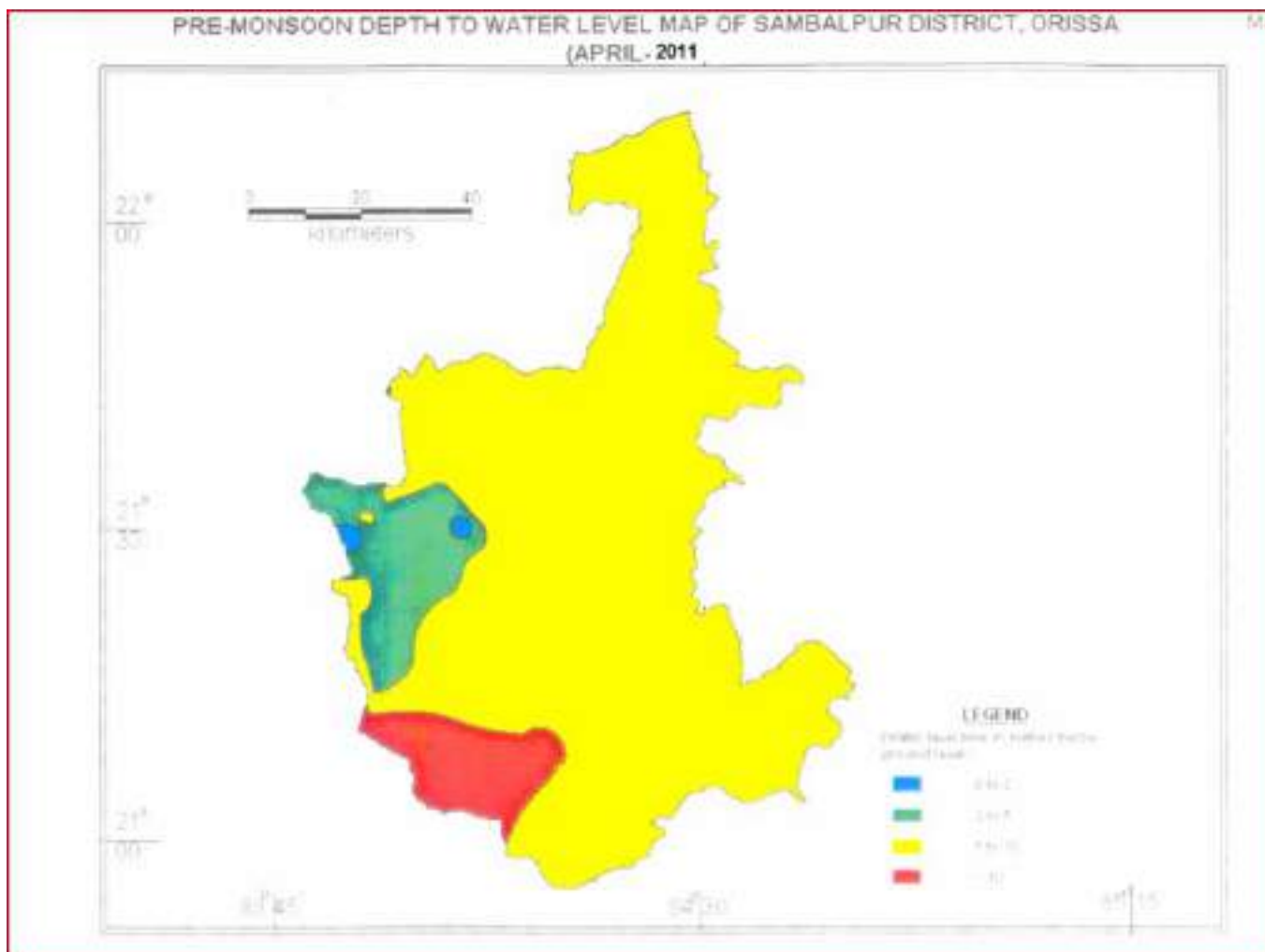
5.5.2 Ground water Quality:

Overall ground water quality in Sambalpur district is good for drinking, industrial and irrigational uses. All the chemical constituents, particularly electrical conductivity, fluorides, arsenic and iron are within the permissible limits. There is no instance of presence of chemical constituents beyond permissible limits in observation wells of Sambalpur district excepting some isolated instance of occurrence of higher electrical conductivity value in patches and Fluoride value of 3.7 ppm at Daicha and 1.7 ppm at Jugipalli. PH in the range of 7 to 8.5 shows ground waters of phreatic aquifers are slightly alkaline.

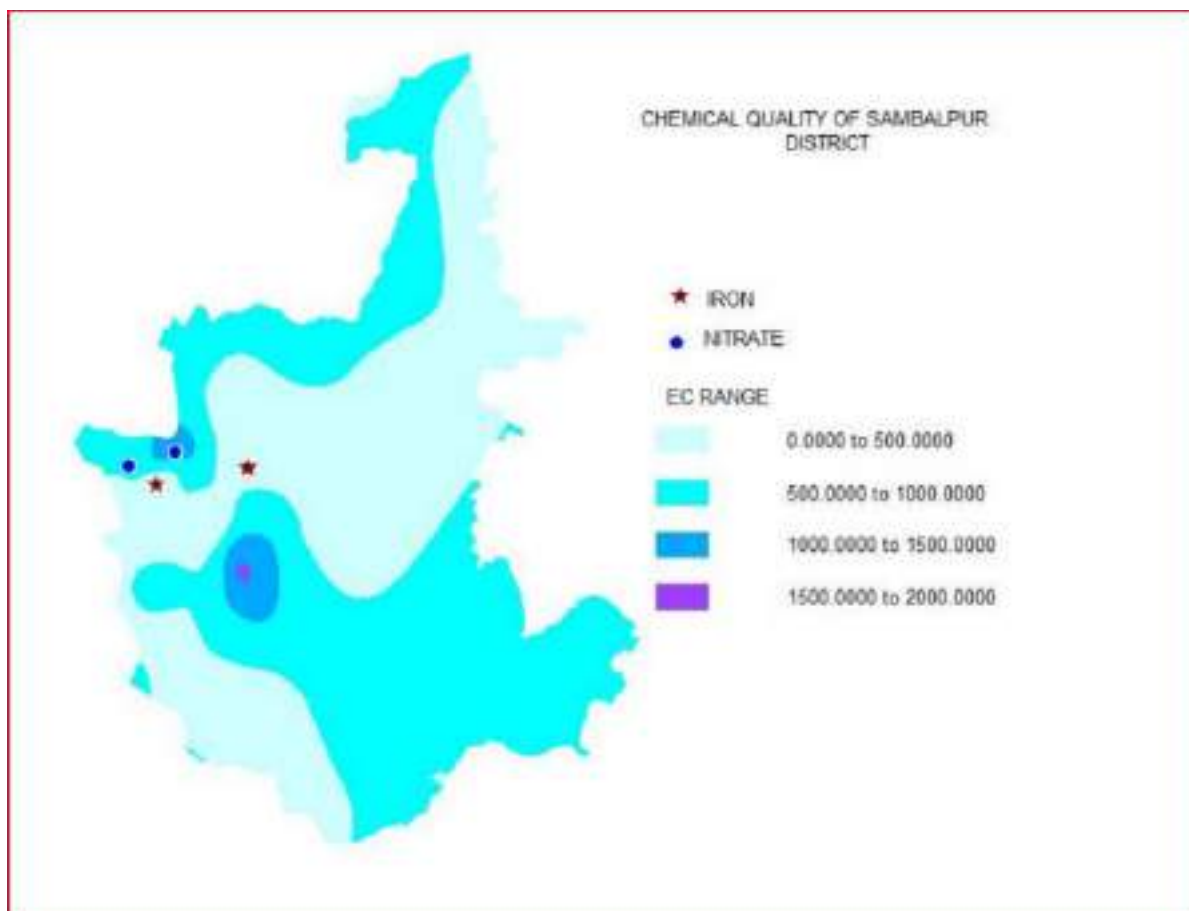


5.5.3: Water conservation and artificial recharge:

Some decline in depth to water level conditions are observed particularly during pre-monsoon summer season in south western part of district in Rairakhol block where pre-monsoon depth to water levels reaches up to 10 meters below ground levels (Map3). In such areas rain water harvesting and suitable artificial recharge techniques like roof top rain water harvesting, recharge through well, constructions of percolation tanks needs to be adopted after site specific studies.









CHAPTER-6

MAINTENANCE & ENHANCEMENT OF FOREST RESOURCE PRODUCTIVITY

6.1 Growing Stock of Wood:

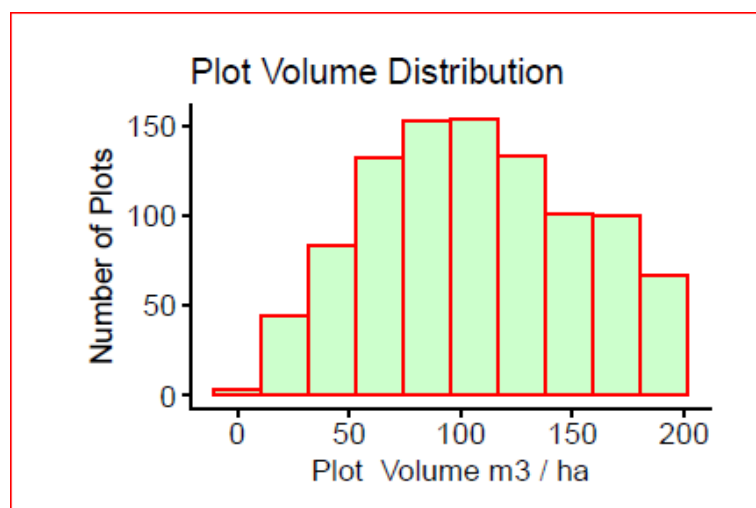
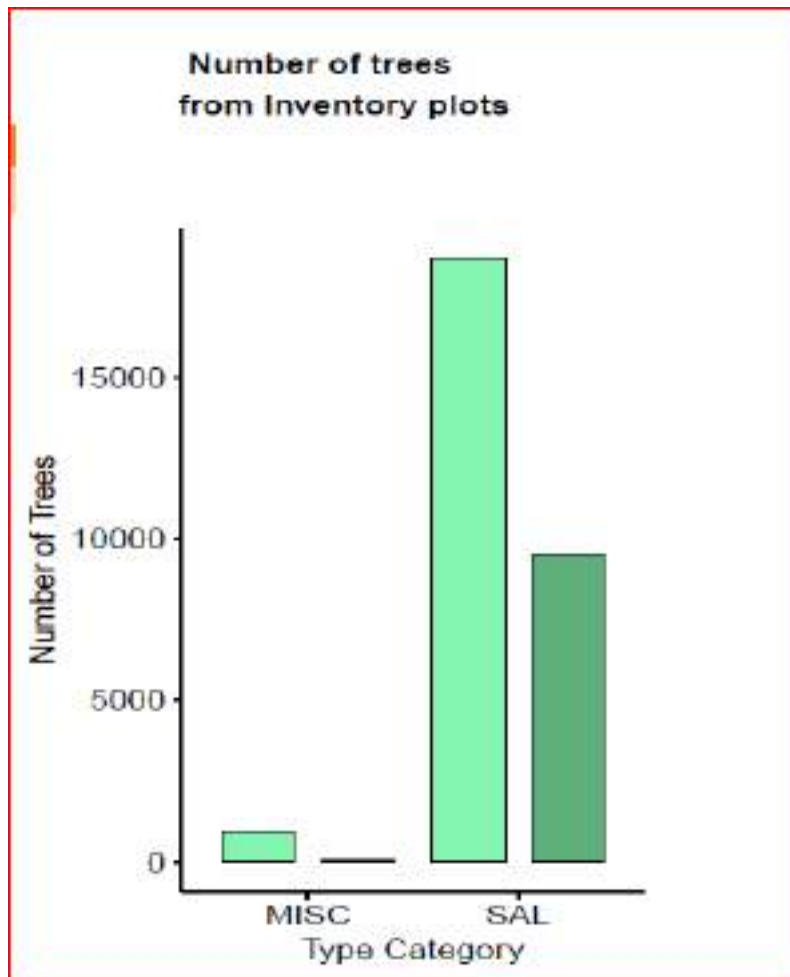
6.1.1 Sampling & Sample point distribution:

The Growing stock has been estimated basing on Sample enumeration carried out at 970 Sample points furnished by NRSC. The field staff enunetared the trees available within 1000 m² taking the Sample points on the centre of the Square of 31.623m side. The collected data has been analysed. On analysis the Growing stock in each forest block has been computed. Distribution of Sample plots to different density Class is furnished below. Data analysis report has been obtained for 970 points from NRSC, Hyderabad. The range wise and density class wise distribution of Sample points are furnished below (**Table No 6.1**)

Table No 6.1 Sample points Distribution Density class wise.(Rairakhol Division)						
Sl No	Range	No of sample plots under density class				
		D1	D2	D3	D4	Total
1	Charmal	22	82	27	10	141
2	Girishchandrapur	51	154	52	9	266
3	Mochibahal (Badmal)	6	59	10	1	76
4	Naktideul	33	122	106	7	268
5	Rairakhol (Badbahal)	2	26	23	2	53
6	Rampur (Rairakhol)	52	88	18	8	166
	Total	166	531	236	37	970

Canopy Density Classes are D1 : > 70%, D2 : 40–70% D3 : 10–40%, D4 : <10%

The plot volume distribution estimated is furnished below.





The number of trees and crop composition (Sal Forest and Non sal Forest) has been estimated and graphically presented on the margin. The plot volume parameters as inferred on various modeling are furnished below. (Table No 6.2)

Table No 6.2 Stand volume parameters – Rairakhol Division

Criteria						
No of trees / ha	Basal Area per ha (M ³)	Volume per Ha (in M ³)	Mean Volume (in M ³)	Standard Error	LB (in M ³)	UB (in M ³)
310.85	14.21	107.17	107.02	0.02	103.64	110.39

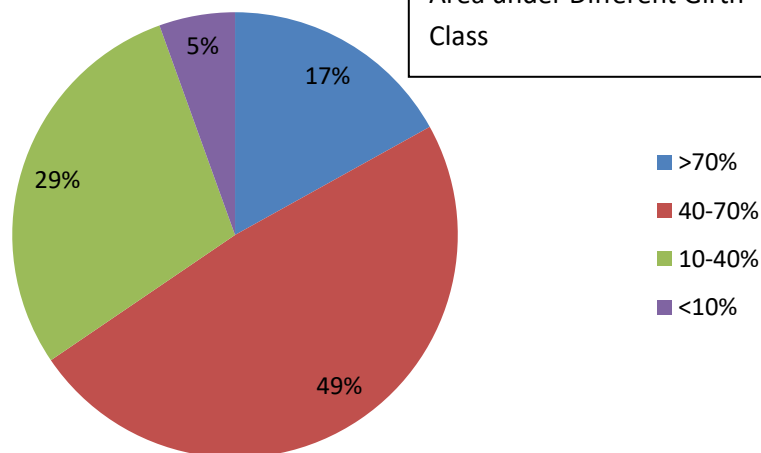
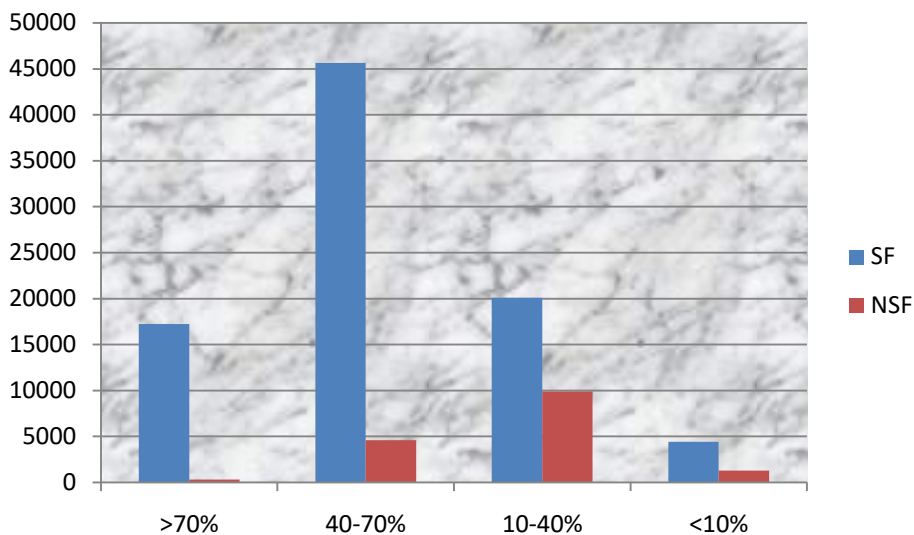
From the graphical representation it is observed that, in Sal Forests composition of Sal is about 50% of the total crop where as in Miscellaneous (Non Sal Forest) Forest, the Sal percentage is about 10-15% of the crop.

6.1.2 Distribution of Area (Density class)

The Overall crop density of the division for Sal and Non sal Forest and area under each density class has been furnished by NRSC. The details are as given below (table No 6.3).

Table No 6.3 Forest Area under Different density Class (Sal & Non sal)

Category	Area under different Density class (in Ha)				Total
	>70%	40-70%	10-40%	<10%	
Sal Forest (SFC)	17223.37	45658.04	20098.03	4417.16	87396.6
No of Plots in SFC	165	486	186	30	867
Density Class %	19.71	52.24	23.00	5.05	100.00
Non Sal Forest (Non- SFC)	296.75	4580.75	9900.29	1285.33	16063.12
No of Plots in Non SFC	1	45	50	7	103
Density %	1.85	28.52	61.63	8.00	100.00
Div. Total					
Area (All)	17520.12	50238.79	29998.32	5702.49	103459.7
Sample plots	166	531	236	37	970
% (area)	16.93	48.56	29.00	5.51	100.00



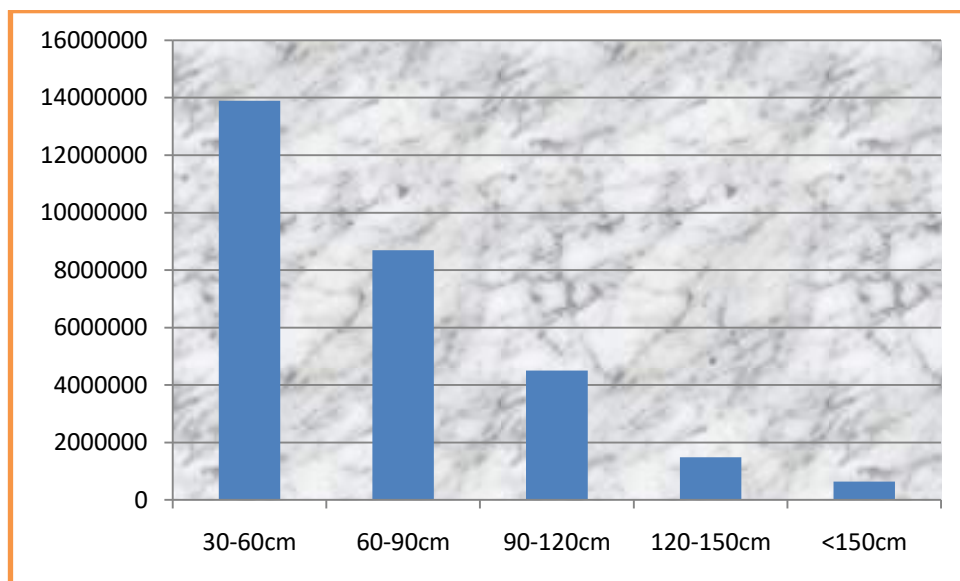
6.1.3 Girth class wise distribution of Trees:

From analysis of data collected through Sample Points, the number of trees available in different forest blocks has been estimated. Range wise / girth class wise trees estimated is produced below. **(Table No 6.4)**



Table No 6.4 Distribution of trees under different Girth Class

Sl No	Range	No of trees in different Girth Class					Total	% of trees
		30-60cm	60-90cm	90-120cm	120-150cm	<150cm		
1	Charmal	1607787	1290281	576224	202133	83172	3759597	12.88
2	Girishchandra pur	3695146	2263892	1185974	410328	185282	7740622	26.52
3	Mochibahal (Badmal)	1693222	675351	202973	55407	29763	2656716	9.10
4	Naktideul	3118044	2286917	1407848	419753	173438	7406000	25.37
5	Rairakhol (Badbahal)	1165129	458135	179395	53842	21877	1878378	6.43
6	Rampur (Rairakhol)	2619257	1712557	947412	336353	136360	5751939	19.70
Total		13898585	8687133	4499826	1477816	629892	29193252	100.00
Percentage		47.61	29.76	15.41	5.06	2.16	100.00	



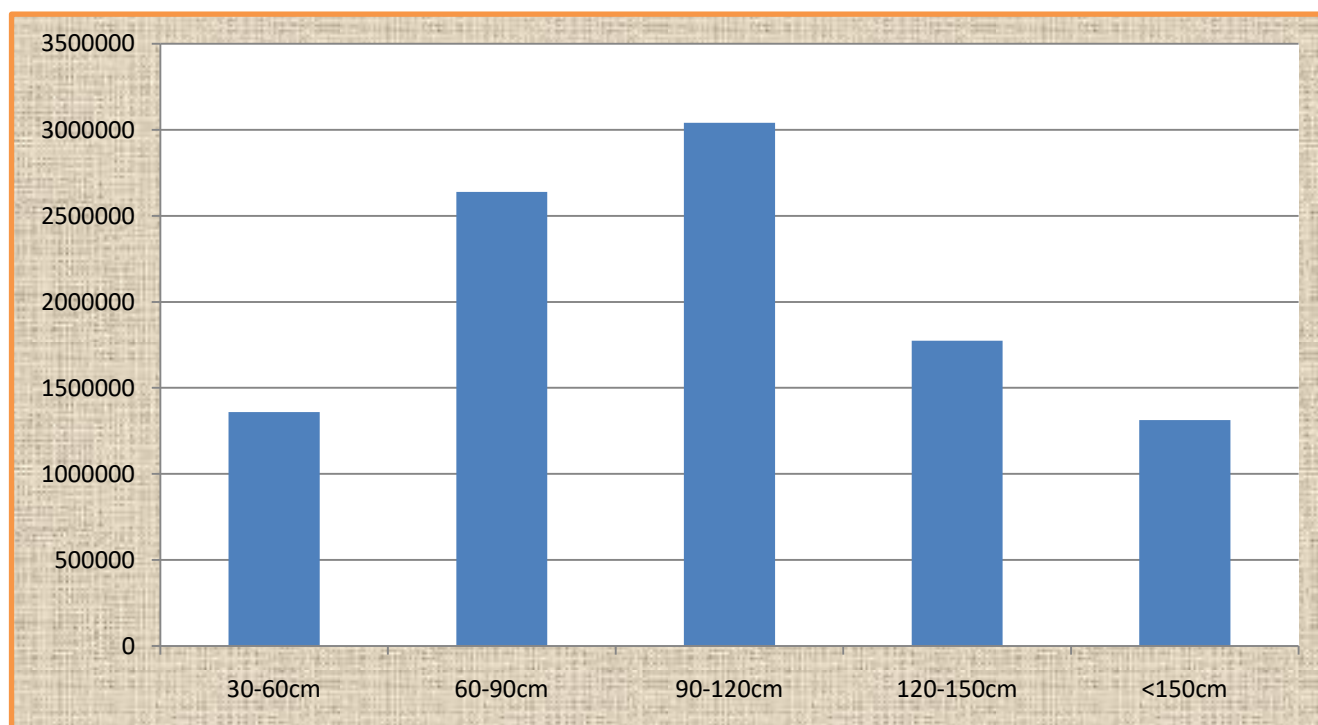
The total established stem in Rairakhol Division is estimated to be 2,91,93,252.

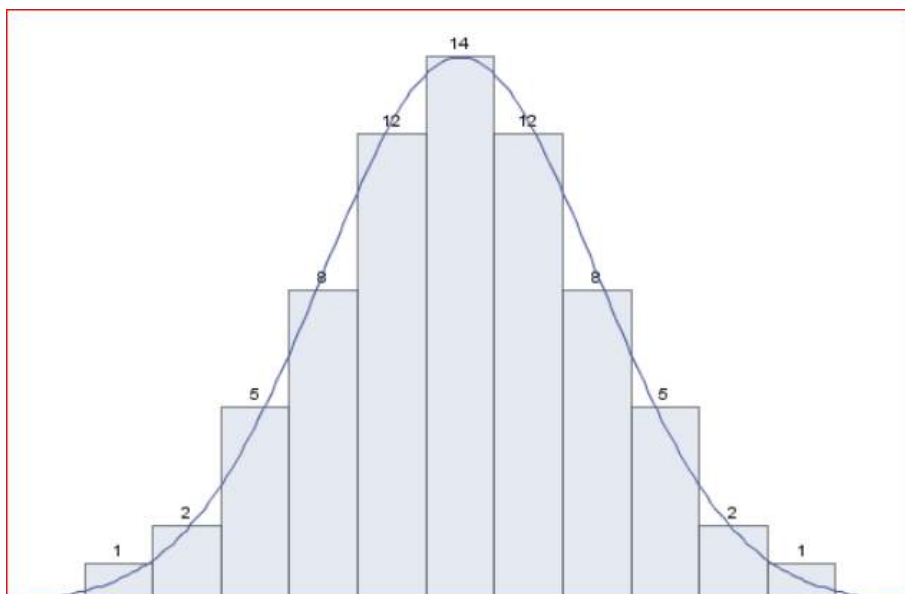


6.1.4 Growing Stock

The total Growing Estimated to be 101.28 lakh cum (10.1 MCum). The volume distribution (Girth Class wise) is as follows (Table No 6.5)

Table No 6.5 Distribution of Growing Stock (Volume) in different Girth Class (in Cum)								
Sl No	Range	Growing Stock in different Girth Class					Total	% of trees
		30-60cm	60-90cm	90-120cm	120-150cm	<150cm		
1	Charmal	156489	383274	376447	239746	178267	1334223	13.17
2	Girishchandrapur	342262	678182	809302	507215	385198	2722159	26.88
3	Mochibahal (Badmal)	162109	207813	147777	71171	68547	657417	6.49
4	Naktideul	368840	730327	943995	487660	358479	2889301	28.53
5	Rairakhol (Badbahal)	108457	138601	123310	61068	50604	482040	4.76
6	Rampur (Rairakhol)	221965	500882	640468	407005	272447	2042767	20.17
Total		1360122	2639079	3041299	1773865	1313542	10127907	100.00
Percentage			13.43	26.06	30.03	17.51	12.97	100.00





6.2 Growing Stock of Bamboo:

There are bamboo forests in the division covering an area of 13400.81 ha. Bamboo has been encountered during Sample point enumeration. The number of clumps above 125 numbers is observed over 30% of the bamboo forests. Number of bamboo clumps in between 60- 125 is over 45% of the bamboo area. Rest of the area under bamboo is considered to be in a stage of degradation. The available harvestable bamboo is estimated as below.

Table no 6.6 Available harvestable bamboo

Crop Status	Area under Bamboo (in ha)	No of Clumps per ha	Total number of Clumps	No of Culms in a clump	Harvestable per clump	Total Harvestable bamboo
Good (30% area)	4020	125	502500	45	22	11055000
Medium (45%)	6030	85	512550	35	15	7688250
Degraded (25%)	3350	50	167500	18	5	837500
Total	13400		1182550			19580750

The harvestable bamboo is estimated to 19580750 number of culms of average height of 7m. The quantum of bamboo that can be harvested is 55945 SU in a Cycle of 4 years. The Growing stock is about 3 times of harvestable bamboo i.e. 167835 SU equivalent to 1.68 lakh Ton. The average yield per annum is estimated to be 13900 SU. Safe harvestable limit is 8000 SU per



annum. This may be considered as Standard for this Division. Any harvest beyond 8000 SU (5% of the Growing Stock) may considered to be over exploitation

6.3 Increment in Volume of Identified Timber Species:

Field exercise has been conducted to find out the increment of important timber species like Sal, Bija, Asan, Arjun, and Teak. The Age has been ascertained, it's Girth at Breast Height and Top height measured. The data so collected are furnished below.

Table 6.7 Increment in volume of identified Timber species

Name of Species	Age	10 yr	20yr	30yr	40yr	50yr	60yr
Sal	GBH in cm	28	36	75	90	115	140
	Height in M.	6.00	8.00	15.00	18.00	21.00	25.00
	Volume in cum	0.02205	0.0486	0.395508	0.683438	1.301836	2.296875
Bija (Piasal)	GBH in cm	40	55	70	85	105	120
	Height in M.	5.00	7.50	10.00	15.00	17.50	23.00
	Volume in cum	0.0375	0.106348	0.229688	0.508008	0.904395	1.5525
Asan	GBH in cm	35	60	90	120	140	160
	Height in M.	9.00	12.00	15.00	17.00	20.0	24.00
	Volume in cum	0.05168	0.2025	0.569531	1.1475	1.8375	2.88
Arjun	GBH in cm	35	65	95	130	150	165
	Height in M.	7.5	9.50	15.00	17.00	19.00	24.00
	Volume in cum	0.043066	0.188145	0.63457	1.346719	2.003906	3.062813
Dhaura	GBH in cm	30	65	105	140	150	160
	Height in M.	7.00	9.50	13.00	14.00	15.00	17.00
	Volume in cum	0.029531	0.188145	0.671836	1.28625	1.582031	2.04

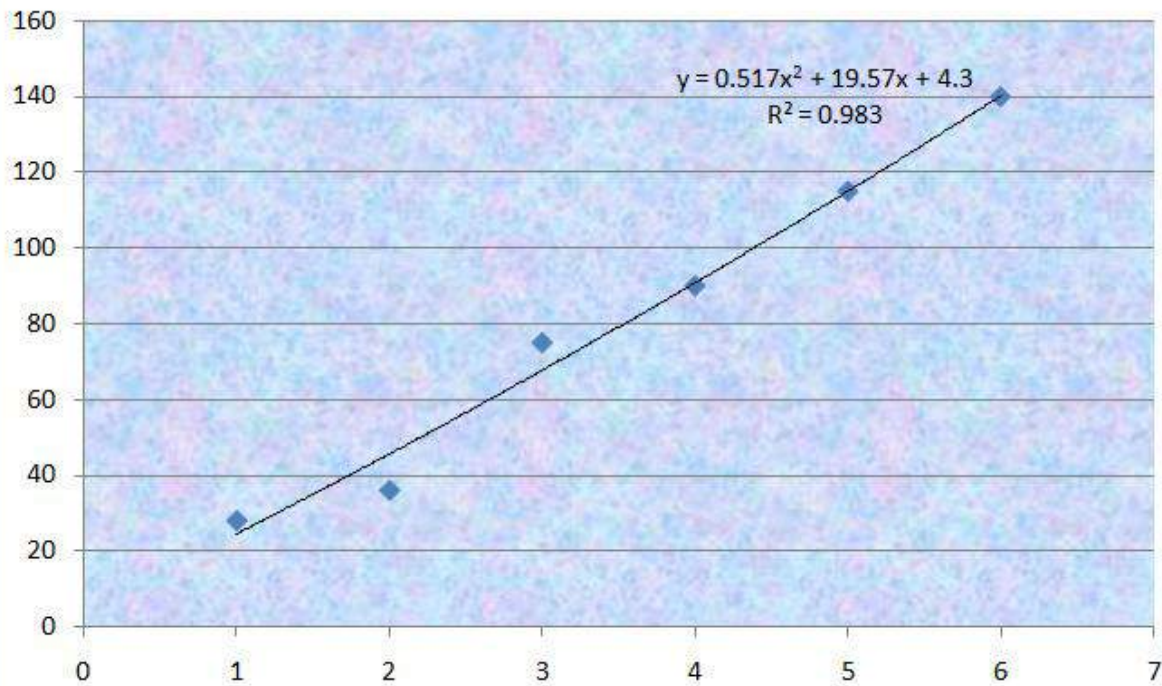
The GBH and height have been taken from field observation and calculating the average of number of data. The volume has been calculated from Quarter Girth Formula with 70% of the tree height. The average Annual increment of few important species has been predicted below.

Table No: 6.8 Average Annual increment of few important species

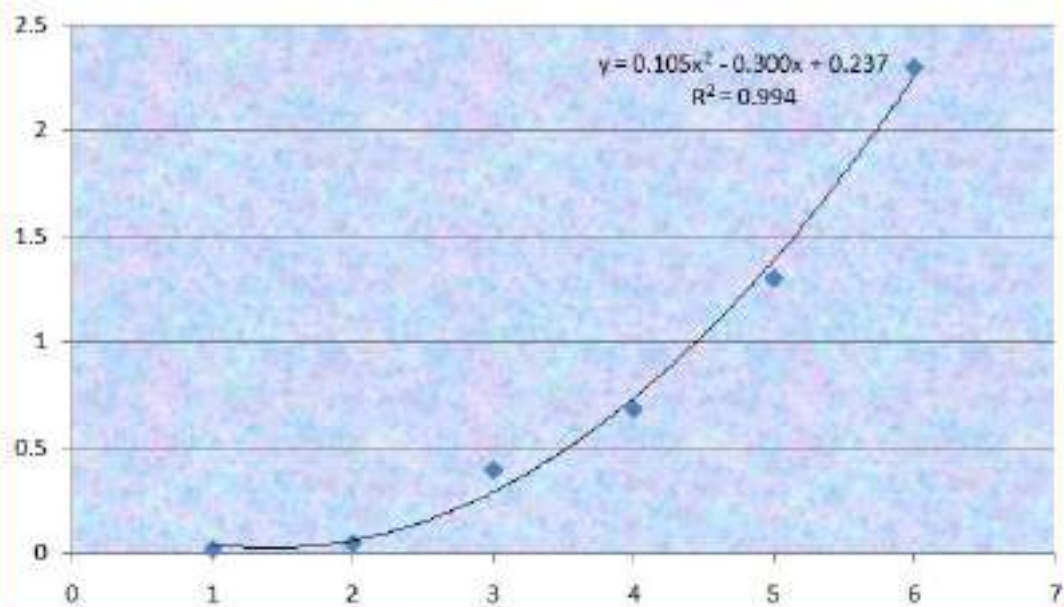
Name of Species	Growth in in cum					Annual increment predicted in Cum
	10-20 Yr	20-30 Yr	30-40Yr	40-50 Yr	50-60Yr	
Sal	0.02655	0.346908	0.28793	0.618398	0.995039	0.045497
Bija	0.068848	0.12334	0.27832	0.396387	0.648105	0.0303
Asan	0.15082	0.367031	0.577969	0.69	1.0425	0.056566
Arjun	0.145079	0.446425	0.712149	0.657187	1.058907	0.060395
Dhaura	0.158614	0.483691	0.614414	0.295781	0.457969	0.040209



Sal/ Age vrs GBH in cm

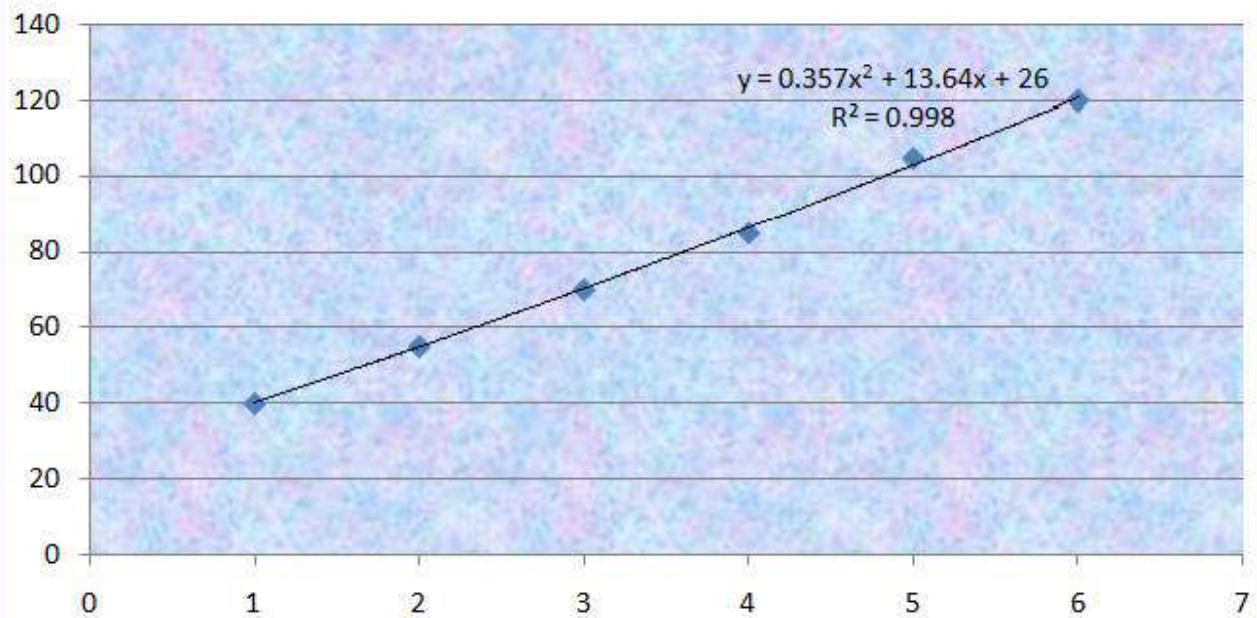


Sal Age vrs Volume in cum

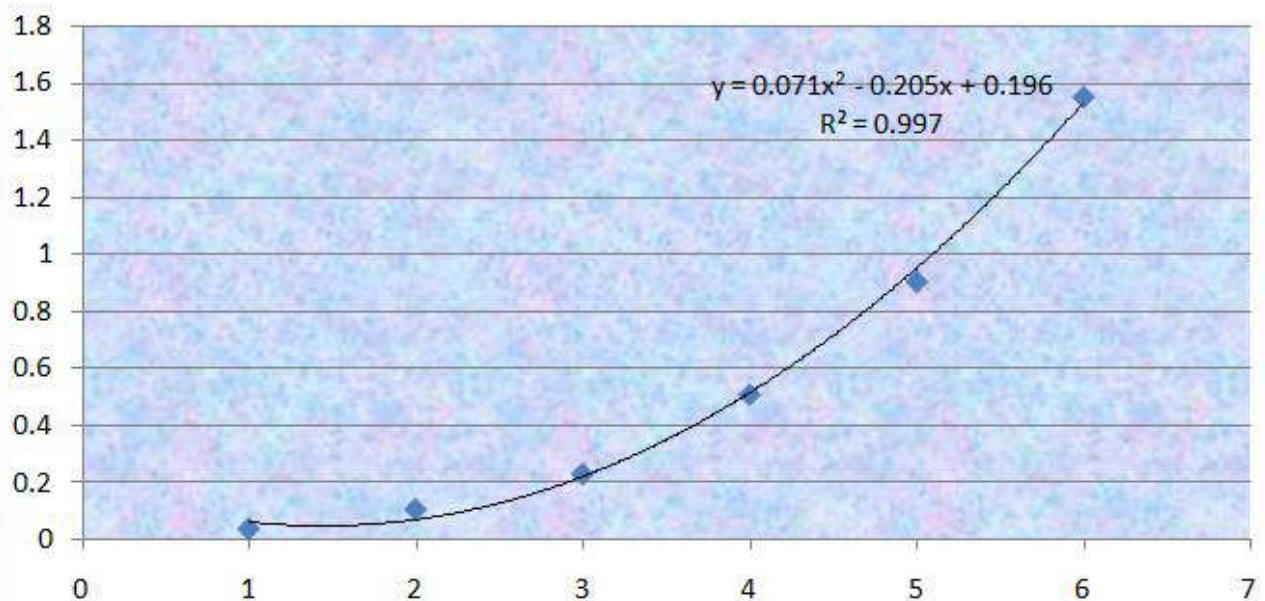




Bija Age vrs GBH in cm

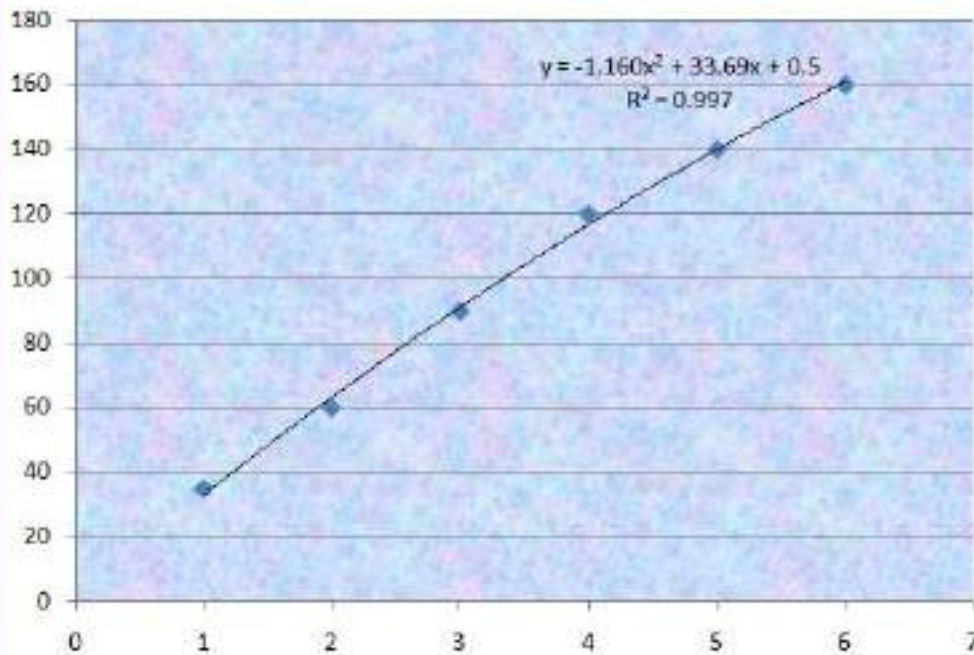


Bija Age vrs Volume in cum

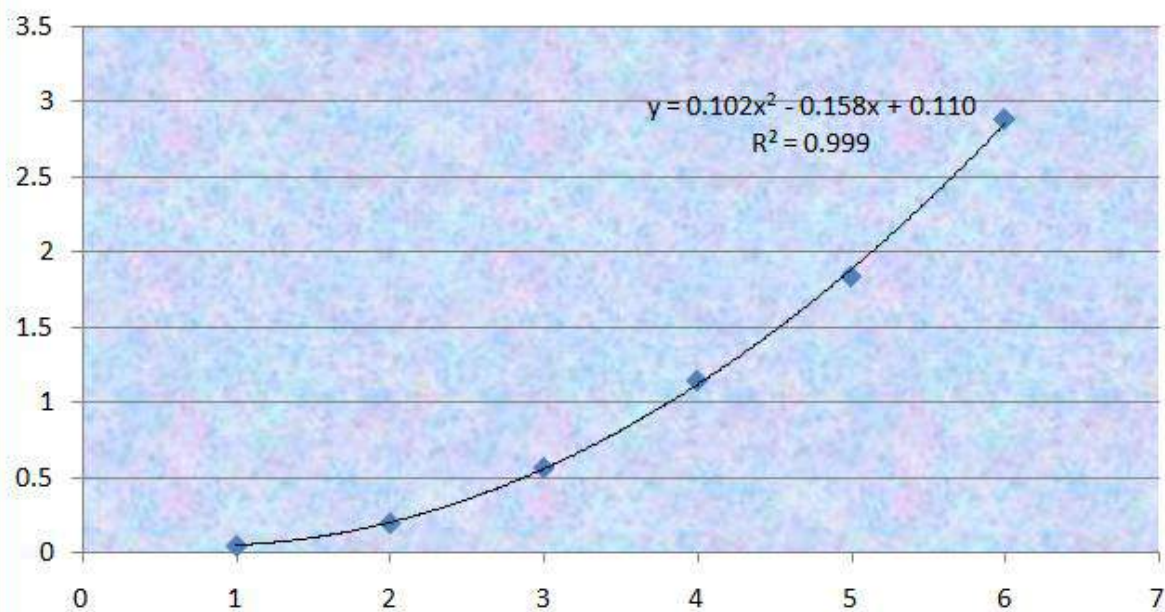




Asan Age vrs GBH in cm

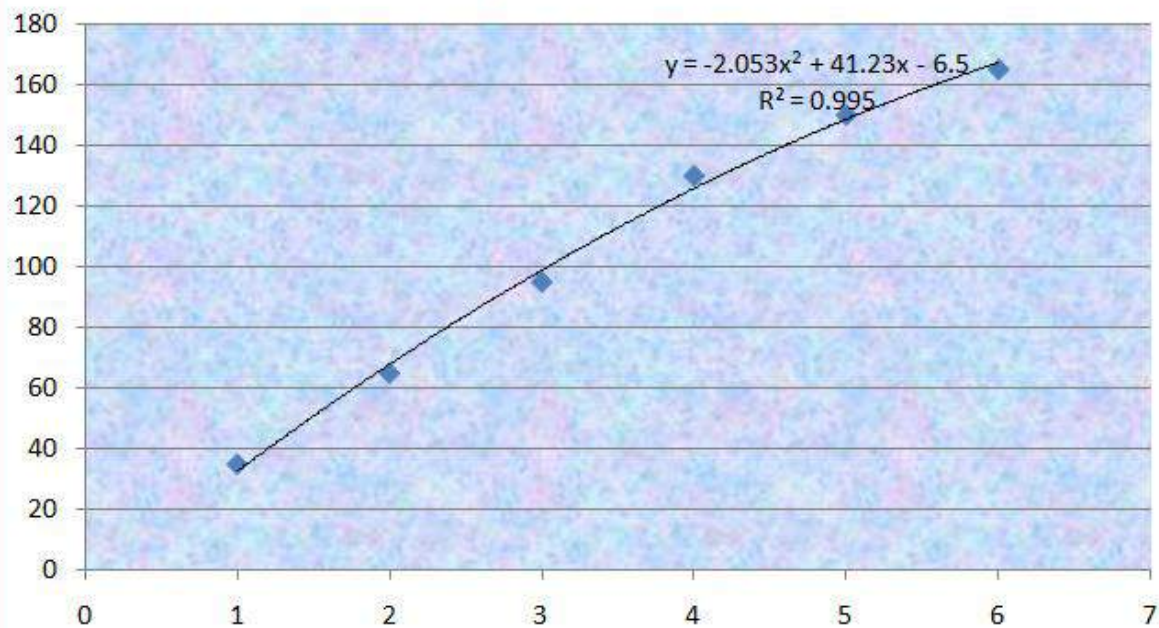


Asan- Age vrs Volume in cum

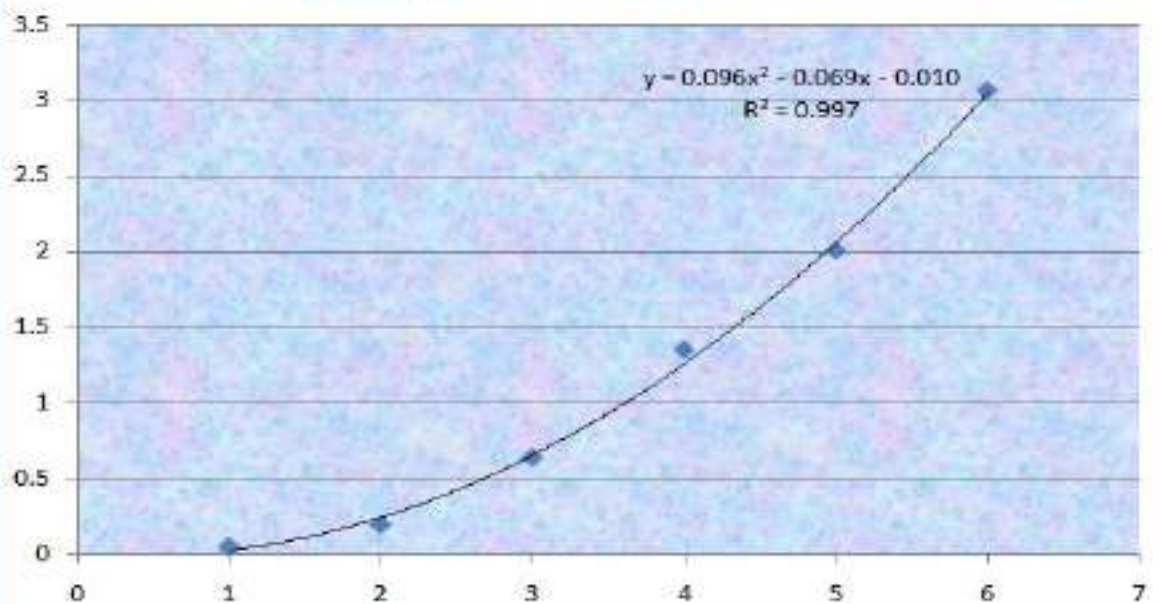




Arjun Age vrs- GBH in cm

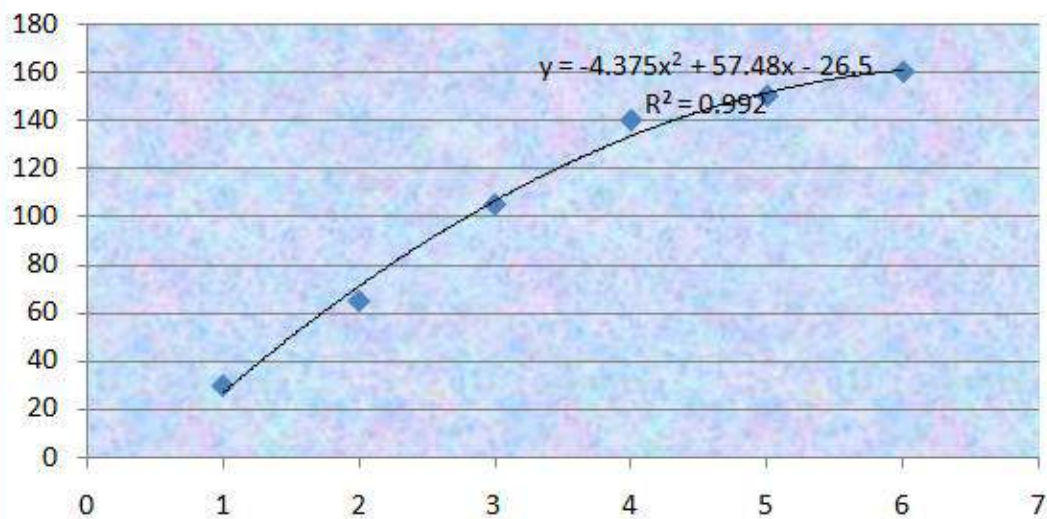


Arjun Age vrs- Volume in cum

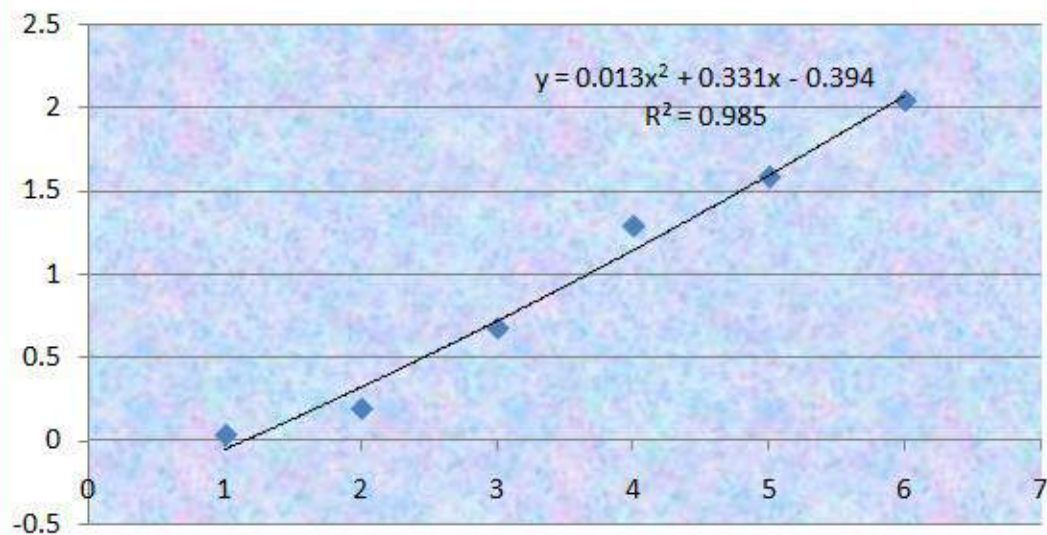




Dhaura Age- Vrs- GBH in cm



Dhaura Age vrs- Volume in cum





The species wise Volume equation derived from growth data is furnished below. This gives a general clue to calculate the volume from Graph or Equation.

Table 6.9 Volume equation for important Species of the Division.			
Sl no	Species	Volume Equation.	Remark
1	Sal	$y = 0.105x^2 - 0.300x + 0.237$	X – Age of the tree for 10 yr x= 1, 20 yr- x = 2 etc
2	Piasal (Bija)	$y = 0.071x^2 - 0.205x + 0.197$	
3	Asan	$y = 0.102x^2 - 0.158x + 0.110$	
4	Arjun	$y = 0.096x^2 - 0.069x - 0.010$	
5	Dhaura	$y = 0.013x^2 + 0.331x - 0.394$	
6	Teak	$y = 0.172x^2 - 0.557x + 0.430$	

6.4 Effects towards enhancement of Forest Productivity through Quality Plantation activities:

Enrichment of Forests through silvicultural practices and enrichment through Plantation is being practiced many decades ago. Conversion of miscellaneous forest to valuable forest through enrichment plantation has been tried and effort is continuing. It is required to improve regeneration by resorting to High forest system than coppice. Diameter growth is required to be attempted. It is observed that Sal is of Quality Class II/III in moist areas where as it is of III/ IV quality Class in a dry low altitude areas. Improvement of Soil quality by SMC will enhance the quality of Forest coupled with rigid Fire protection

6.5 Carbon Stock:

For calculation of Carbon Stock due to trees / Herbs / Leaf litters on forest floor, is required to be enumerated as per procedures led out in the National Working Plan Code-2014. No systematic study has been taken up due to funds constraint. As per thumb Rule & taking Wood Empirical Formula $C_nH_{2n}O_n$, 30 gms of Wood contain 12 gms of carbon. Considering the Ash content i.e. Metals and its oxides in plants 1 % reduction of Carbon may be safely considered.

Hence 30 Tons of Wood may contain $(12T-0.3T)$ 11.70 Ton of Carbon. Hence 1 Ton of Wood (Dry mass) may contain 0.39 Tons of fixed Carbon. For Conversion of mass of Wood from Cum to Ton, the density factors for various species recorded in Tropical forests are furnished below



Table No 6.10 Density of Wood

Sl No	Species	Wood density	Sl No	Species	Wood density
Tropical Asia					
1	<i>Acacia arabica</i>	0.70 *	31	<i>Amoora aherniana</i>	0.58
2	<i>Acacia catechu</i>	0.88	32	<i>Amoora macrocarpa</i>	0.55
3	<i>Acacia confusa</i>	0.75	33	<i>Amoora spp.</i>	0.6
4	<i>Acacia leucophloea</i>	0.76	34	<i>Anisophyllea zeylanica</i>	0.46 *
5	<i>Acacia richii</i>	0.69	35	<i>Anisoptera aurea</i>	0.53
6	<i>Adina cordifolia</i>	0.58, 0.59 +	36	<i>Anisoptera spp.</i>	0.54
7	<i>Aegle marmelo</i>	0.75	37	<i>Anisoptera thurifera</i>	0.54
8	<i>Agathis dammara</i>	0.41	38	<i>Anogeissus latifolia</i>	0.78, 0.79 +
9	<i>Agathis spp.</i>	0.44	39	<i>Anthocephalus chinensis</i>	0.36, 0.33 +
10	<i>Agathis vitiensis</i>	0.45	40	<i>Antidesma pleuricum</i>	0.59
11	<i>Aglaia diffusa</i>	0.7	41	<i>Aphanamixis cumingiana</i>	0.58
12	<i>Aglaia iloil</i>	0.53	42	<i>Aphanamixis perrottetiana</i>	0.52
13	<i>Aglaia llanosiana</i>	0.89	43	<i>Araucaria bidwillii</i>	0.43
14	<i>Alangium longiflorum</i>	0.65	44	<i>Artocarpus blancoi</i>	0.43
15	<i>Alangium meyeri</i>	0.63	45	<i>Artocarpus heterophylla</i>	0.6
16	<i>Albizzia amara</i>	0.70 *	46	<i>Artocarpus lakoocha</i>	0.53 *
17	<i>Albizzia falcataria</i>	0.25	47	<i>Artocarpus ovata</i>	0.47
18	<i>Albizzia lebbek</i>	0.55, 0.66 +	48	<i>Artocarpus spp.</i>	0.58
19	<i>Albizzia odoratissima</i>	0.76	49	<i>Azadirachta indica</i>	0.69
20	<i>Albizzia procera</i>	0.52 *, 0.59 +	50	<i>Azadirachta spp.</i>	0.52
21	<i>Aleurites moluccana</i>	0.25	51	<i>Balanocarpus spp.</i>	0.76
22	<i>Aleurites trisperma</i>	0.43	52	<i>Barringtonia edulis</i>	0.48
23	<i>Alnus japonica</i>	0.43	53	<i>Bauhinia spp.</i>	0.67
24	<i>Alphitonia philippinensis</i>	0.4	54	<i>Beilschmiedia tawa</i>	0.58
25	<i>Alphitonia zizyphoides</i>	0.5	55	<i>Berrya cordifolia</i>	0.78 *
26	<i>Alphonsea arborea</i>	0.69	56	<i>Bischofia javanica</i>	0.54, 0.58, 0.62 +
27	<i>Alseodaphne longipes</i>	0.49	57	<i>Bleasdalea vitiensis</i>	0.43
28	<i>Alstonia macrophylla</i>	0.62	58	<i>Bombax ceiba</i>	0.33
29	<i>Alstonia scholaris</i>	0.36	59	<i>Bombycidendron vidalianum</i>	0.53
30	<i>Alstonia spp.</i>	0.37	60	<i>Boswellia serrata</i>	0.5
31	<i>Bridelia retusa</i>	0.5	91	<i>Cedrela spp.</i>	0.42
32	<i>Bridelia squamosa</i>	0.5	92	<i>Cedrela toona</i>	0.43
33	<i>Buchanania lanzan</i>	0.45	93	<i>Ceiba pentandra</i>	0.23
34	<i>Buchanania latifolia</i>	0.45	94	<i>Celtis luzonica</i>	0.49
35	<i>Bursera serrata</i>	0.59	95	<i>Chisocheton cumingianus</i>	0.52



Table No 6.10 Density of Wood

Sl No	Species	Wood density	Sl No	Species	Wood density
Tropical Asia					
36	<i>Butea monosperma</i>	0.48	96	<i>Chisocheton pentandrus</i>	0.52
37	<i>Calophyllum blancoi</i>	0.51	97	<i>Chloroxylon swietenia</i>	0.76, 0.79, 0.80 +
38	<i>Calophyllum inophyllum</i>	0.57	98	<i>Chukrassia tabularis</i>	0.57
39	<i>Calophyllum neo-ebudicum</i>	0.5	99	<i>Cinnamomum mercadoi</i>	0.65
40	<i>Calophyllum obliquinervium</i>	0.58	100	<i>Cinnamomum spp.</i>	0.43
41	<i>Calophyllum spp.</i>	0.53	101	<i>Citrus grandis</i>	0.59
42	<i>Calophyllum vitiense</i>	0.5	102	<i>Cleidion speciflorum</i>	0.5
43	<i>Calycarpa arborea</i>	0.53	103	<i>Cleistanthus collinus</i>	0.88
44	<i>Cananga odorata</i>	0.29	104	<i>Cleistocalyx operculatus</i>	0.66
45	<i>Canarium asperum var. asperum</i>	0.50, 0.60 +	105	<i>Cleistocalyx spp.</i>	0.76
46	<i>Canarium hirsutum forma scabrum</i>	0.4	106	<i>Cochlospermum gossypium + religiosum</i>	0.27
47	<i>Canarium luzonicum</i>	0.51	107	<i>Cocos nucifera</i>	0.5
48	<i>Canarium spp.</i>	0.44	108	<i>Colona serratifolia</i>	0.33
49	<i>Canarium vanikoroense</i>	0.54	109	<i>Combretodendron quadrialatum</i>	0.57
50	<i>Canarium vitiense</i>	0.54	110	<i>Cordia spp.</i>	0.53
51	<i>Canarium vrieseanum forma stenophyllum</i>	0.56	111	<i>Cotylelobium spp.</i>	0.69
52	<i>Canthium monstrosum</i>	0.42	112	<i>Crataeva religiosa</i>	0.53 *
53	<i>Carallia calycina</i>	0.66 *	113	<i>Cratoxylon arborescens</i>	0.4
54	<i>Cassia fistula</i>	0.71	114	<i>Cryptocarya spp.</i>	0.59
55	<i>Cassia javanica</i>	0.69	115	<i>Cubilia cubili</i>	0.49
56	<i>Cassia spectabilis</i>	0.48	116	<i>Cullenia excelsa</i>	0.53
55	<i>Castanopsis philippensis</i>	0.51	117	<i>Cynometra insularis</i>	0.76, 0.91 +
56	<i>Casuarina equisetifolia</i>	0.83	118	<i>Cynometra ramiflora</i>	0.7
57	<i>Casuarina nodiflora</i>	0.85	119	<i>Cynometra spp.</i>	0.8
58	<i>Cedrela odorata</i>	0.38	120	<i>Dacrycarpus imbricatus</i>	0.45, 0.47 +
60	<i>Dacrydium elatum</i>	0.48	151	<i>Dipterocarpus gracilis</i>	0.61
61	<i>Dacrydium nausoriensis</i>	0.52	152	<i>Dipterocarpus grandiflorus</i>	0.62
62	<i>Dacrydium nidulum</i>	0.52	153	<i>Dipterocarpus kerrii</i>	0.56
63	<i>Dacrydium spp.</i>	0.46	154	<i>Dipterocarpus kunstlerii</i>	0.57



Table No 6.10 Density of Wood

Sl No	Species	Wood density	Sl No	Species	Wood density
Tropical Asia					
64	<i>Dacryodes spp.</i>	0.61	155	<i>Dipterocarpus spp.</i>	0.61
65	<i>Dalbergia latifolia</i>	0.75	156	<i>Dipterocarpus warburgii</i>	0.52
66	<i>Dalbergia paniculata</i>	0.64	157	<i>Dracontomelon dao</i>	0.52
67	<i>Decussocarpus philippinensis</i>	0.5	158	<i>Dracontomelon edule</i>	0.46
68	<i>Decussocarpus vitiensis</i>	0.37	159	<i>Dracontomelon spp.</i>	0.5
69	<i>Degeneria vitiensis</i>	0.35	160	<i>Dryobalanops spp.</i>	0.61
70	<i>Dehaasia triandra</i>	0.64	161	<i>Drypetes bordenii</i>	0.75
71	<i>Dialium spp.</i>	0.8	162	<i>Durio spp.</i>	0.53
72	<i>Dillenia luzoniensis</i>	0.69	163	<i>Durio zibethinus</i>	0.44, 0.53 +
73	<i>Dillenia megalantha</i>	0.69	164	<i>Dyera costulata</i>	0.36
74	<i>Dillenia pentagyna</i>	0.53	165	<i>Dysoxylum altissimum</i>	0.42
75	<i>Dillenia philippinensis</i>	0.61	166	<i>Dysoxylum decandrum</i>	0.51
76	<i>Dillenia spp.</i>	0.59	167	<i>Dysoxylum euphlebiun</i>	0.63
77	<i>Diospyros embryopteris</i>	0.63 *	168	<i>Dysoxylum quercifolium</i>	0.49
78	<i>Diospyros inclusa</i>	0.68	169	<i>Dysoxylum richii</i>	0.49
79	<i>Diospyros melanoxyton</i>	0.68	170	<i>Elaeocarpus serratus</i>	0.40 *
80	<i>Diospyros mindanaensis</i>	0.69	171	<i>Emblia officinalis</i>	0.8
81	<i>Diospyros nitida</i>	0.71	172	<i>Endiandra laxiflora</i>	0.54
82	<i>Diospyros philippensis</i>	0.81	173	<i>Endospermum macrophyllum</i>	0.4
83	<i>Diospyros pilosanthera</i>	0.8	174	<i>Endospermum peltatum</i>	0.31
84	<i>Diospyros poncei</i>	0.81	175	<i>Endospermum spp.</i>	0.38
85	<i>Diospyros pyrrhocarpa</i>	0.6	176	<i>Enterolobium cyclocarpum</i>	0.35
86	<i>Diospyros spp.</i>	0.7	177	<i>Epicharis cumingiana</i>	0.73
87	<i>Diplodiscus paniculatus</i>	0.63	178	<i>Erythrina fusca</i>	0.25
88	<i>Dipterocarpus caudatus</i>	0.61	179	<i>Erythrina suberosa</i>	0.32
89	<i>Dipterocarpus eurynchus</i>	0.56	180	<i>Erythrina subumbrans</i>	0.24
90					
91	<i>Erythrophloeum densiflorum</i>	0.65	211	<i>Heritiera sylvatica</i>	0.77
92	<i>Eucalyptus citriodora</i>	0.64	212	<i>Hevea brasiliensis</i>	0.53
93	<i>Eucalyptus deglupta</i>	0.34	213	<i>Hibiscus tiliaceus</i>	0.57
94	<i>Eugenia spp.</i>	0.65	214	<i>Homalanthus populneus</i>	0.38
95	<i>Fagraea gracilipes</i>	0.84	215	<i>Homalium spp.</i>	0.76
96	<i>Fagraea spp.</i>	0.73	216	<i>Hopea acuminata</i>	0.62
97	<i>Ficus benjamina</i>	0.65	217	<i>Hopea foxworthyi</i>	0.64



Table No 6.10 Density of Wood

Sl No	Species	Wood density	Sl No	Species	Wood density
Tropical Asia					
98	<i>Ficus botryocarpa</i>	0.43	218	<i>Hopea plagata</i>	0.88
99	<i>Ficus minahassae</i>	0.42	219	<i>Hopea spp.</i>	0.64
100	<i>Ficus spp.</i>	0.39	220	<i>Intsia bijuga</i>	0.61, 0.68, 0.74
101	<i>Ficus variegata</i>	0.28	221	<i>Intsia palembanica</i>	0.68
102	<i>Ganua obovatifolia</i>	0.59	222	<i>Kayea garciae</i>	0.53
103	<i>Garcinia myrtifolia</i>	0.65	223	<i>Kingiodendron alternifolium</i>	0.48
104	<i>Garcinia spp.</i>	0.75	224	<i>Kleinhovia hospita</i>	0.36
105	<i>Gardenia latifolia</i>	0.64	225	<i>Knema spp.</i>	0.53
106	<i>Gardenia turgida</i>	0.64	226	<i>Koompassia excelsa</i>	0.63
107	<i>Garuga pinnata</i>	0.51	227	<i>Koompassia malaccensis</i>	0.72
108	<i>Gluta spp.</i>	0.63	228	<i>Koordersiodendron pinnatum</i>	0.65, 0.69 +
109	<i>Gmelina arborea</i>	0.41, 0.45 +	229	<i>Kydia calycina</i>	0.72
110	<i>Gmelina vitiensis</i>	0.54	230	<i>Lagerstroemia parviflora</i>	0.62
111	<i>Gonocaryum calleryanum</i>	0.64	231	<i>Lagerstroemia piriformis</i>	0.5
112	<i>Gonystylus bancanus</i>	0.52	232	<i>Lagerstroemia speciosa</i>	0.53
113	<i>Gonystylus macrophyllus</i>	0.52	233	<i>Lagerstroemia spp.</i>	0.55
114	<i>Gonystylus punctatus</i>	0.57	234	<i>Lannea coromandelica</i>	0.54
115	<i>Grewia multiflora</i>	0.46	235	<i>Lannea grandis</i>	0.5
116	<i>Grewia tiliaefolia</i>	0.68	236	<i>Leucaena leucocephala</i>	0.64
117	<i>Hardwickia binata</i>	0.73	237	<i>Litchi chinensis var. philippinensis</i>	0.88
118	<i>Harpullia arborea</i>	0.62	238	<i>Lithocarpus celebica</i>	0.68
119	<i>Heritiera ornithocephala</i>	0.68	239	<i>Lithocarpus llanosii</i>	0.63
120	<i>Heritiera spp.</i>	0.56	240	<i>Lithocarpus soleriana</i>	0.63
121					
122	<i>Litsea garciae</i>	0.34	271	<i>Milliusa velutina</i>	0.63
123	<i>Litsea leytensis</i>	0.35	272	<i>Mimusops elengi</i>	0.72 *
124	<i>Litsea perrottetii</i>	0.45	273	<i>Mitragyna parviflora</i>	0.56
125	<i>Litsea spp.</i>	0.4	274	<i>Myristica castaneifolia</i>	0.49
126	<i>Lophopetalum spp.</i>	0.46	275	<i>Myristica chartacea</i>	0.49
127	<i>Macaranga bicolor</i>	0.29	276	<i>Myristica gillespieana</i>	0.49
128	<i>Macaranga denticulata</i>	0.53	277	<i>Myristica spp.</i>	0.53
129	<i>Madhuca fulva</i>	0.53	278	<i>Neesia spp.</i>	0.53



Table No 6.10 Density of Wood

Sl No	Species	Wood density	Sl No	Species	Wood density
Tropical Asia					
130	<i>Madhuca longifolia</i> var. <i>latifolia</i>	0.74	279	<i>Neonauclea bernardoi</i>	0.62
131	<i>Madhuca oblongifolia</i>	0.53	280	<i>Neotrewia cumingii</i>	0.55
132	<i>Mallotus multiglandulosus</i>	0.42	281	<i>Ochna foxworthyi</i>	0.86
133	<i>Mallotus philippensis</i>	0.64	282	<i>Ochroma pyramidale</i>	0.3
134	<i>Mangifera altissima</i>	0.55	283	<i>Octomeles sumatrana</i>	0.27, 0.32 +
135	<i>Mangifera indica</i>	0.52, 0.59 +	284	<i>Oroxylon indicum</i>	0.32
136	<i>Mangifera merrillii</i>	0.52	285	<i>Ougenia dalbergiodes</i>	0.7
137	<i>Mangifera</i> spp.	0.52	286	<i>Palaquium fidjiense</i>	0.48
138	<i>Maniltoa grandiflora</i>	0.76	287	<i>Palaquium hornei</i>	0.7
139	<i>Maniltoa minor</i>	0.76	288	<i>Palaquium lanceolatum</i>	0.55
140	<i>Mastixia philippinensis</i>	0.47	289	<i>Palaquium luzoniense</i>	0.45
141	<i>Melanorrhoea</i> spp.	0.63	290	<i>Palaquium philippense</i>	0.41
142	<i>Melia dubia</i>	0.4	291	<i>Palaquium</i> spp.	0.55
143	<i>Melicope triphylla</i>	0.37	292	<i>Palaquium tenuipetiolatum</i>	0.5
144	<i>Meliosma macrophylla</i>	0.27	293	<i>Palaquium vitilevuense</i>	0.48
145	<i>Melochia umbellata</i>	0.25	294	<i>Pangium edule</i>	0.5
146	<i>Mesua ferrea</i>	0.83, 0.85 +	295	<i>Parashorea malaanonan</i>	0.51
147	<i>Metrosideros collina</i>	0.70, 0.76 +	296	<i>Parashorea</i> spp.	0.44
148	<i>Michelia platyphylla</i>	0.51	297	<i>Parashorea stellata</i>	0.59
149	<i>Michelia</i> spp.	0.43	298	<i>Paratrophis glabra</i>	0.77
150	<i>Microcos stylocarpa</i>	0.4	299	<i>Parinari corymbosa</i>	0.76
151	<i>Micromelum compressum</i>	0.64	300	<i>Parinari insularum</i>	0.65
152					
153	<i>Parinari</i> spp.	0.68	331	<i>Salmalia malabarica</i>	0.32, 0.33 +
154	<i>Parkia roxburghii</i>	0.34	332	<i>Samanea saman</i>	0.45, 0.46 4
155	<i>Payena</i> spp.	0.55	333	<i>Sandoricum koetjape</i>	0.44
156	<i>Peltophorum pterocarpum</i>	0.62	334	<i>Sandoricum vidalii</i>	0.43
157	<i>Pentace</i> spp.	0.56	335	<i>Sapindus saponaria</i>	0.58
158	<i>Phaeanthus ebracteolatus</i>	0.56	336	<i>Sapium luzonicum</i>	0.4
159	<i>Phyllocladus hypophyllus</i>	0.53	337	<i>Schleichera oleosa</i>	0.96
160	<i>Pinus caribaea</i>	0.48	338	<i>Schrebera swietenoides</i>	0.82



Table No 6.10 Density of Wood

Sl No	Species	Wood density	Sl No	Species	Wood density
Tropical Asia					
161	<i>Pinus insularis</i>	0.47, 0.48 +	339	<i>Semicarpus anacardium</i>	0.64
162	<i>Pinus merkusii</i>	0.54	340	<i>Serialbizia acle</i>	0.57
163	<i>Pisonia umbellifera</i>	0.21	341	<i>Serianthes melanesica</i>	0.48
164	<i>Pittosporum pentandrum</i>	0.51	342	<i>Sesbania grandiflora</i>	0.4
165	<i>Planchonella vitiensis</i>	0.77	343	<i>Shorea agsaboensis</i>	0.35
166	<i>Planchonia spectabilis</i>	0.58	344	<i>Shorea almon</i>	0.42
167	<i>Planchonia spp.</i>	0.59	345	<i>Shorea assamica forma philippinensis</i>	0.41
168	<i>Podocarpus neriifolius</i>	0.52	346	<i>Shorea astylosa</i>	0.73
169	<i>Podocarpus spp.</i>	0.43	347	<i>Shorea ciliata</i>	0.75
170	<i>Polyalthia flava</i>	0.51	348	<i>Shorea contorta</i>	0.44
171	<i>Polyscias nodosa</i>	0.38	349	<i>Shorea gisok</i>	0.76
172	<i>Pometia pinnata forma pinnata</i>	0.58	350	<i>Shorea guiso</i>	0.68
173	<i>Pometia spp.</i>	0.54	351	<i>Shorea hopeifolia</i>	0.44
174	<i>Pouteria villamilii</i>	0.47	352	<i>Shorea malibato</i>	0.78
175	<i>Premna tomentosa</i>	0.96	353	<i>Shorea negrosensis</i>	0.44
176	<i>Pterocarpus indicus</i>	0.52	354	<i>Shorea palosapis</i>	0.39
177	<i>Pterocarpus marsupium</i>	0.67	355	<i>Shorea plagata</i>	0.7
178	<i>Pterocymbium macrorater</i>	0.47	356	<i>Shorea polita</i>	0.47
179	<i>Pterocymbium tinctorium</i>	0.28	357	<i>Shorea polysperma</i>	0.47
180	<i>Pygeum vulgare</i>	0.57	358	<i>Shorea robusta</i>	0.72
181	<i>Quercus spp.</i>	0.7	359	<i>Shorea spp. balau group</i>	0.7
182	<i>Radermachera pinnata</i>	0.51	360	<i>Shorea spp. dark red meranti</i>	0.55
183					
184	<i>Shorea spp. light red meranti</i>	0.4	391	<i>Terminalia chebula</i>	0.96
185	<i>Shorea spp. white meranti</i>	0.48	392	<i>Terminalia citrina</i>	0.71
186	<i>Shorea spp. yellow meranti</i>	0.46	393	<i>Terminalia copelandii</i>	0.46
187	<i>Shorea virescens</i>	0.42	394	<i>Terminalia foetidissima</i>	0.55
188	<i>Sloanea javanica</i>	0.53	395	<i>Terminalia microcarpa</i>	0.53



Table No 6.10 Density of Wood

Sl No	Species	Wood density	Sl No	Species	Wood density
Tropical Asia					
189	<i>Soymida febrifuga</i>	0.97	396	<i>Terminalia nitens</i>	0.58
190	<i>Spathodea campanulata</i>	0.25	397	<i>Terminalia pterocarpa</i>	0.48
191	<i>Stemonurus luzoniensis</i>	0.37	398	<i>Terminalia tomentosa</i>	0.73, 0.76, 0.77 +
192	<i>Sterculia ceramica</i>	0.27	399	<i>Ternstroemia megacarpa</i>	0.53
193	<i>Sterculia foetida</i>	0.47 *	400	<i>Tetrameles nudiflora</i>	0.3
194	<i>Sterculia urens</i>	0.67	401	<i>Tetramerista glabra</i>	0.61
195	<i>Sterculia vitiensis</i>	0.31	402	<i>Thespesia populnea</i>	0.52
196	<i>Stereospermum suaveolens</i>	0.62	403	<i>Toona calantas</i>	0.29
197	<i>Strombosia philippinensis</i>	0.71	404	<i>Trema orientalis</i>	0.31
198	<i>Strychnos potatorum</i>	0.88	405	<i>Trichospermum richii</i>	0.32
199	<i>Swietenia macrophylla</i>	0.49, 0.53 +	406	<i>Tristania decorticata</i>	0.91
200	<i>Swintonia foxworthyi</i>	0.62	407	<i>Tristania micrantha</i>	0.89
201	<i>Swintonia spp.</i>	0.61	408	<i>Tristania spp.</i>	0.8
202	<i>Sycopsis dunni</i>	0.63	409	<i>Turpinia ovalifolia</i>	0.36
203	<i>Syzygium cumini</i>	0.7	410	<i>Vateria indica</i>	0.47 *
204	<i>Syzygium luzoniense</i>	0.63	411	<i>Vatica mangachapoi</i>	0.65
205	<i>Syzygium nitidum</i>	0.74	412	<i>Vatica obscura</i>	1.04 *
206	<i>Syzygium simile</i>	0.56	413	<i>Vatica pachyphylla</i>	0.78
207	<i>Syzygium spp.</i>	0.69, 0.76 +	414	<i>Vatica spp.</i>	0.69
208	<i>Tamarindus indica</i>	0.75	415	<i>Vitex parviflora</i>	0.7
209	<i>Tectona grandis</i>	0.50, 0.55 +	416	<i>Vitex peduncularis</i>	0.96
210	<i>Teijsmanniodendron ahernianum</i>	0.9	417	<i>Vitex spp.</i>	0.65
211	<i>Terminalia arjuna</i>	0.68	418	<i>Vitex turczaninowii</i>	0.49
212	<i>Terminalia belerica</i>	0.72	419	<i>Wallaceodendron celebicum</i>	0.55, 0.57 +
213	<i>Terminalia catappa</i>	0.52	420	<i>Weinmannia luzoniensis</i>	0.49
214					
215	<i>Wrightia tinctoria</i>	0.75	425	<i>Zanthoxylum rhetsa</i>	0.33
216	<i>Xanthophyllum excelsum</i>	0.63	426	<i>Zizyphus spp.</i>	0.76
217	<i>Xanthostemon verdugonianus</i>	1.04	427	<i>Zizyphus talanai</i>	0.53
218	<i>Xylia xylocarpa</i>	0.73, 0.81 +	428	<i>Zizyphus xylopyra</i>	0.85



6.6 Carbon Sequestration& Mitigation:

6.6.1 Carbon sequestration:

Carbon sequestration is the process involved in carbon capture and the long-term storage of atmospheric carbon dioxide or other forms of carbon to mitigate or defer global warming. It has been proposed as a way to slow the atmospheric and marine accumulation of greenhouse gases, which are released by burning fossil fuels.

Carbon dioxide (CO₂) is naturally captured from the atmosphere through biological, chemical, and physical processes.

Carbon dioxide may be captured as a pure by-product in processes related to petroleum refining or from flue gases from power generation. CO₂ sequestration includes the storage part of carbon capture and storage, which refers to large-scale, artificial capture and sequestration of industrially produced CO₂ using subsurface saline aquifers, reservoirs, ocean water, aging oil fields, or other carbon sinks.

Increasing yields and efficiency generally reduces emissions as well, since more food results from the same or less effort. Techniques include more accurate use of fertilizers, less soil disturbance, better irrigation, and crop strains bred for locally beneficial traits and increased yields.

Replacing more energy intensive farming operations can also reduce emissions. Reduced or no-till farming requires less machine use and burns correspondingly less fuel per acre. However, no-till usually increases use of weed-control chemicals and the residue now left on the soil surface is more likely to release its CO₂ to the atmosphere as it decays, reducing the net carbon reduction.

In practice, most farming operations that incorporate post-harvest crop residues, wastes and byproducts back into the soil provide a carbon storage benefit. This is particularly the case for Practices such as field burning of stubble – rather than releasing almost all of the stored CO₂ to the atmosphere; tillage incorporates the biomass back into the soil.

Carbon Sequestration as it relates to Forestry, the following steps are suggested:

- Planting of Species of long rotation period in order to enhance carbon storage for a longer period.
- The crop should not be harvested if the bio mass growth is faster i.e. first growing species to be favored to slow growing species. When growth is retired the species may be harvested.



- The timber should be utilized in structures / house hold articles than use as fuel.
- Leaf litters, Twigs may be allowed to convert to compost and goes back to soil than use as fuel which immediately releases CO₂ to atmosphere.
- Steps to be taken to improve soil organic content than losing carbon to atmosphere as CO₂.

Enhancing carbon removal:

All crops absorb CO₂ during growth and release it after harvest. The goal of agricultural carbon removal is to use the crop and its relation to the carbon cycle to permanently sequester carbon within the soil. This is done by selecting farming methods that return biomass to the soil and enhance the conditions in which the carbon within the plants will be reduced to its elemental nature and stored in a stable state. Methods for accomplishing this include:

- Use cover crops such as grasses and weeds as temporary cover between planting seasons
- Concentrate livestock in small paddocks for days at a time so they graze lightly but evenly. This encourages roots to grow deeper into the soil. Stock also till the soil with their hooves, grinding old grass and manures into the soil.
- Cover bare paddocks with hay or dead vegetation. This protects soil from the sun and allows the soil to hold more water and be more attractive to carbon-capturing microbes.
- Restore degraded land, which slows carbon release while returning the land to agriculture or other use.

Agricultural sequestration practices may have positive effects on soil, air, and water quality, be beneficial to wildlife, and expand food production. On degraded croplands, an increase of 1 ton of soil carbon pool may increase crop yield by 20 to 40 kilograms per hectare of wheat, 10 to 20 kg/ ha for maize, and 0.5 to 1 kg/ha for cowpeas.

The effects of soil sequestration can be reversed. If the soil is disrupted or tillage practices are abandoned, the soil becomes a net source of greenhouse gases. Typically after 15 to 30 years of sequestration, soil becomes saturated and ceases to absorb carbon. This implies that there is a global limit to the amount of carbon that soil can hold.

Many factors affect the costs of carbon sequestration including soil quality, transaction costs and various externalities such as leakage and unforeseen environmental damage. Because



reduction of atmospheric CO₂ is a long-term concern, farmers can be reluctant to adopt more expensive agricultural techniques when there is not a clear crop, soil, or economic benefit.

6.6.2 Forest Type Wise Carbon Stock:

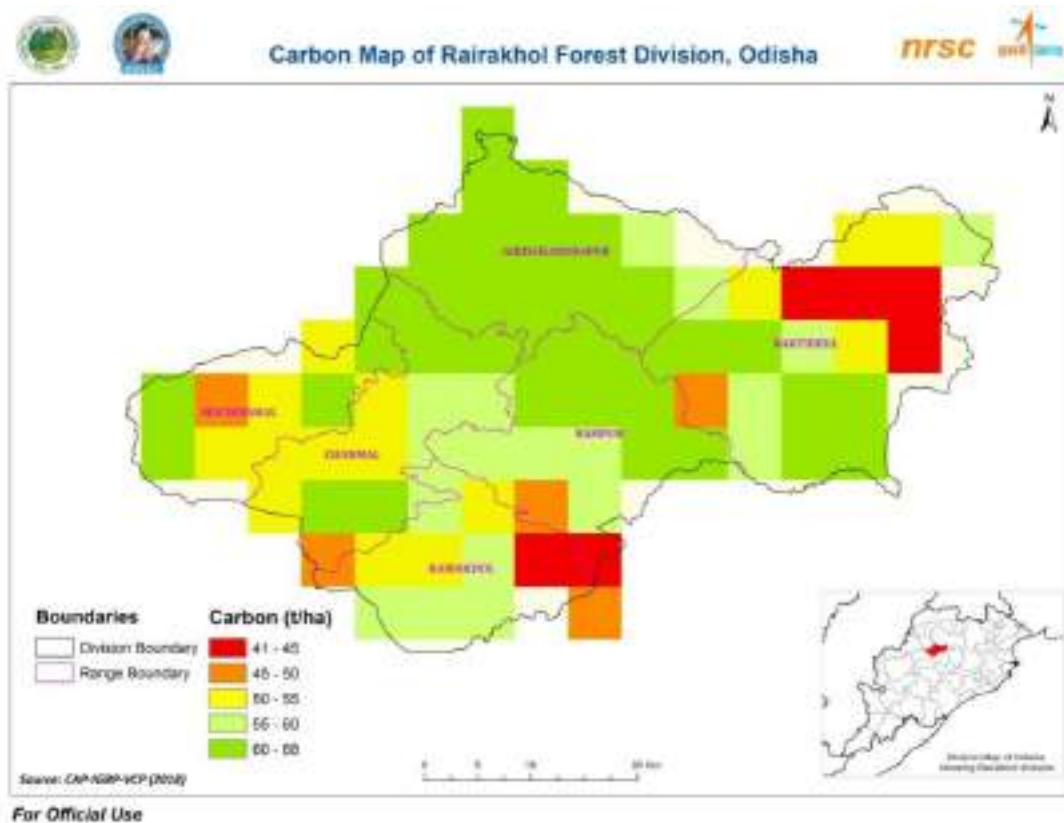
Table No 6.11 Forest Type Carbon Stock

Sl No.	Name of classification	Area in ha	Growing Stock in 10 ³ cum	Growing Stock in 10 ³ T	Carbon in 10 ³ T	Carbon Dioxide Equivalent in 10 ³ T
1	3C Moist Sal Forest	20764.7	2225353	1557.747	607.521	2227.58
2	5B / C Dry Deciduous Sal Forest & Mixed Forest	80140.60	8588668	6012.068	2344.706	8597.26
3	Bamboo (Overlapping)	13400.81		168.00	65.52	240.24
	Div. Total	100905.3	10814021	7737.815	3017.747	11065.08

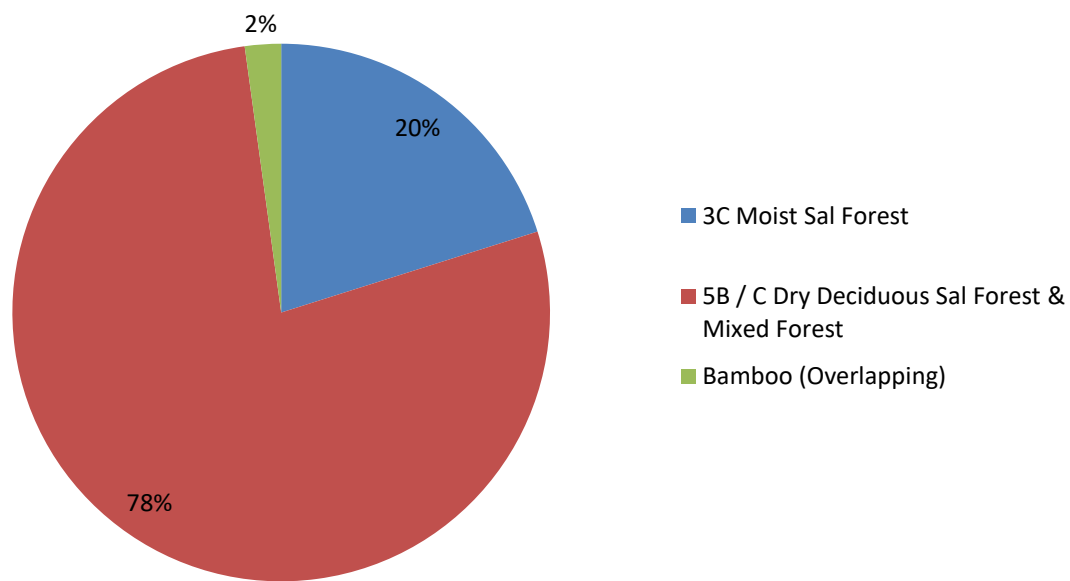
The total carbon stock in Rairakhol Division is estimated to be 30.17x10⁵ Ton which will sequester Carbon dioxide equivalent to 110.65x10⁵ T.



Revised working plan of Rairakhol Division (2021-22 to 2030-31)



Carbon Stock in 10^3 T





6.6.3 Mitigation Measures:

It is a common knowledge that Green House Gases are the cause of Global Warming. The entire world is greatly concerned to increase of GHG specially the CO₂. Photosynthesis is the simplest method to reduce the GHG in the atmosphere. The mitigation measures that can be practiced by a Forester are

- Increase tree cover by woody vegetation on Blank Areas.
- Enrich the existing forest by plantation and crop density may be maintained above 70%
- Allow Ground Flora to cover the Forest Floor.
- Long term Rotation to be adopted than a short term rotation.
- Reduce Forest Fire and release of CO₂.
- Allow a good humus cover to retain soil fertility and vigor.
- Reduce Fire wood consumption in rural areas through improved Chulla / Fire Place.
- Increase life of wooden materials through seasoning & treatment.



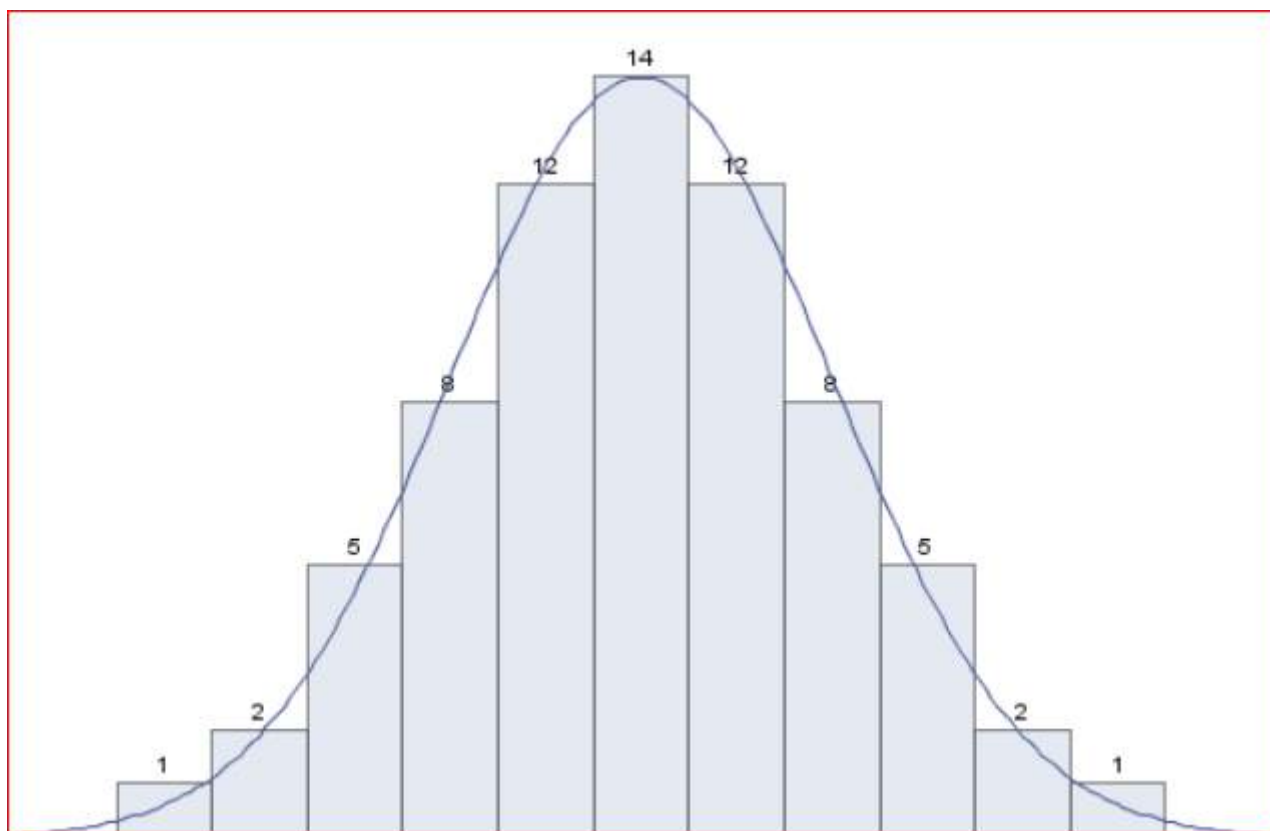


CHAPTER-7

OPTIMIZATION OF FOREST RESOURCE UTILIZATION

7.1 Recorded Removal of Timber:

Rairakhol Division is having good Sal Forest of the State. The growing stock as furnished at Table No 6.5 is well distributed and matches with normal (ideal) distribution pattern.



Considering all aspects the outgoing plan had suggested felling of trees in a practical manner. There are 9 (nine) number of Felling Series in the SWC (Excluding Subarnapur Division Part).



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 7.1 Record Removal of Timber in Cum – Rairakhol Division.

Year	Coupe No.	Area in ha	No. of trees for marking as prescribed	No. of trees Marked/ delivered		Timber production (in cum)	Timber from Other Sources	Total Timber
				Marked and delivered	Nos. of trees felled.			
2007-08	I	9375.45	5401	4803	4803	2004.07	165.887	2169.957
2008-09	II	8482.86	5407	5155	5155	1327.582	29.633	1357.215
2009-10	III	9236.14	5408	4423	4423	1652.4525	10.225	1662.678
2010-11	IV	8712.81	5409	5141	5141	1942.393	79.021	2021.414
2011-12	V	9972.76	5403	5537	5537	2435.735	48.764	2484.499
2012-13	VI	8702.43	5403	5400	5400	2888.26	160.3717	3048.632
2013-14	VII	9106.07	5402	5162	5162	3342.705	202.8919	3545.597
2014-15	VIII	8044.11	5406	5401	5401	3058.941	300.696	3359.637
2015-16	IX	8617.72	5403	5400	5400	3628.491	184.963	3813.454
2016-17	X	8292.80	5420	5197	5197	1244.09	168.128	1412.218
Total		88543.15	54062	51619	51619	23524.72	1350.581	24875.3

Considering the coupe working from 2007-08 to 2016-17, 88543.15 ha of Forest has been workedout as regular coupe and 51619 trees have been marked and felled. Number of trees marked per ha is 1.71 and productivity is 0.281 cum per ha.

7.2 Recorded Removal of Fuel wood:

Table No 7.2 Recorded Removal of Fuel Wood in Stack Volume

Year	Coupe No.	No. of trees Prescribed as per Working Plan	No. of trees Marked/ delivered		Firewood (in stack)	Firewood from other sources	Total
			Marked and delivered to OFDC Ltd.	Nos. of trees felled.			
2007-08	I	5421	4803	4803	906	873	1779
2008-09	II	5400	5155	5155	701	385	1086
2009-10	III	5255	4423	4423	1048	299.5	1347.5
2010-11	IV	5412	5141	5141			
2011-12	V	5538	5537	5537	933	438	1371



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

2012-13	VI	5599	5400	5400	1451	27	1478
2013-14	VII	5421	5162	5162	1009	209	1218
2014-15	VIII	5401	5401	5401	1157	234	1391
2015-16	IX	5400	5400	5400	1274	335	1609
2016-17	X	5415	5197	5197	1098	146	1244
Total		48847	46422	46422	10617	3149.5	13766.5

(NB: 1 Stack= 12'x3'x3')= 1.50 Ton)

7.3 Recorded Removal of Bamboo / Rattans:

Though there was six cutting series prescribed for Bamboo Working in the outgoing plan. No bamboo coupe was worked out and production is NIL.

7.4 Recorded removal of locally important NTFPs including MAPs:

Most of the available NTFP & MAP are now collected by the registered collectors under Gram Panchyat jurisdiction. Records of removal of NTFP except Sal leaf are not available. Kenduleaf is also produced in this tract. Sal leaf locally collected for own consumption. The KL details is furnished below.

7.4.1 Kendu Leaf:

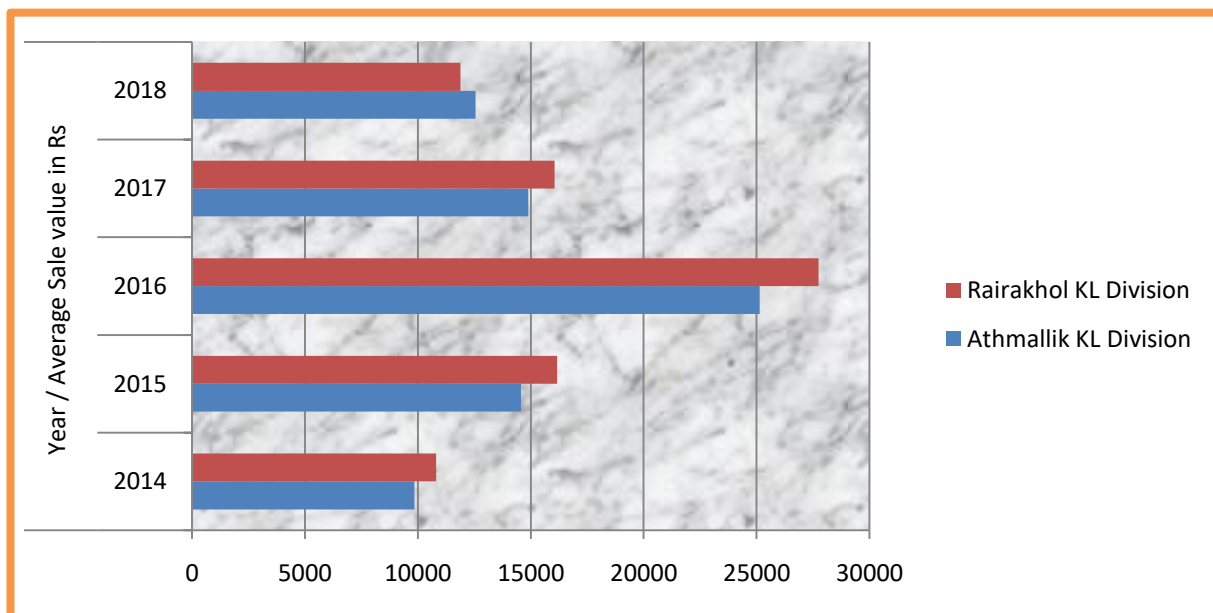
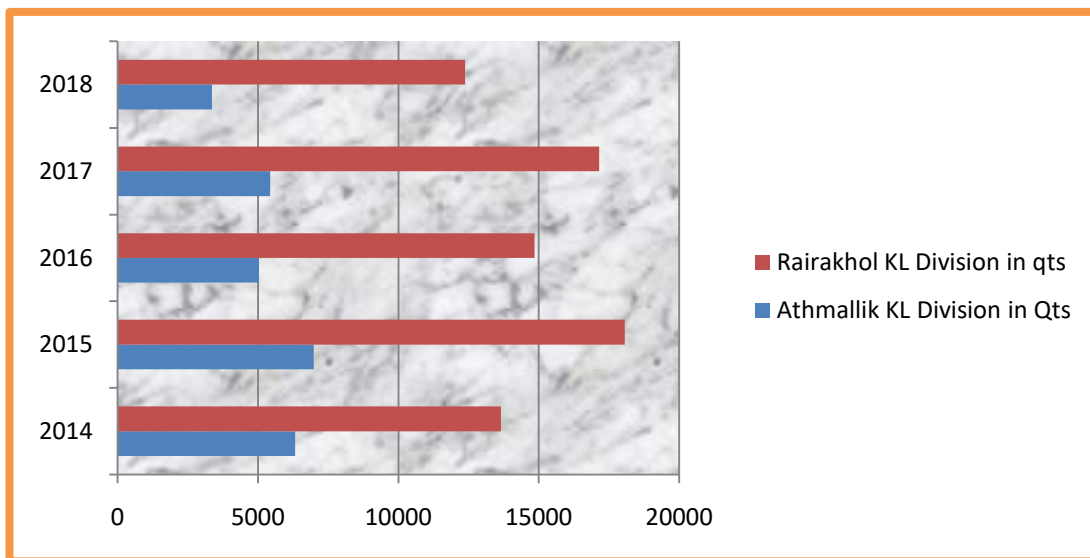
Rairakhol Division is rich in Kenduleaf. Rairakhol KL Division and Athmalik KL Division (Part) are working in the area. The production and average sale value of KL in these divisions are furnished at table No 7.3.

Table No 7.3 Production of Kendu Leaf in Rairakhol KL Division & Part of Athmallik Division.

Name of Division / Sub Division	Year / Production in Qtls.					Year / Average Sale value in Rs				
	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018
Athmallik Division	6324.6	6984.6	5035.8	5434.2	3360.0	9855.79	14561.14	25138.51	14895.54	12549.51
Rairakhol Division	13648.80	18067.80	14849.40	17146.80	12378.60	10809.85	16175.24	27750.43	16062.65	11886.29



Revised working plan of Rairakhol Division (2021-22 to 2030-31)



7.4.2 Siali Leaf / Fiber:

Siali climber is available in Moist Deciduous Forest of this Division. Its concentration is high in Badmal and Girishchandrapur Range. Leafs are used for making Plates / Chaupati. Its fiber is also collected for bundling of Kendu leaf during processing of Kendu Leaf. The leaf & fiber primary collectors are getting a good price.



7.4.3 Kanta Badhuni:

Kanta badhuni, a grass when dry, its stem become strong and people collect the grass when it is dry (January- March). They prepare the broom and sold in the market at good price. It is plentifully available in field bonds, fellow land and near to dry water bed.

7.4.4 Myrobalans& MAP (Medicinal & Aromatic Plants):

Harida, Bahada and Anla are collected from both moist and dry forests. Due to its medicinal value it fetches a good price in the market. The nearby villagers collect MAP from forests.

7.4.5 Sal Seeds.

Sal seed is collected by local people near to Sal forests. Sal seed being an oil seed used for soap making. As its oil extraction process is “vapour evaporation process” and limited extraction facilities are available in Raipur of Chhatisgarh. Its market demand is falling for which collection is reducing day by day.

7.4.6 Mahua Flowers & cornel (Tola).

Mahua flower is moderately collected in this area. Mahua trees are available in Forest & Non Forest area. Flowers are used for preparation of good country liquor for which its demand is always at high level. It gives good and gainful employment to tribal and people near to forests. It is also used as cattle feed. The flower is also liked by Bear, Elephant and other herbivorous animals. Mahua flowers are also used for human cosumption.

Mahua Cornels are collected in a green stage for extraction of Oil which is used as cooking media in rural areas. Collection in massive scale is noticed. The Oil is mostly used for house hold consumption.

7.4.7 Other Fruits / Beries/ Nuts:

Chara, Kendu, Bela, Jamun, Cashew etc are commonly collected during respective season. These collection are marketed in the local market, road side vending is also seen. Its nutritional value is well known. Collection and marketing provides part time engagement to rural people. Neem oil is being extracted and used for medicinal purpose. Tentuli (Tamarind) is also locally collected in this division & locally used.

7.5 Demand & Supply of Timber and important Non- Timber Forest Produce:

Rairakhol division is a forested area and there are many Revenue Forests from which people are meeting their demand for all house hold offers. The local people seldom purchase timber



for construction of House and making household furnitures. The annual Production of Timber from various sources is in between 4000 cum to 5000 cum and mostly purchased by Traders from OFDC Ltd. For academic interest the Demand of Timber / Fuel wood / Bamboo has been estimated.

i) Timber and Poles:

As per 2011 Census there are 27123 House hold within Rairakhol Division. The area is mostly rural. For construction of house poles are useally used rather than Timber. It is estimated that about 2% of the House Hold used to construct House every year and requires about 3 Cum of Timber for construction purpose. Hence timber requirement per annum is $271 \times 2 \times 3 = 1626$ Cum or Say 1650 Cum of timber.

Most of the family used to repair house every year. About 10% of family will required Poles @ 10 numbers per annum Hence 27100 poles or say 27000 poles will be required and the demand persists.

ii) Fuel wood:

Due to rural habitation, dependency on fuelwood is heavy in spite of various plans to supply LPG under many schemes. 50% of House hold in the Division is still depending on Fuel Wood from Forest. The Total House Hold in the Division is 27123. Taking one family using 1 Quintal of Fuel wood per month and 50% of the house hold still depends on Fuel wood, the requirement of Fuel wood has been estimated to be **16275 Ton per Annum. $[(27123/2) \times 1 \times 12]$**

iii) Bamboo:

Bamboo was previously worked out by OFDC Ltd through Raw Material Procurer of various Paper Orient Paper Mill was harvesting Bamboo for its Paper Mill at Brajrajnagar of District Jharsuguda. Now Bamboo is being used by Local bamboo articians for Basket making and People are using bamboo for Thathed House Roof repairing and thatching. In the Division about 200 Bamboo artisans family are engaged in their "Family trade of basket Making". Per day they require about 5 bamboos for 250 days in a year. Hence the requirement is projected at $200 \times 5 \times 250$ i.e. 2,50,000 bamboo is annually required which is about 715 SU= 750 Ton of bamboo.



For annual House repair and thatching 40% of the house hold depends on Bamboo. Hence the requirement @ 15 numbers per Households at a lower side estimates to 162738bambo equivalent to 465 SU= 465 Ton.

The total bamboo requirement for local use is estimated to be at **1215 Ton.**

iv) Sal & Siali Leaf:

Sal Leaf & Siali Leaf are locally collected and use for Khali Plate and Cup for local use and use in Social ceremony. The approximate collection is occularly estimated to be around 100 Ton per annum. These leaves are collected and being marketed in local Village weekly market.

v) Other NTFP:

Other NTFP though locally collected and being marketed there is no major potential to be indicated / estimated.

7.5.1 Timber & Firewood Depot

One Timber and Firewood depot is being maintained Rairakhhol By Odisha Forest Development Corporation Ltd. The Quantum of Forest Produce handled during last 5 years is furnished below.

Table No 7.4 Depot Operated by OFDC Ltd.

Sl No	Name of Depot	Timber sold during last 4 year in Cum				Firewood sold during last 3 year in Ton.			
		2016	2017	2018	2019	2016	2017	2018	2019
1	OFDCLtd. Depot, Luhapunk, Rairakhhol	4451.478	3423.14140	4734.9627	1107.5590	1943.25	1754	5215.25	467.5

7.5.2 Saw Mill:

There is no Licenced Saw Mill in Rairakhhol Division.

7.5.3 NTFP & MAP.

Most of the MAP isherbs / shrubs of annual plants. Due to Ground Fire, it is seriously damaged. Usually, it is observed that in village markets, two / three vendors are selling NTFP & MAP. Mahua Flowers, Sal seeds, Sal leaf and Siali Leaf are directly sold by primery collectors or village middle man.



7.5.4 Demand & Supply:

On demand / Supply of Timber & Firewood, there is a huge gap. There is a strong demand of Furniture wood like Teak, Bija, Kashi, Sisoo, Kuruma, Tentera and its supply is about 25% of the demand. Plywood and molded plastic materials are gradually replacing the timber due to its scarcity and cost prohibitive.

The Timber and Firewood removed from Forests are being sold in State Level Tender and Division Level Auction. These are being purchased by Traders of the State and Outside the state.

Regarding NTFP, the supply is rapidly falling and their secured market is not available. The price is decided mostly by purchasers. Except collection of Mahua Flowers, Kanta badhuni, Sal leaf, Siali leaf & Fiber, char seed and honey others are not so lucrative and assured market.

Kendu Leaf being a nationalized NTFP, its collection & trade is systematic and remunerative to people. Many welfare schemes are also launched by Government to attract people to this trade. Bamboo an important NTFP is also in a decline condition.

As a whole, the NTFP demand is comparatively very high but the supply is much below the expectation.

7.6 Import & Export of Wood & Wood Products:

There is no record of Import & Export of wood and wood products to this division during last five years.

7.7 Import & Export of NTFPs:

There is no record available about import & export of NTFP to / from the division except Kenduleaf. Kenduleaf is normally exported to Srilanka, Bangladesh etc by traders.

7.8 Removal of Fodder:

There is lacking of grazing ground in the tract. Cattle / goat etc are used to graze in the forest even deep inside. Stall feeding practices is very limited. Removal of fodders from Forests by cutting / lopping etc is limited. People used to cut the branches of fodder species and allow the goats / cattle to feed on it. It is not possible to quantify the fodder collected / feed to cattle from forests.



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

7.9 Valuation of Products:

7.9.1 Value of Timber:

The value of timber / Sawn sizes has been obtained from OFDC Ltd for General sale in depots. The same is furnished below. The general sale rates of round timber and sawn timber is collected from OFDC Ltd, Odisha vide memorandum no 132/T/88/2011-12 dated 16.01.2019.

Table 7.5 : Sale Value of Timber

Girth Class	Length Class	Sal, Kasi, Panas	Mehogani Teak, Sisoo (Rose Wood)	Bija, Kendu (With black portion) Haldu/Kurum	Gambhari, Champa	Bandhan, Bali sisoo, Accacia, Tendra, Sirish, Kangada & Mitikina	Asan, Jamu, Neem, Kendu (Without Black portion)	Dhaura, Neem, Kendu, (without black portion)	Harida, Bahada, Mango, Mahula, Kusum, Veru, Sunari, Chakhunda, Mangium and other hard wood	Euclayptus, Simili, Rai, Mai, Salai, Chatiana & other softwood
45 to 59cm	Below 2m	To be sold as poles	12626	To be sold as poles	To be sold as poles	To be sold as poles	To be sold as poles	To be sold as poles	To be sold as poles	To be sold as poles
	2m to under 3.74m	To be sold as poles	16821	To be sold as poles	To be sold as poles	To be sold as poles	To be sold as poles	To be sold as poles	To be sold as poles	To be sold as poles
	3.74m to under 5m	To be sold as poles	23132	To be sold as poles	To be sold as poles	To be sold as poles	To be sold as poles	To be sold as poles	To be sold as poles	To be sold as poles
	5mt & above	To be sold as poles	29404	To be sold as poles	To be sold as poles	To be sold as poles	To be sold as poles	To be sold as poles	To be sold as poles	To be sold as poles
60 to 74cm	Below 2m	12571	26399	16342	15085	11314	8800	5986	4789	3592
	2m to under 3.74m	16353	34341	21259	19624	14718	11447	7787	6230	4672
	3.74m to under 5m	20432	42907	26562	24518	18389	14302	9730	7784	5838
	5mt & above	24510	51471	31863	29412	22059	17157	11672	9337	7003
75 to 89cm	Below 2m	16353	34341	21259	19624	14718	11447	7787	6230	4672
	2m to under 3.74m	20432	42907	26562	24518	18389	14302	9730	7784	5838
	3.74m to under 5m	24510	51471	31863	29412	22059	17157	11672	9337	7003
	5mt & above	28181	59180	36635	33817	25363	19727	13420	10736	8052



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table 7.5 : Sale Value of Timber

Girth Class	Length Class	Sal, Kasi, Panas	Mehogani Teak, Sisoo (Rose Wood)	Bija, Kendu (With black portion) Haldu/Kurum	Gambhari, Champa	Bandhan, Bali sisoo, Accacia, Tendra, Sirish, Kangada & Mitikina	Asan, Jamu, Neem, Kendu (Without Black portion)	Dhaura, Neem, Kendu, (without black portion)	Harida, Bahada, Mango, Mahula, Kusum, Veru, Sunari, Chakhunda, Mangium and other hard wood	Euclayptus, Simili, Rai, Mai, Salai, Chatiana & other softwood
90 to 119cm	Below 2m	23928	45681	28279	26104	19578	15227	10118	8094	6071
	2m to under 3.74m	30597	58412	36160	33378	25034	19471	12643	10114	7586
	3.74m to under 5m	36707	70077	43381	40044	30033	23359	15168	12134	9101
	5mt & above	41259	78767	48760	45010	33757	26256	17446	13956	10467
120 to 149cm	Below 2m	31107	59386	36763	33935	25451	19795	13153	10522	7892
	2m to under 3.74m	39783	75949	47016	43399	32549	25316	16439	13151	9863
	3.74m to under 5m	47731	91123	56410	52070	39053	30374	19724	15779	11834
	5mt & above	53662	102446	63419	58541	43906	34149	22690	18152	13614
150 to 179cm	Below 2m	38878	74222	45947	42413	31810	24741	16439	13151	9863
	2m to under 3.74m	45764	87368	54085	49925	37444	29123	18911	15129	11347
	3.74m to under 5m	50337	96098	59489	54913	41185	32033	20801	16640	12480
	5mt & above	54121	103322	63961	59041	44281	34441	22884	18307	137330
180cm & above	Below 2m	41768	79739	49362	45565	34174	26580	18082	14465	10849
	2m to under 3.74m	47022	89769	55571	51296	38472	29923	19883	15906	11930
	3.74m to under 5m	51741	98778	61148	56444	42333	32926	21878	17502	13127
	5mt & above	55595	106136	65703	60649	45487	35379	24067	19254	14440



7.9.2 Value of Firewood:

Table No 7.6 Sale value of Firewood Per Qtls.				
Sl No	Name of FW Depot	Rate per Qtls (Billets)		
		2016	2017	2018
1	Luhapank Timber depot, Rairakhol	280/-	280/-	280/-

7.9.3 Auction Sale Result:

Timber and Firewood are being sold from Luhapunk Timber Depot of OFDC Ltd. The average Sale Price obtained in Tender / auction during July- September 2020 quarter is at Annexure – IX.

7.9.4 Value of NTFP.

The value of NTFP like Sal leaf, Mahua Flower, Sialifiber etc are fixed by District Pricing Committee. The forest staff also collected information from village markets. The same is produced below. The Pricing Committee of various Blocks have not fixed any Price for NTFP in Rairakhol / Naktideul Block.

Table 7.7 Value of NTFP- Rairakhol Division				
Sl No	Name of product	Unit	Sale Price in Rs	Source of information.
1	Kendu leaf	Bundle of 20 nos	1.00	Kenduleaf wing.
2	Sal Seeds	Kg	12.00-15.00	Local market.
3	Mahua Flower	Kg	20.00-22.00	
4	Siali Fiber	Bondle of 20 strips.	14.00-15.00	
6	Harida	Kg	60.00	
7	Bahada	Kg	25.00	
8	Anala	Kg	40.00	
9	Kanta badhuni	Per Piece	12.00	
10	Siali Leaf	Bundle of 30 nos	17.00	
11	Char	Kg	45.00	
12	Kendu	Kg	55.00	





CHAPTER-8

MAINTENANCE & ENHANCEMENT OF SOCIAL, ECONOMIC, CULTURAL AND SPIRITUAL BENEFITS

8.1 Number of JFM Committees and areas protected by them:

The process of Joint Forest Management initiated during Social Forestry Project in 1985. Under Social Forestry Project, The village Forest so created assigned to Village Forest Committee for its management under Village Forest Rule -1985. Subsequently Forest Protection Committee was constituted under Resolution 1988 and protection of forest fringe area was assigned. Afterwards a comprehensive JFM Resolution came up during 1993 with elaborated provisions. Vana Samrakshyana Samiti – VSS developed / Constituted under the provisions of Resolution. Afterwards Forest Development Agency (FDA) – a common forum of VSS developed under National Afforestation Program (NAP) from 2002 onwards. There after OFSDP sector operated in 11 divisions with full scale participatory approach from 2006. With a view to consolidate all developments in joint forest management and address legal matters those came up in the management process, JFM Resolution 2011 formulated. Subsequently amendment has been made to provisions of JFM Resolution 2011 vide Notification No 9182/F&E dated 1st June 2015 and 2019 (copy at Annexure-Xa& Xb)

Out of all projects in Forest Department, Ama Jangala Yojana (AJY) is a Special project in Odisha. Redhakhhol Forest Division is one of the Divisions in which AJY has made a mark covering 160 nos of VSS in 6 Nos of FMUs. Several works like community mobilization, survey, demarcation, pillar posting and ANR work are being done by the villagers with the assistance of partner NGO.

The AJY Scheme aims to achieve sustainable forest management in the project area through forest restoration initiatives, along with providing income generating and livelihood opportunities to the forest dependent communities, so that the pressure on adjoining forests is relieved/ reduced. The main project objectives of AJY Scheme are listed below:

1. To conserve and restore degraded forests through forest restoration initiatives.
2. To arrest further degradation of forests through participatory forest conservation and management strategy.



3. To empower forest dependent communities by building up their capacity to participate in the sustainable forest management.
4. To improve the livelihood opportunities of the forest dependent communities so as to reduce their dependence on forests.

Under AJY, an area of up to 50 ha. will be assigned to each VSS out of which 10 ha. will be maintained as the control plot, 5 ha. will be the demonstration plot and the remaining 35 ha. will be for taking up Aided Natural Regeneration (ANR) with gap planting at the rate of 200 plants per hectare. In about 500 VSSs, where suitable land for ANR with gap is not available, an area of 10 ha. will be covered under Block Plantations.

8.1.1 VSS(Vana Surakshya Samiti) Constituted under AJY.

In Rairakhol Division there are 160 VSS in operation. The Range wise list of VSS, Area assigned etc are furnished at Table No 8.1

Table No 8.1 List of VSS - Rairakhol Division

Table No 8.1 List of VSS - Rairakhol Division						
Sl No	Name of the VSS	Name of Village	Type of forest land forest area allotted (in Ha.)			Total
			RF	PRF	Revenue For. Land	
Charmal Range						
1	Mahaling	Mahaling			55.0	55.0
2	Bansajal	Bansajal			60.0	60.0
3	Brahmani	Brahmani	53			53.0
4	Koilipadar	Koilipadar		50		50.0
5	Helei	Helei			51.0	51.0
6	Musakata	Musakata		55.2		55.2
7	Sanhindol	Sanhindol		60.5		60.5
8	Erundibahal	Erundibahal			55.6	55.6
9	Senaghati	Senaghati	56.30			56.3
10	Garagadbahal	Garagadbahal	54.4			54.4
11	Kusumbahali	Kusumbahali			60.1	60.1
12	Dimirimunda	Dimirimunda		53.4		53.4
13	Badberna	Badberna			50.0	50.0
14	Bhadidar	Bhadidar			100.0	100.0
15	Dangapathar	Dangapathar			50.0	50.0
16	Khubel	Khubel	100			100.0



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Table No 8.1 List of VSS - Rairakhol Division

Sl No	Name of the VSS	Name of Village	Type of forest land forest area allotted (in Ha.)			Total
			RF	PRF	Revenue For. Land	
17	Mugpal	Mugpal			100.0	100.0
18	Sarapal	Sarapal			100.0	100.0
19	Berhampura	Berhampura		50		50.0
	Range Total		263.7	269.1	681.7	1214.5
Girishchandrapur Range						
20	Badbahal	Badbahal	45.0		45.0	90.0
21	Brahmanipali	Brahmanipali	50.0		50.0	100.0
22	Buramal	Buramal			63.0	63.0
23	Burbuda	Burbuda			80.0	80.0
24	Dhalpur	Dhalpur	100.0			100.0
25	Gaudpali	Gaudpali			100.0	100.0
26	Hiraloi	Hiraloi	50.0		50.0	100.0
27	Jaresingha	Jaresingha			101.0	101.0
28	Kanchanpur	Kanchanpur			60.0	60.0
29	Khamarbahal	Khamarbahal	110.0			110.0
30	Kisinda	Kisinda	100.0			100.0
31	Machhudihi	Machhudihi	100.0			100.0
32	Phulkusum	Phulkusum			50.0	50.0
33	Pithauguda	Pithauguda			80.0	80.0
34	Podamal	Podamal			100.0	100.0
35	Ranja	Ranja	100.0			100.0
36	Dimirikuda	Dimirikuda	90.3			90.3
37	Loisingh	Loisingh			59.9	59.9
38	Gariakhaman	Gariakhaman	51.9			51.9
39	Nuagaon	Nuagaon			58.8	58.8
40	Phatamunda	Phatamunda	196.0			196.0
41	Kankdar	Kankdar	120.0			120.0
42	Balikutha	Balikutha	52.6			52.6
43	Balat	Balat			60.0	60.0
44	Talab	Talab			101.0	101.0
45	Luhabir	Luhabir	101.0			101.0
46	Tileimal	Tileimal	147.0			147.0



Table No 8.1 List of VSS - Rairakhol Division

SI No	Name of the VSS	Name of Village	Type of forest land forest area allotted (in Ha.)			Total
			RF	PRF	Revenue For. Land	
47	Ganjabahal	Ganjabahal	62.0			62.0
48	Betjharan	Betjharan	54.0			54.0
49	kholgarh	kholgarh	61.0			61.0
50	Mangalpur	Mangalpur	55.0			55.0
51	Dhalatoila	Dhalatoila	52.0			52.0
	Range Total		1697.8		1058.7	2756.5
Badmal Range						
52	Badpati	Badpati			50.0	50.0
53	Balbaspur	Balbaspur			50.0	50.0
54	Bhaluchua	Bhaluchua			50.0	50.0
55	Chakamunda	Chakamunda			50.0	50.0
56	Jhankarpali	Jhankarpali			50.0	50.0
57	Kasanda	Kasanda			50.0	50.0
58	Tudabahal	Tudabahal			50.0	50.0
59	Kaudiapali	Kaudiapali			50.0	50.0
60	Mochibahal	Mochibahal			80.0	80.0
61	Palsamal	Palsamal			50.0	50.0
62	Satsama	Satsama			50.0	50.0
63	Kuakhol	Kuakhol			50.0	50.0
64	Sunamodi	Sunamodi			50.0	50.0
65	Telighana	Telighana			50.0	50.0
66	Sagjoree	Sagjoree			50.0	50.0
67	Khairtap	Khairtap			50.0	50.0
68	Lamtidadar	Lamtidadar			50.0	50.0
69	Bandhataila	Bandhataila			50.0	50.0
70	Piplikani	Piplikani			50.0	50.0
71	Satyanandapali	Satyanandapali			50.0	50.0
72	Lakthakpali	Lakthakpali			50.0	50.0
73	Ladlada	Ladlada			50.0	50.0
74	Kuliabahali	Kuliabahali			50.0	50.0
75	Khandsi	Khandsi	50.0			50.0
76	Ghantadhala	Ghantadhala		50.0		50.0



Table No 8.1 List of VSS - Rairakhol Division

Sl No	Name of the VSS	Name of Village	Type of forest land forest area allotted (in Ha.)			Total
			RF	PRF	Revenue For. Land	
77	Sangrampur	Sangrampur		50.0		50.0
78	Kadalipali	Kadalipali		50.0		50.0
	Range Total		50.0	150.0	1180.0	1380.0
Naktideul Range						
79	Baghbar	Baghbar			100.0	100.0
80	Hitasara	Hitasara			100.0	100.0
81	Bhalugadia	Bhalugadia	98.0			98.0
82	Chemerda	Chemerda			50.0	50.0
83	Katrapali	Katrapali			101.0	101.0
84	Tiklipada	Tiklipada			100.0	100.0
85	Dhatukimal	Dhatukimal			50.0	50.0
86	Dhauragoth	Dhauragoth			100.0	100.0
87	Kadobahali	Kadobahali			50.0	50.0
88	Kardakhman	Kardakhman			100.0	100.0
89	Khetrapur	Khetrapur			50.0	50.0
90	Koing	Koing			50.0	50.0
91	Losara	Losara			50.0	50.0
92	Palsaburi	Palsaburi	50.0			50.0
93	Pandrisila	Pandrisila			50.0	50.0
94	Panunali	Panunali	50.0			50.0
95	Rail	Rail			50.0	50.0
96	Sarapali	Sarapali			50.0	50.0
97	Mahakud	Mahakud	150.0			150.0
98	Kudanali	Kudanali	55.0			55.0
99	Tileimal	Tileimal			50.0	50.0
100	Kaunsipal	Kaunsipal			50.0	50.0
101	Chadchadi	Chadchadi		94.0		94.0
102	Jamjoree	Jamjoree			57.1	57.1
103	Hitasara(Baul pada &Mathasahi)	Hitasara(Baul pada &Mathasahi)	206.0			206.0
104	Bhetiaberni	Bhetiaberni	67.2			67.2
105	Angabira	Angabira			184.0	184.0



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Table No 8.1 List of VSS - Rairakhol Division

Sl No	Name of the VSS	Name of Village	Type of forest land forest area allotted (in Ha.)			Total
			RF	PRF	Revenue For. Land	
106	Kadobahali(Talipada)	Kadobahali(Talipada)			81.4	81.4
107	Kunjamura	Kunjamura			61.0	61.0
108	Bindupur	Bindupur			92.3	92.3
109	Dahimal	Dahimal			194.0	194.0
110	Bijagarh	Bijagarh			82.4	82.4
111	Gajalaxmi VSS,Hitasara	Gajalaxmi VSS,Hitasara	70.0			70.0
	Range Total		746.20	94.00	1903.20	2743.40
	Badbahal Range					
112	Ambjchori	Ambjchori	100.0			100.0
113	Dhaurakhman	Dhaurakhman	100.0			100.0
114	Haripur	Haripur			100.0	100.0
115	Kardapal	Kardapal			60.0	60.0
116	Kasibahal	Kasibahal	50.0		50.0	100.0
117	Kendumunda	Kendumunda			60.0	60.0
118	Khandam	Khandam			80.0	80.0
119	Kusapali	Kusapali			80.0	80.0
120	Pandkimal	Pandkimal			100.0	100.0
121	Sisuparna	Sisuparna			100.0	100.0
122	Jhamkarei	Jhamkarei			50.0	50.0
123	Sanrengali	Sanrengali		100.0		100.0
124	Podabalanda	Podabalanda		100.0		100.0
125	Bhaluchua	Bhaluchua			50.0	50.0
126	Mahatpur	Mahatpur	70.0			70.0
127	Arkhakud	Arkhakud			60.0	60.0
128	Kuhi	Kuhi			53.0	53.0
129	Tumbamal	Tumbamal	70.0			70.0
130	Purunagarh	Purunagarh			100.0	100.0
131	Badbahal	Badbahal			59.0	59.0
132	Badkuda	Badkuda			55.0	55.0
133	Rahan VSS	Rahan VSS	50.0			50.0



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 8.1 List of VSS - Rairakhol Division

Sl No	Name of the VSS	Name of Village	Type of forest land forest area allotted (in Ha.)			Total
			RF	PRF	Revenue For. Land	
134	Godakhol VSS	Godakhol VSS			50.0	50.0
135	Sudamunda VSS	Sudamunda VSS	50.0			50.0
136	Badkhol	Badkhol	50.0			50.0
137	Khajurijharan VSS	Khajurijharan VSS	50.0			50.0
	Range Total		590.0	200.0	1107.0	1897.0
	Rairakhol Range					
138	Budhipani	Budhipani			100.0	100.0
139	Chhatarpur	Chhatarpur			100.0	100.0
140	Daincha	Daincha			100.0	100.0
141	Dalki	Dalki			120.0	120.0
142	Hemamura	Hemamura			50.0	50.0
143	Hinterai	Hinterai			100.0	100.0
144	Jaripani	Jaripani			60.0	60.0
145	Jhinkidadar	Jhinkidadar			50.0	50.0
146	Laiza	Laiza			100.0	100.0
147	Mahaling	Mahaling			100.0	100.0
148	Maulabhanja	Maulabhanja			50.0	50.0
149	Rukunipur	Rukunipur			50.0	50.0
150	Similipal	Similipal			100.0	100.0
151	Sadhumunda	Sadhumunda			50.0	50.0
152	Charbati	Charbati			50.0	50.0
153	Gagua	Gagua			100.0	100.0
154	Patulipali	Patulipali		100.0		100.0
155	Terbeda	Terbeda			50.0	50.0
156	Gopalpur	Gopalpur	56.0			56.0
157	Dhunkchhali	Dhunkchhali	51.7			51.7
158	Maa Bhubaneswari ,VSS ,Daincha	Daincha	50.0			50.0
159	Tandabira VSS	Tandabira	50.0			50.0
160	Sampur VSS	Sampur	50.0			50.0
	Range Total		257.7	100.0	1330.0	1687.7
	Div. Total		3605.4	813.1	7260.6	11679.1

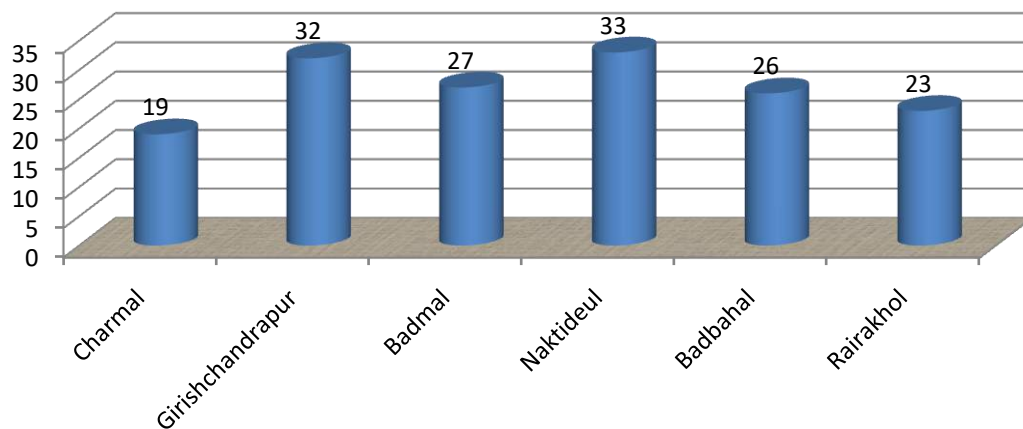


8.1.1.1 ABSTRACT of VSS Constituted:

Table 8.1(a) Abstract of VSS constituted

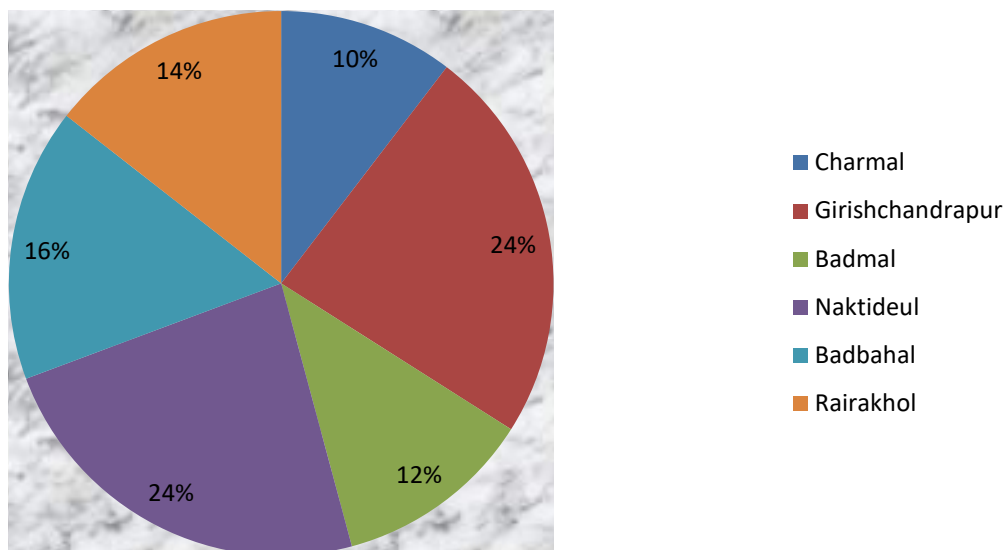
Range	No of VSS Constituted	Area assigned to VSS in ha			
		RF	PRF	Rev. Forest	Total
Charmal	19	263.7	269.1	681.7	1214.5
Girishchandrapur	32	1697.8	0	1058.7	2756.5
Badmal	27	50.0	150.0	1180.0	1380.0
Naktideul	33	746.20	94.00	1903.20	2743.40
Badbahal	26	590.0	200.0	1107.0	1897.0
Rairakhol	23	257.7	100.0	1330.0	1687.7
Div. Total	160	3605.4	813.1	7260.6	11679.1

No of VSS Constituted





Area assigned in Ha



8.1.2 Functioning of Village Forest Committee (VFC).

Plantations have been raised in this division during Social Forestry Project during 1985 onwards till 1995 which has been declared as village forest under section 30 of the Odisha Forest Act, 1972. The detail list of Village forest is at Para 2.1.3. There is one VFC for each village.

Table No 8.2 List of Village Forest Committee in Rairakhol Division

Sl. No.	Range	Name of V.F.	Comp. No.	Area as per Notification		GIS area (in Ha.)
				Notification No	Area (in Ha)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	Naktideul	Bindpur	-	No.1981-AFFN (DIDA)-F&E dt. 28.01.1992	30.0	57.86
	Total 1 block				30.00	57.86



8.2 Status of empowerment of JFMCs:

The empowerment of JFMC is at a medium to higher level. The Villagers are taking interest in Protection & Management of Forest assigned to them. Under National Afforestation Program, the involvement of VSS is of Participation level-V i.e.

- i) They resolve what operation to be taken up along with work program.
- ii) They prepare the Micro plan and work accordingly.
- iii) Funds directly transferred from MoEF&CC to FDA at Division Level. There after it is transferred to VSS account.
- iv) They withdraw and furnish account directly to the Secretary of FDA i.e. Divisional Forest Officer.
- v) The account is audited by Chartered Accountant & passed by the General Body of the VSS.
- vi) Training camps being organized to disseminate knowledge to VSS on forest management and allow them to become technically sound to manage plantations / Forest/ wildlife etc

The VSS functions as an independent decision taking body.

8.3 Labour welfare:

For uplift of labours, occasional health camps, Skill up-gradation training camps are being conducted by the department. No such camps have been organized within last five years.

8.3.1 Socio Economic Study:

No Socio Economic study has been conducted by the Forest department to ascertain economic status of villages and effect of Forest on improvement of Socio Economic status. The Economic study conducted in the State during 2014-15 by Planning & Coordination Department is at **Annexure-XI**.

8.4 Use of indigenous knowledge:

The people in Odisha were more traditional in nature believing the faith and practices of the local communities. They happened to manage their livelihood through agriculture and maintained an indigenous life with their own knowledge system. They used to maintain the long-standing traditions from their ancestors and spread the knowledge in different spheres of livelihood. Such socially generated knowledge is popularly called as **local knowledge**. The on-going practice of using such knowledge for indigenous communities established the belief



that such knowledge used in traditional manner was fruitful for the people. In course of time **such personalized knowledge took the shape of Indigenous Knowledge (IK)** which was confined to a particular community and locality and specific knowledge seekers find the effective use of such traditional knowledge for indigenous people and are interested to preserve the knowledge for the communities. It is an established fact that India has long and strong racial, cultural and ethnic groups that generate a traditional knowledge system for its people. The ethnic minorities, rural and tribal populations, women and other disadvantaged communities in India who are deprived of economic, political and social benefits are more dependable upon such knowledge system for their livelihood. With the modernization of the present society, the needs of those disadvantaged populations were brought to the limelight and their knowledge system was given the importance. Similar phenomenon is gaining ground in other countries in the world where the local knowledge of the communities are treated as the real knowledge for survival. The concept of indigenous knowledge gained its world wide recognition through the United Nations Conference on Environment and Education in 1992, World Conservation Strategy of International Union and Conservations of Natural Resources in 1980, Brundtland Commission, and World Commission on Environment and Development, 1987. These events recognized the existence of indigenous knowledge in every country, society, culture. Since India has a long history and much enriched culture there is abundant reservoir of indigenous knowledge in every part of the country. Similarly Odisha is a historical land having enriched cultural heritage which has varied communities and immense resources. Its flora and fauna are vast and varied in nature. The State has a large number of tribal communities who appear to live on their own knowledge system. The term indigenous knowledge has different connotations such as, traditional knowledge, local knowledge, community knowledge, rural people's knowledge, farmer's knowledge. Although the concept has different forms the meaning appears to be synonymous. According to Grenier (1998) indigenous knowledge is the traditional knowledge of the local community existing within and developed around the specific conditions of women and men indigenous to a particular geographical area. It is not confined to the rural people rather any community possessing indigenous knowledge- rural or urban, settled or nomadic, original inhabitants and migrants. Indigenous knowledge is referred to not only to the knowledge of indigenous people but also the intellectual property of other communities. There are many facets involved in the indigenous knowledge such as, information of the communities, beliefs on religious faiths, tools of using in agriculture, materials in house construction work,



experimentation in farming and healthcare, natural resources in flora and fauna, human resources and expertise in skilled artisans, education and learning and communication of information. Indigenous knowledge is found in people's memories and activities and is expressed in the form of stories, songs, folklores, proverbs, dance myths, cultural values, beliefs, rituals, community laws, local language and taxonomy, agricultural practices, equipments, materials, plant species, and animal breeds.

Significance of Indigenous Knowledge: Indigenous knowledge is primarily inherited from the ancestors through generations of the community. Such knowledge stands as the main source of utilization and management of resources. It is not only a self centered knowledge but a collecting knowledge, the collection of phenomena and experiences which the older people also. Such knowledge is confined to few people who shared influenced others in a restricted manner. The people in older times were more spiritual, religious, God- fearing and believing in virtuous livelihood. They believed that their living will be happy and prosperous if they work in a systematic manner with certain beliefs and practices. Such beliefs of a locality bear fruits for their existence. Indigenous Traditional Knowledge is developed and adopted continuously to a changing environment and passed on from generation to generation. The livelihood of rural population mainly depends on certain experiencebased knowledge which is essential for their survival. Such knowledge system has embraced many areas of the peoples activities such as health, education, agriculture, animal husbandry, handicrafts, religion, culture and tradition of a local community. The people in those days used to practice such knowledge for sustainable development. The knowledge is basically used to cure diseases of human as well as animal and to develop nutrition, to bring out better agricultural systems in farming, to improve the arts and craft, and to maintain the religious practices and astrological beliefs. Indigenous knowledge is embedded in community practices, institutions, relationships and rituals. It provides the basis for problem solving strategies for the communities.

Sources of Indigenous Traditional Knowledge: The sources of the traditional knowledge mainly derived from the human experiences, beliefs and practices which are collected from several sources. There are also semi-recorded information such as manuscripts, photographs, and folk literature and grey literature. Ancient people had developed the Vedas, Puranas, religious books, grey literature, ethno-botanical texts and archaeological deposits which were the sources of knowledge for those people. Those sources give detail account of the life of the ancient people and the method of living in a prosperous way. Again those sources also



give information about biotechniques, medicinal knowledge, breeding techniques, agricultural farming systems, healthcare techniques, religious and astrological guidelines and cultural artifacts. Some of the indigenous traditional knowledge are available in written form in primary, secondary and tertiary sources of information. But most of the indigenous traditional knowledge are undocumented and are available orally or in memory of the group of the community of a region or area. Indigenous Traditional Knowledge in Odisha is widely scatted and fragile and there is a need to integrate those distributed sources of information in concrete form. Although religious books which give a lot of information about indigenous traditional knowledge are least used in present time. There is greater need to accumulate and acquire to collect information and make documentation of such knowledge. While tribal communities frequently use such knowledge which is essential to trace the sources of information of indigenous traditional knowledge among tribal communities.

Documenting the Indigenous Knowledge: The origin of indigenous knowledge can be traced back to the ancient period. People used such knowledge from generation to generation for their livelihood in an unaccounted manner. There are no such written documents for recording and dissemination of such knowledge. It is found that such knowledge system is essential for development. It must be gathered and documented for a particular community. Collection and storage of indigenous knowledge should be supplemented with adequate dissemination and exchange among interested parties using newsletter, journals and other media. In order to develop an indigenous traditional knowledge system in Odisha, it is essential to prepare a documentation and archival repository.

Although collection of indigenous traditional knowledge is difficult, adequate attention is necessary to convince the indigenous traditional knowledge owners to share their knowledge by protecting their intellectual property. After collecting those knowledge it is essential to record the list of such indigenous traditional knowledge facets available to different parts of the state.

8.5 Extent of Culture / Sacred groves:

The people of Western, Odisha are inhabited by tribals and they have, in fact, shaped the real art and culture which highlights the non-sophisticated folk indentifying their traditional life. Truly speaking, art and culture of this region identity the creative faculty of this soil. The overall West Odishian art and culture, its genuine native air, beautiful natural surroundings etc. give a projection of rural picture which is universal in mind and heart. In nutshell,



Western Odisha displays a descriptive picture of tribal culture, focusing on rituals, belief, practices, ideologies, social and kingship organization, dance, music, song, dormitory system, dress, ornaments, festivals, food and drink, languages, heritage etc. but in between the tradition and the modernity.

Sambalpur serves as the gateway to the bewitching western zone of Odisha. It is the epicenter of a very high profile and rich culture. Its culture and art is an unique proposition of dance, music, handicraft, believes, social values, traditional practices etc.

Dalkhai Dance

Young girls of Binjhals, Soura and Mirdha tribes perform this dance during Dussehra, Bhaijuntia and other festive occasions. The young girls stand in a line or in a semicircular pattern with song known as Dalkhai songs.

Karma Dance

Karma is the most colorful dance of the District. It is a tribal dance in honour of “Karam Sain”, the deity who grants children, as they believe. In the beginning the dancers enter the dancing arena in two rows. The drummers and the singers accompany with rhythmic steps.

Humo & Bauli

These are two playful dances performed by young and un-married girls on special occasions that sing and dance in groups. The stepping and movements of the dance are very slow.

Koisabadi Dance

This dance is prevalent among the Gond and the Bhuyan tribes. Male dancers take part, holding a two feet long stick. The songs are mainly based on the immortal love story of Radha and Krishna.

Use of Musical Instruments in Jharsuguda / Sambalpur

The Folk instruments which are in vogue in Sambalpur Region are Dhole, Madal, Nishan, Tasa, Pakhoj, Banshi, Bir- Kahali, Gini, Ektara, Muhuri, Ghulgula, Ghunguru, Jhanj etc.

Dhole

It is an age old instrument of Indian Folk Music. The Dhole of Sambalpur is slightly different in its making and use. It is made of trunk of a tree. Both the side of the Dhole is of same size. Sambalpur Dhole can be used for any type of Sambalpuri Folk Song.



Madal

The Sambalpuri Madal is different from that of all other parts of India. The Madal is made out of fired clay and is like a cylinder. Madal is a drum which is used in slower rhythms. Most of the non-dance songs are accomplished with the Madal.

Nishan

Nishan is made out of iron sheets. The sound emitted by the Nishan is heart-throbbing. This is mostly used in worship of Kali or Durga and in the battle field.

Tasha

Tasha is played by two thin bamboo sticks. The sound of Tasha creates an atmosphere of horror, fear and excitement.

Festivals

Sital Sasthi

It is the Marriage Ceremony of Lord Shiva with Goddess Parvati. The festival is observed in the month of June with pomp and ceremony at Sambalpur and is extended for a week. Pilgrims from the neighboring Districts and States of Madhya Pradesh and Bihar also participate in the festival. Lakhs of people congregate in this week long festival, mostly in the month of June every year.

Nuakhai

This is the most important social festival of Sambalpur. Generally it takes place during the month of August and September. Preliminary preparation of the festival starts 15 days before the occasion. The first grains of the paddy crop, cooked into various dishes are offered to the deities. There after the eldest member of the family distributes new rice to the junior members of the family. All the household articles are cleaned. People greet each other. It is a community festival celebrated by every Hindu family low and high.

Bhaijiuntia

It is mostly known only in the region of Western Odisha. Bhaijiuntia festival is celebrated on the Mahastami Day of Durga Puja. It is a total fasting undertaken by girls and women for the whole day and night to seek Goddess Durga's blessing for the long life of their brothers(in Oriya language, it is called bhai).

Puajiuntia

It is another fasting Puja of similar austerity for women of the area. The Puajiuntia festival is observed by mothers to invoke the grace of Lord Dutibahana for the long life and prosperity of their sons. Besides the above listed festivals, other religious festivals are also observed in



the District. These include Shiva Ratri, Dola Jatra, Durga Puja, Janmastami, Dipavali, Ganesh Puja and Saraswati Puja. Shiva Ratri Mela at Huma attracts a large number of devotees. Ratha Jatra is held at almost all central places of Sambalpur. On the occasion of Makara Jatra, a fair is held at Themra in Sambalpur. The most popular festivals celebrated by Muslims are Id-UI-Fitre, Id-UI-Juha and Muharram. The Sikhs also celebrate the Birth Day of Guru Nanak.

8.5.1 Sacred Groves:

There are number of Sacread Groves in the Division which is being maintained by the department. The list is furnished at Table No 8.3

Table No.8.3 List of Sacred Groves Redhakhol Division

Sl No	Name of the Range	Name of Sacred Groves & address	Latitude	Longitude	Approximated Area.In Ha
1	2	3	4	5	6
1	Redhakhol	Baishnabhuli Luhapank Section Kutasingha Beat	21 ⁰ 03' 58.9" N	84 ⁰ 25' 53.4" E	0.2
2	Redhakhol	Sadhumunda Luhapank section Kutasingha Beat	21 ⁰ 02' 52.5" N	84 ⁰ 26' 37.2" E	0.2
3	Badmal	Badmal	21 ⁰ 05' 34.20" N	84 ⁰ 02' 48.50" E	0.071
4	Badmal	Lamkheta	21 ⁰ 08' 12.52" N	84 ⁰ 10' 21.60" E	0.07
	4 Site				0.541

8.6 Eco-tourism areas and activities:

There is no Site in the Division for development of Eco Tourism.

8.7 Social Customs (As relates to Forests):

There is no specific social custom as related to Forests being followed in the society of this Division.



8.8 Status of Compliance of Forest Right Act (FRA):

Under Forests Rights act, 2006 till December'2018 1099 cases has been decided in favour of applicants and 815.961 hectares (2288.91 Ac) of Forest land has been given to Tribals under individual category.

Table No 8.4 Implementation of Forest Right Act, 2006			
Sl. No	Description	Individual	Community
1	Name of the Dist./Sub-Division	Sambalpur	
2	No. of village in the District		350
2(A)	No. of villages fully covered so far (Total)		179
3	No. of Gram Sabha meeting held		350
4	No. of Gram Sabha meeting held subsequently		501
5	No. of FRCs constituted by Gram Sabha		350
6	No. of claims received by FRCs		2948
7	No. of claims verified by FRCs & sent to Gram Sabha (out of Col.7)		2948
GRAM SABHA LEVEL			
8	No. of claims approved by Gram Sabha & sent to SDLC		2737
9	Area involved (in acres) & No. of families Area (in acres)		3321.75
10	No. of families		2737
11	No. of claims rejected by Gram Sabha		-
12	No. of claims remanded to FRCs		-
12(A)	No. of Gram Sabha confirming completion of recognition on claims so far (Total)		179
SUB-DIVISIONAL COMMITTEE LEVEL			
13	No. of claims approved by SDLC (Sub-Division wise) & sent to DLC		1051
14	Area involved (in acres) & No. of families		2320.61
	Area (in acres)		
15	No. of families		1051
16	No. of claims rejected by SDLC		1073
17	No. of claims remanded to Gram Sabha		613



Table No 8.4 Implementation of Forest Right Act, 2006

Sl. No	Description	Individual	Community
17(A)	No. of Sub-Division confirming completion of Recognition on claims so far (Total)		1051
DISTRICT LEVEL COMMITTEE LEVEL			
18	No. of claims approved by DLC for title		1051
19	Area involved (in acres) & No. of families		2320.61
	Area (in acres)		
20	No. of families		1051
21	No. of claims rejected by DLC		-
22	No. of claims remanded by SDLC		-
23	No. of certificate of titles distributed		1036
24	Area in acres		2293.50
25	No. of certificate of titles distributed to PTG		-
26	Area in acres		-
27	No. of claims uploaded in Web Site (MOTA)		962
N.B.- ALL CLAIMS SETTLED IN FAVOUR OF SCHIDULED TRIBE			

8.8.1: Detailed of Forest Land Diverted for Non-Forest use Under FRA, 2006

Forest land has been diverted for Non Forestry used in 25 cases involving 11.8585 ha of Forest land as detailed in Table No 8.6 Under community category.



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Table No 8.5 Land Diverted for Non Forestry Purpose under FRA,2006

SL.N o.	Name of the Project	Name of the Tahsil	Area Diverted in Ha.	Status of Forest Land
1	Eclectic line from Burda to Bantalo E.E, Sambalpur	Naktideul	0.8097	Rev. Forest
2	Eclectic line from Kalindar to Badmal, E.E, Sambalpur	Redhakhol	0.506	Rev. Forest
3	BDO Naktideul Sankhabhanguni to Dangteka	Naktideul	0.99	Rev. Forest
4	Eclectic line from Buramal to Brahamani E.E, Sambalpur	Redhakhol	0.2	Rev. Forest
5	Eclectic line from Kamalanali to Badbil E.E, Sambalpur	Naktideul	0.25	Rev. Forest
6	Eclectic line from Luhapank to Gadumunda E.E, Sambalpur	Redhakhol	0.22	Rev. Forest
7	Eclectic line from Rukunipur to Gopalpur E.E, Sambalpur	Redhakhol	0.3	Rev. Forest
8	Eclectic line from Hemamura to Budhipani E.E, Sambalpur	Redhakhol	0.4	Rev. Forest
9	Eclectic line from Dehurisahi to Jadumanipatna E.E, Sambalpur	Redhakhol	0.20	Rev. Forest
10	Eclectic line from Ghosuramal to Rail – Buramal E.E, Sambalpur	Naktideul	0.0158	Rev. Forest
11	Eclectic line from Kutunia to Khasua E.E, Sambalpur	Redhakhol	0.5	Rev. Forest
12	Eclectic line from Kaunsipal to Khasbharadi E.E, Sambalpur	Naktideul	0.4	Rev. Forest
13	Construction of Road from Chasbharadi to Kaunsipal BDO, Naktideul	Naktideul	0.894	Rev. Forest
14	Eclectic line from Tribanpur to Godakhol E.E, Sambalpur	Redhakhol	0.3	Rev. Forest
15	EE, MI Division, Sambalpur Landijharan MI Irrigation	Naktideul	0.583	Rev. Forest
16	Eclectic line from Rail to Koing E.E, Sambalpur	Naktideul	0.7	Rev. Forest
17	Eclectic line from Khasua to Brahamani E.E, Sambalpur	Redhakhol	0.25	Rev. Forest
18	Construction of AJY Community centre in Naktideul Range/ A.C.F, Redhakhol Division	Naktideul	0.04	Rev. Forest



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Table No 8.5 Land Diverted for Non Forestry Purpose under FRA,2006

SL.N o.	Name of the Project	Name of the Tahsil	Area Diverted in Ha.	Status of Forest Land
19	Construction of AJY Community centre in Mochibahal Range/ A.C.F, Redhakhol Division	Redhakhol	0.10	Rev. Forest
20	Eclectic line from Jharbeda to Hinjamura E.E, Sambalpur	Naktideul	0.75	Rev. Forest
21	Eclectic line from Bhetiaberni to Batgaon E.E, Sambalpur	Naktideul	0.60	Rev. Forest
22	Eclectic line from Musakani to Sahebi E.E, Sambalpur	Naktideul	0.75	Rev. Forest
23	Eclectic line from Kendukata to Hatibahal E.E, Sambalpur	Redhakhol	0.76	Rev. Forest
24	Eclectic line from Kakanpada to Dimirimunda E.E, Sambalpur	Redhakhol	0.35	Rev. Forest
25	Construction of Odisha Adarsha Vidyalaya at-Rampur	Redhakhol	0.99	Rev. Forest
Total Area			11.8585	

8.8.2 Forest land Diverted under Forest (Conservation) Act,1980

Forest land diverted under Forest (Conservation) Act,1980 for various projects is 616.524 ha.

The details land diverted Project wise is furnished at table No 8.6

Table No 8.6Details of forest land Diverted under FC Act, 1980-Rairakhol Division.

SL.N o.	Name of the project approved under FC Act.	Area Diverted (in Ha).	Category of land diverted		Approval Order No.
			R.F	Revenue Forest	
1	11 KV & 33 KV transmission line from Rairakhol to Danda Microwave Project .	52.5	15	37.5	No.8-336/ 85 FRY (Cons) dt.23.02.1983
2	33 KV transmission line from Hatibari to Rairakhol .	6.6	0	6.6	10F Cons.19/83-1291 dt.14.01.1983
3	400 KV Transmission line from Rengali to Jeypore by POWER GRID CORPN.OF INDIA Ltd.	221.393	0	221.393	No.8-122/85-Fry (Cons)- dt.19.12.1987
4	Construction of approach road over Sukhanallah bridge at 212/6-8Km. of NH-42.	1.116	0	1.116	No.8-141/89-FC, dt.25.07.1989



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Table No 8.6 Details of forest land Diverted under FC Act, 1980-Rairakhol Division.

Sl.N o.	Name of the project approved under FC Act.	Area Diverted (in Ha).	Category of land diverted		Approval Order No.
			R.F	Revenue Forest	
5	Lease of stone quarry in Goudgad RF for construction of Spilway of Hariharjore Dam Project by the E.E., Hariharjore Irrigation Project Divn.No.I, Birmaharajpur	0.75	0.75.	0	No.8b/13/11-90FC, dt.01.08.1989.
6	Construction of Minor bridge over Churmani nallah of NH-42.	0.585	0	0.585	No.No.8 b-1/89/FC dt.07.08.1989
7	Construction of Talcher-Sambalpur Railway line by the Chief Project Manager, S.E.Railway, Sambalpur.	123.314	0	123.314	No.8/25/91-FC, dt.06.04.1992.
8	Construction of HL bridge over Tantasira nallah of NH-42 by the E.E., NH Division, Sambalpur.	0.6	0	0.6	No.8/362/FC, dt.29.01.1999.
9	Construction of 400 KV/SC transmission line from Meramundali to Jeypore via Tusura by the Chief Manager, POWERGRID CORPN. OF INDIA Ltd.	15.22.	0	15.22.	No.8-115/02-FC-GOI, F&E, dt. 5/6.05.2003.
10	Construction of 400 KV/DC transmission line from Ib-Thermal to Meramundali.	56.44	0	56.44	No.8/53/99FC dt.13.11.2003
11	Petroleum Pipe line from Paradip to Raipur, etc. by the Indian Oil Corporation Ltd.(IOCL)	14.969	0	14.969	F.No.-8-01/2013-FC dt. 04.09.2013
12	2 X 765 KV S/C, D/C Transmission line from Angul Pooling station to Jhasuguda Pooling Station by Power Grid Corporation India Ltd. (PGCIL)	123.784	0	123.784	F. No. 8-50/2013-FC dt. 21.11.2013
13	Rehabilitation and up gradation of existing 2-lane road to 4- lane of NH stretches Angul-Sambalpur (Jn. of NH-6 at Sambalpur) Section of NH-42 from Km.112.000 to Km. 265.000 (length = 153Km)	70.051	6.965	63.086	Stage-I approved, Stage-II yet to be approved.
14	Construction of 2x765 KV Double circuit (D/C) Transmission lines form Angul Poling Station to Jhasuguda polling station by PGCIL.	129.879	2.49	127.389	F.No-5 ORA285/216-BHU-dt.19.12.2016
15	Diversion of forest land for doubling of Railway line from Talcher to sambalpur.	16.515	0.375	16.14	Stage -1 not approved.



Table No 8.6 Details of forest land Diverted under FC Act, 1980-Rairakhol Division.

Sl.N o.	Name of the project approved under FC Act.	Area Diverted (in Ha).	Category of land diverted		Approval Order No.
			R.F	Revenue Forest	
16	Talab to Phulkusum PMGSY Road.	6.4	0	6.4	No.10F (cons)216/2017- 19869/F&E, Dt.21.09.2017
17	Musakata to Jhamkari PMGSY Road.	1.2	1.2	0	No.10F (cons)215/2017- 19939/F&E, Dt.22.09.2017
18	Podabalnda to Ambjhari PMGSY Road.	4.4	4.4	0	No.10F (cons)217/2017- 19873/F&E, Dt.21.09.2017.
19	Telsingh Chhak to Arkhakuda PMGSY Road.	5.12	5.12	0	No.10F (cons)212/2017- 19516/F&E, Dt.15.09.2017.
20	Construction of Water Treatment Plant (WTP) in Sambalpur District.	2.023	2.023	0	FE-DIV-FLD-0038- 2020-15894/F&E dt.15.10.2020.
21	Rail to Talanali Via- Kudanali, PMGSY Road.	9.35	9.35	0	FE-DIV-FLD-0048- 2020-17174/F&E dt.03.11.2020.
Total Area		846.989	46.923	799.316	

8.9 Other Rights and Concessions:

The JFM Resolution 2011 has elaborated the rights & responsibilities of VSS. Similarly the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 has admitted certain rights & concessions to forest dwellers. Besides the above there are no other rights & concessions admitted for the public.

8.10 Dependency of Local People on NTFPs:

The availability of NTFP has been described under Para 7.4. The major NTFP on which the livelihood of people depends are Kendu Leaf, Sal leaf, Sal Seed, Mahua Flower & Cornel, Siali Leaf & Fiber and Bamboo to a major extent. It's collection & earning supports about 25% of



their income annually. Kendu leaf wings of the Forest Department recently launched various welfare schemes for the labour engaged in Kendu leaf operation. Besides group insurance, support for children's education, daughter's marriage and other facilities to improve their skill & efficiency are being provided.

8.11 Other aspects:

Forest plays a vital role in the life of the people of this region. It provides recreational avenue to local as well as people of nearby districts.





CHAPTER-9

ADEQUACY OF POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK.

9.1 Existing policy and legal framework and their compliance:

For management of Forests, regulation of forest produce, protection of Wildlife, For collection & use of NTFP various Acts, Rules and Regulation, policy have been framed by the Central Government and State Government. These are

- i) The Odisha Forest Act, 1972 and rules there under;
- ii) The Wildlife Protection Act, 1972 and Rules thereof;
- iii) The Environment (Protection) Act, 1986 and Rule 1986,
- iv) The Forest (Conservation) Act, 1980 & Rules.
- v) The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 & Rules,
- vi) EIA, Notification, 2006
- vii) NTFP Collection Policy-2000
- viii) The Orissa Kendu Leaves (Control of Trade) Act, 1961 and Rules.

These rules and regulations are duely being implemented by the Forest Department for better management of Forests.

9.2 Status of approved working plan and compliance:

9.2.1 Details of Outgoing Plan:

The division at present being managed under prescriptions of working Plans by Sri Sankarsan Behera OFS-I (SB) for the period 2007-08 to 2016-17. The details of previous Working Plan are as follows. Table No 9.1

Table No 9.1 List of Out going Plans of Rairakhol Division

Sl No	Name of the Author	Period of the Plan	Remark
1	Dr. Mooney	1942-1957	
2	Sri A.P. Mohanty	1961-62 to 1980-81	
3	Sri A. N. Nath	1982-83 to 2001-02	
4	Sri M.R Panda	1981-82 to 1990-91	1 st Scheme
5	Sri M.R Panda	1981-82 to 1990-91	2 nd Scheme
6	Sri Sankarsan Behera	2007-08 2016-17	



9.2.2 Details of Revised Plan:

This revised plan comprises the entire area of the Division (All RF, PRF, DPF, VF and PF). On event of its approval it will be for the period from 2021-22 to 2030-31 (For 10 years i.e. **1st April 2021 to 31st March 2031**). In course of preparation of Plan modern techniques has been adopted to estimate the Growing Stock, Carbon sequestration and Crop density. The village forests of the erst while Social Forestry Project has been included in this plan to have a better management of forests created under participatory approach.

9.3 Number of forest offences:

The Forest Offences are mainly classified into three category i.e.

- (i) For Violation of the Odisha Forest Act, 1972 & Rules framed thereof.
- (ii) For Violation of the Wildlife (Protection) Act, 1972 & Rules framed thereof.
- (iii) For the Forest (Conservation) Act, 1980.

9.3.1 Forest Offence for Violation of the Odisha Forest Act, 1972 & Rules framed thereof.

The most of the cases are under Odisha Forest Act, 1972 & Rules thereof. The number of cases booked / disposed up and balance cases pending for disposal are as furnished at Table No 9.2

Table No: 9.2 Cases Booked under OFA,1972 and Status									
Year	No. of cases booked			No. of cases disposed			Balance		
	OR	UD	Total	OR	UD	Total	OR	UD	Total
2007-08	1284	176	1460	1246	176	1460	0	0	0
2008-09	1177	109	1286	1136	109	1286	0	0	0
2009-10	965	84	1049	940	84	1049	0	0	0
2010-11	824	75	899	810	75	899	0	0	0
2011-12	969	79	1048	939	79	1048	0	0	0
2012-13	1124	58	1182	1103	58	1182	0	0	0
2013-14	1075	35	1110	1056	35	1110	0	0	0
2014-15	1273	44	1317	1261	44	1317	0	0	0
2015-16	1462	45	1507	1447	45	1507	0	0	0
2016-17	1547	61	1608	1537	61	1598	10	0	10
2017-18	1587	70	1657	1545	89	1634	22	1	23
2018-19	1477	62	1539	1450	57	1507	27	5	32
2019-20	1515	101	1616	1495	95	1590	20	6	26

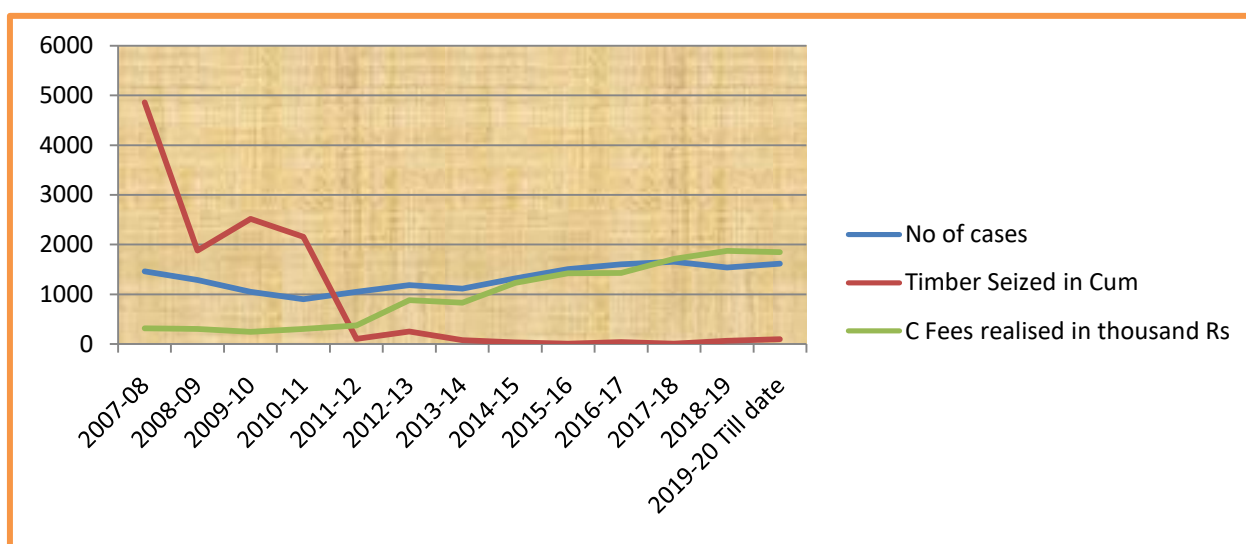


9.3.2 Number of cases booked / quantum of Forest Produce involved:

The quantum of Forest Produce indicates the actual weightage of the Offence being committed and damage caused to Forest. The quantum of Forest produce seized and Compounding fees realized is at table No 9.3

Table No 9.3 No of cases Booked & Forest Produce involved – Rairakhol Division.

Year	Total Cases booked(OR+UD)	Seized Timber in Cum	Compounding Fees Realized in lakh Rs
2007-08	1460	4857.54	3.15
2008-09	1286	1878.70	3.00
2009-10	1049	2515.05	2.45
2010-11	899	2153.90	3.00
2011-12	1048	99.517	3.73
2012-13	1182	246.5693	8.83
2013-14	1110	73.4693	8.34
2014-15	1317	32.82	12.33
2015-16	1507	4.2442	14.25
2016-17	1608	37.3154	14.29
2017-18	1657	6.179	17.17
2018-19	1539	64.1616	18.75
2019-20 Till date	1616	94.31924	18.49





From the above facts, it is revealed that the disposals of booked cases are at a good position. Similarly, it is observed that the smuggling of Timber and Firewood is in a declined trend which is attributed to

- (i) Decreasing dependency on Timber and Firewood due to alternatives available at affordable price.
- (ii) Involvement of VSS in protection & management of forests is also factor in reduced forest cases.
- (iii) Decrease in availability quality timber in forest fringes.
- (iv) People are earning their lively hood by engaging in other activities than depending on Forest Produce.

9.3.3 Number of Cases sent to court / To Authorized Officer & disposal position:

Numbers of Cases send to court / To Authorized Officer & disposal position is furnished at **Table No 9.4**

Table No 9.4 Number of Cases send to court / To Authorized Officer & disposal position					
Year	Number of OR Cases	Cases send to		Disposal Position	
		Judicial Court	Authorized Court	Judicial Court	Authorized Court
2007-08	38	38	0	38	0
2008-09	41	41	0	41	0
2009-10	25	20	5	3	3
2010-11	14	14	0	1	0
2011-12	30	7	16	5	16
2012-13	21	13	8	0	2
2013-14	19	8	11	3	15
2014-15	12	9	3	2	2
2015-16	15	5	6	1	6
2016-17	16	9	6	1	5
2017-18	33	6	2	0	1
2018-19	19	1	0	0	0
2019-20	30	6	0	0	0

9.3.4 Forest Offence for Violation of the Wildlife Protection Act,1972 & Rules thereof.

The number of cases involved in violation of Wildlife Protection Act, 1972 & Rules thereof and its disposalls furnished in Table No 9.5



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Table No 9.5 List of Cases under WPA,1972

year	Total No. of cases	OR No.	Person arrested	Theme of case.
2006-07	1	30G of 2006-07	Cass against WESCO officers	Three elephant died due to electrocution.
2007-08	2	123R of 2007-08	1 no	Illegal possession of bear cub for trading
		43G of 2007-08	1 no	Hunting of Pangolin
2008-09	2	173R 2008-09	9 No	Hunting of elephant
		101C of 2008-09	1 no	Seizure of un tained leopard skin.
2009-10	2	10N of 2009-10	1 no	Hunting of barking deer.
		15N of 2009=10	1 n o.	Hunting of porcupine
2010-11	0			
2011-12	5	17Rkl of 2011-12	2 No.	Killing of Nilgai
		11C of 2011-12	1 no	Entry in RF with Gun
		12C of 2011-12	2 no	Wild bore meat.
		158N of 2011-12	2 no	Hunting of Great Indian Horn Bill
		12R of 2011-12	3 no.	Hunting of barking deer
2012-13	2	17R of 2012-13	3 no.	Hunting of barking deer
		30Rkl of 2012-13	1 no	Hunting of barking deer
2013-14	0			
2014-15	3	46R of 2014-15	1 no	Seizure of pangolin scalp
		75M of 2014-15	3 no.	Entry in RF with gun
		104N of 2014-15	2 no	Hunting of wild bore
2015-16	1	77N of 2015-16	2	Trapping of wild bird in the nest for treading.
2016-17	0			
2017-18	3	1R of 2017-18	4 no	Hunting of Common Palm Civet.
		40M 2017-18	2 no	Hunting of wild bore
		151G of 2017-18	2 no	Hunting of wild bore
2018-19	5	108R of 2018-19	1 no	Hunting of wild bore
		40C of 2018-19	1 no.	Hunting of spotted deer.
		87C of 2018-19	1 no.	Wild pig cooked meat
		194R of 2018-19	1 no.	Barking deer meat.
		33R of 2018-19	3 nos.	Hunting of sloth bear.
Total cases	26			



9.3.4 Cases booked for Violation of Forest (Conservation) Act, 1980

There is no case of violation under Forest (Conservation) Act, 1980.

9.4 Status of Research & Development:

There are no research activities in Rairakhol Division.

9.5 Human resource capacity building efforts:

For Human Resource Capacity Building, circle level training camps have been organized to improve working skill. Training on following subject matter is being conducted under various training program for Foresters, Deputy Range Officer & Range Officers.

- i. On Forest (Conservation) Act, 1980 and various amendments & guidelines issued by MoEF& CC, New Delhi.
- ii. Joint Forest Management Resolution, 2011, 2015, 2019& various stages of Development of Participatory Forest management since 1985.
- iii. Forest Rights Act, 2006 its implecation & procedure involved for settlement of Rights.
- iv. National Working Plan Code 2014, various technics developed for tree enumeration, growing stock estimation, Carbon sequestration, Study of Regeneration Status. REED⁺ etc.

Besides short duration training course, workshops, symposium, the Foresters & Forest Guards are under going training at Forest Training institutes at Angul, Champua and Bhubaneswar. The number of Foresters / Forest Guards trained during last ten years is furnished below.

Table No 9.6 Human Resource Development Program. (Staff / VSS)

Year	Name of Training program	Duration	Participants
2012	Human Resource Development	13.2.12 to 17.2.12	Rajendra kumar Pradhan, Forest Guard
2013		22.10.13 to 26.10.13	Manidhar Dudum, Forester
2013		18.11.13 to 23.11. 13	Govinda Majhi, Forest Guard
2013		02.12.13 to 07.12.13	Sujit Ku Pradhan, Forester
2016		26.12.16 to 31.12.16	Prasanjit Ekka, Forest Guard
2016		22.08.16 to 26.08.16	Manidhar Dudum, Dy. Ranger
2106		17.10.16 to 21.10.16	Smt. Prisca Lakra, Forest Guard
2017		16.01.17 to 21.01.17	Smt. Truptibala Behera, Forest Guard
2017		06.02. 17 to 10.02. 17	Chitaranjan Miri, Forest Guard
2017		13.02.17 to 18.02.17	Ranjan Ku Matuary, Junior Clerk



The daily labours as required in the field is being engaged by the Range Officer/ Foresters/ Forest Guards on daily wage basis and being paid minimum wage rate notified by the Government. The present wage rate past wage rate is furnished below.

9.5.1 Labour Welfare & Revision of Wage Rate:

The revision of wage rate is being changed half yearly basing on Consumer Price index as on 1st April and 1st October every year. The revised wage rate form different date since 1995 is furnished below.

Sl No	Notification Date (Month / Year)	Wage Rate (in Rs.)			
		Unskilled	Semi Skilled	Skilled	High Skilled
1	13.12.1995	30.00	36.00	42.00	48.00
2	29.04.1999	40.00	48.00	56.00	64.00
3	14.02.2002	50.00	60.00	70.00	80.00
4	15.02.2006	75.00	85.00	90.00	100.00
5	14.07.2009	90.00	103.00	116.00	129.00
6	06.10.2012	150.00	170.00	190.00	205.00
7	30.04.2015	200.00	220.00	240.00	260.00
8	04/2017	213.50	233.50	253.50	273.50
9	11/2018	280.00	320.00	370.00	430.00
10	05/2019	286.30	326.30	376.30	436.30
11	11/2019	298.00	338.00	388.00	448.00
12	07/2020	303.40	343.40	393.40	453.40
13	10/2020	308.00	348.00	398.00	458.00
14	05/2021	311.00	351.00	401.00	461.00
15	11/2021	315.00	355.00	405.00	465.00

In case of Contractual engagement the remuneration is being paid as per Government directives. In some cases where the nature of engagement is more than six months at a stretch, manpower through “Service Providers” being engaged to avoid legal complicity.

9.6 Forest Resource Accounting:

During Last Plan Period, no systematic approach has been developed and adopted for accounting Forest Resource of the Division. However, for Bamboo working in different coupes of the division, sample study for assessing availability of Bamboo for Commercial



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working has been carried out. During assessment Type & quality of Bamboo area is being classified into Class-I, II, & III and further Treatment Type- A, B or C is being assessed. The guiding principle is

Area with healthy and well-stocked Bamboo clumps consisting of

Clump Quality – I	Culms height of Bamboos 9 m and up.
Clump Quality – II	Culms height of Bamboos between 6m to 9 m.
Clump Quality – III	Culms height of Bamboos below 6 m

Treatment Type:

Type A: Area with healthy and well-stocked Bamboo clumps.

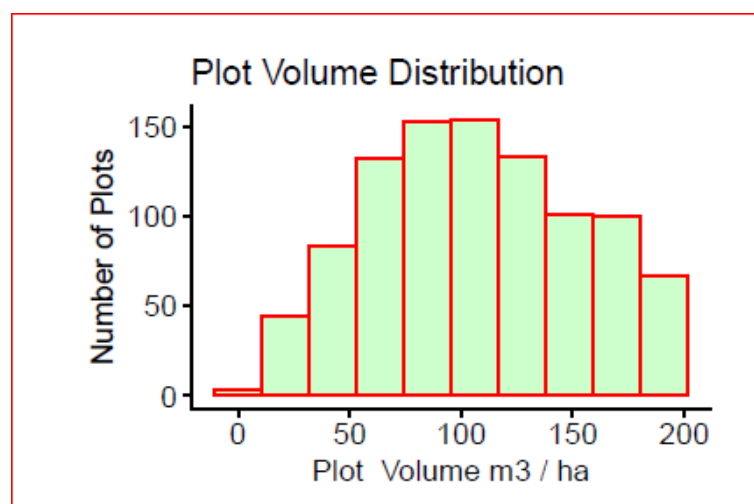
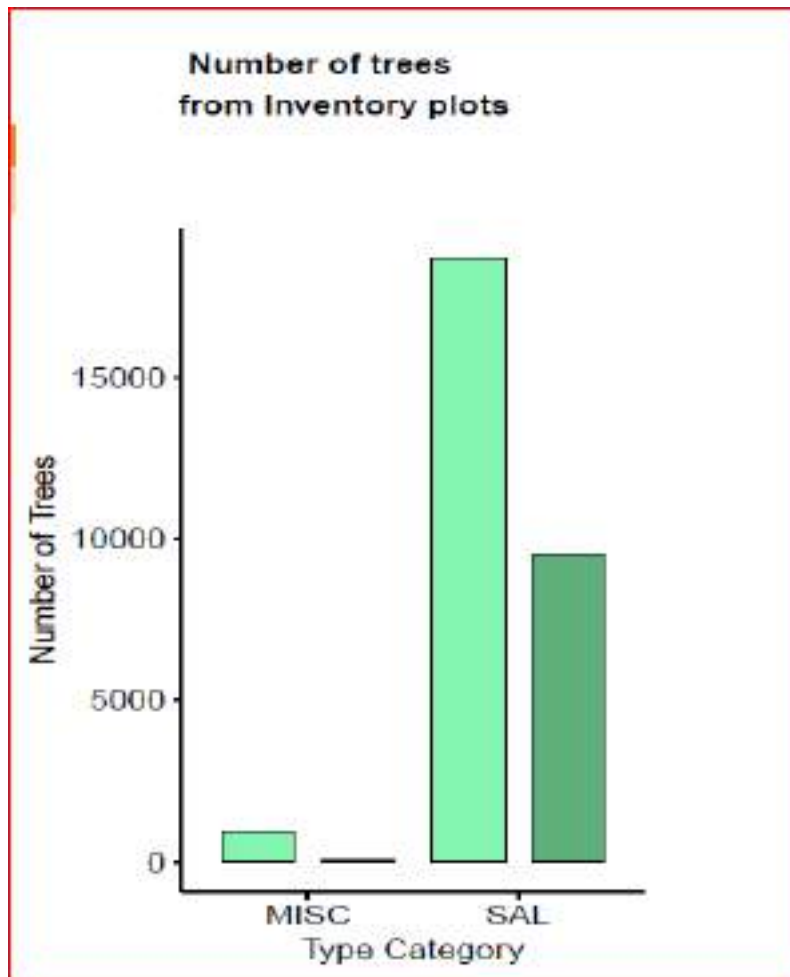
Type B: Areas with well-stocked but degraded, damaged, congested and/or fire burnt.

Type C: Areas where bamboo clumps are sparse and scattered.

For preparation of this Working Plan Point sampling has been carried out and analysed over 970 sample points (1133 sample points enumerated) . Each sample point is of 0.1 ha i.e. of 1000 sq .M. Out of 1133 points enumeration NRSC has analysed tree enumeration pertaining to 970 points. The growing stock has been estimated as follows.

Table No 9.7 Stand volume parameters – Rairakhol Division

Criteria							
No of trees / ha	Basal Area per ha (M ³)	Volume per Ha (in M ³)	Mean Volume (in M ³)	Standard Error	LB (in M ³)	UB (in M ³)	
310.85	14.21	107.17	107.02	0.02	103.64	110.39	





The total Growing Stock of the division has been assessed and estimated to be 10.1 Million Cum

9.7 Budgetary allocations to the forestry sector:

9.7.1 Allocation from Normal General Budget& Other sources.

The budgetary allocation under various sub head is furnished below. The total State plan, Non Plan & Central plan was Rs72.8 lakh during 2008-09 and has increased many folds till date. The allocation during 2017-18 is Rs178.30 lakh The Year wise graphical presentation is furnished below.

Table No 9.8 Budgetary Allocation for Rairakhol Division.

Year	Allotment in Rs					
	State Plan	Central Plan	FDA	CAMPA	Others	Total in lakh Rs
2009-10	10360565	1363600	Nil	29966000	186260	418.76
2010-11	15218651	1051400	Nil	18862765	373650	355.06
2011-12	20352235	909375	Nil	24191856	562500	460.16
2012-13	30536782	1370625	Nil	34591850	705000	672.04
2013-14	11718905	1178200	981820	56165500	955000	709.99
2014-15	26388307	364000	3007815	77676856	562000	1079.99
2015-16	23613733	Nil	2848500	57336956	1668000	854.67
2016-17	33432952	Nil	1029520	52250772	43800	867.57
2017-18	30032050	5639315	365893	69192546	Nil	1052.30
2018-19	36653042	2558403	2181782	Nil	Nil	413.93
2019-20	15220413	5147763	1416981	64376614	Nil	861.62

9.8 Existence of Monitoring, Assessment & Reporting Mechanism:

For monitoring the implementation of various programs and assessment of success rate, standard monitoring mechanism has been developed in the Forest department. Online transmission of progress report, paybills & payments, payment of wages to labour through Bank accounts are being implemented. All payments pertaining to CAMPA, MGNREGS, and FDA are 100% through bank accounts.

9.9 Public awareness and education:

Public awareness on various Forest & Environment matters are regularly being conducted by the division. World Forestry day, Earth Day, World Environment Day, Elephant Day,



Vanamahotsava week , Mass tree Planting Program, Wildlife Week are being conducted at Division Level & Range Level. The usual features associated are

- Essay, Drawing, Debate, Paragraph writing Competitions being conducted involving School Children.
- Awareness through Rally, Nature camps etc are being conducted.
- Eco clubs are being promoted and various leaflets distributed among school children.
- Display of hoardings at public places to educate people,
- Conducting Meetings followed by Tree Planting Program,
- VSS members / NGO are motivated against Forest Fire.

9.10 Adequacy manpower in forest division:

The Sanction cadre strength of Rairakhol Division is 169. As on 31.12.2018 the staff in position is as furnished in Table No 9.9

Table No 9.9 Sanctioned Cadre Strength and Present Position.

Sl No	Name of Cadre	Sanctioned Strength	Persons in Position	Remark
1	D.F.O.	01	01	0
2	A.C.F	03	02	01
3	Forest Ranger	06	06	0
4	Deputy Ranger	08	01	07
5	Forester	32	28	04
6	Forest Guard	75	45	30
7	Head Clerk	01	01	0
8	Junior Accountant	07	04	03
9	Junior Clerk	09	02	07
10	Junior Steno	01	0	01
11	Driver (LV)	02	01	01
12	Amin	01	0	01
13	Dak Runner	03	03	0
14	Office Peon	01	0	1
15	Chain man	01	01	0
	Total:	151	95	56

Vacancy of Staff is about 37% of Sanctioned Strength.



Form the above table it is seen that vacancy of staff at cutting edge is more which may affect the efficiency at field level.

The division has been created with effect from 1948. The incumbency chart of the Divisional Forest Officer, Rairakhol Division is at **Annexure-XII**.

Besides the regular staffs, there are protection squads, fire fighting squads, elephant trackers to assist the regular staffs in the field. Considering the workload, various schemes under implementation, it is felt that more ministerial and technical staffs at grass root level (Forest Guards and Foresters) are required to be deployed for better management of forest & wildlife. It is also felt to have full-fledged computer cell and GIS Cell to monitor the work, prepare maps and study the growth of plantations through satellite imagery.





CHAPTER-10

FIVE YEAR PLANS

10. Five Year Plans:

From 1947 to 2017, the Indian economy was premised on the concept of planning. This was carried through the **Five-Year Plans**, developed, executed, and monitored by the Planning Commission (1951-2014) and the NITI Aayog (2015-2017). With the prime minister as the ex-officio chairman, the commission has a nominated deputy chairman, who holds the rank of a cabinet minister. The Twelfth Plan completed its term in March 2017. Prior to the Fourth Plan, the allocation of state resources was based on schematic patterns rather than a transparent and objective mechanism, which led to the adoption of the Gadgil formula in 1969. Revised versions of the formula have been used since then to determine the allocation of central assistance for state plans. The new government elected in 2014, has announced the dissolution of the Planning Commission, and its replacement by a think tank called the NITI Aayog (an acronym for National Institution for Transforming India).

10.1 First Five year Plan: (1951-1956)

The First Five-Year Plan was one of the most important, because it had a great role in the launching of Indian development after Independence. Thus, it strongly supported agriculture production and also launched the industrialization of the country (but less than the Second Plan, which focused on heavy industries). It built a particular system of mixed economy, with a great role for the public sector (with an emerging welfare state), as well as a growing private sector.

The first Indian Prime Minister, Jawaharlal Nehru, presented the First Five-Year Plan to the Parliament of India and needed urgent attention. The First Five-year Plan was launched in 1951 which mainly focused in development of the primary sector. The First Five-Year Plan was based on the Harrod–Domar model with few modifications.

The total planned budget of Rs.2069 crore (2378 crore later) was allocated to seven broad areas:

- i. Irrigation and energy (27.2%),
- ii. Agriculture and community development (17.4%),



- iii. Transport and communications (24%),
- iv. Industry (8.4%),
- v. Social services (16.6%),
- vi. Rehabilitation of landless farmers (4.1%),
- vii. Other sectors and services (2.5%).

The most important feature of this phase was active role of state in all economic sectors. Such a role was justified at that time because immediately after independence, India was facing basic problems—deficiency of capital and low capacity to save.

The target growth rate was 2.1% annual gross domestic product (GDP) growth; the achieved growth rate was 3.6% the net domestic product went up by 15%. The monsoon was good and there were relatively high crop yields, boosting exchange reserves and the per capita income, which increased by 8%. National income increased more than the per capita income due to rapid population growth. Many irrigation projects were initiated during this period, including the Bhakra, Hirakud, Mettur Dam and Damodar Valley dams. The World Health Organization (WHO), with the Indian government, addressed children's health and reduced infant mortality, indirectly contributing to population growth.

At the end of the plan period in 1956, five Indian Institutes of Technology (IITs) were started as major technical institutions. The University Grants Commission (UGC) was set up to take care of funding and take measures to strengthen the higher education in the country. Contracts were signed to start five steel plants, which came into existence in the middle of the Second Five-Year Plan. The plan was quasi-successful for the government.

10.2 Second Five Year Plan: (1956-1961)

The Second Plan focused on the development of the public sector and "rapid Industrialisation". The plan followed the Mahalanobis model, an economic development model developed by the Indian statistician Prasanta Chandra Mahalanobis in 1953. The plan attempted to determine the optimal allocation of investment between productive sectors in order to maximise long-run economic growth. It used the prevalent state-of-the-art techniques of operations research and optimization as well as the novel applications of statistical models developed at the Indian Statistical Institute. The plan assumed a closed economy in which the main trading activity would be centred on importing capital goods.



Hydroelectric power projects and five steel plants at Bhilai, Durgapur, and Rourkela were established with the help of Russia, Britain (the U.K) and West Germany respectively. Coal production was increased. More railway lines were added in the north east.

The Tata Institute of Fundamental Research and Atomic Energy Commission of India were established as research institutes. In 1957, a talent search and scholarship program was begun to find talented young students to train for work in nuclear power.

The total amount allocated under the Second Five-Year Plan in India was Rs.48 billion. This amount was allocated among various sectors: power and irrigation, social services, communications and transport, and miscellaneous. The second plan was a period of rising prices. The country also faced foreign exchange crisis. The rapid growth in population slowed down the growth in the per capita income.

The target growth rate was 4.5% and the actual growth rate was 4.27%.

The plan was criticized by classical liberal economist B.R. Shenoy who noted that the plan's "dependence on deficit financing to promote heavy industrialization was a recipe for trouble". Shenoy argued that state control of the economy would undermine a young democracy. India faced an external payments crisis in 1957, which is viewed as confirmation of Shenoy's argument.

On Forestry Sector, in this two 5 year plan the focus was on the Rehabilitation Of The Degraded Forests and the creation of plantations of economically important species. In the second plan, the stress was also on the conservation of Wild Life.

10.3 Third Five Year Plan (1961-1966)

The Third Five-year Plan stressed agriculture and improvement in the production of wheat, but the brief Sino-Indian War of 1962 exposed weaknesses in the economy and shifted the focus towards the defence industry and the Indian Army. In 1965–1966, India fought a War with Pakistan. There was also a severe drought in 1965. The war led to inflation and the priority was shifted to price stabilisation. The construction of dams continued. Many cement and fertilizer plants were also built. Punjab began producing an abundance of wheat.



Many primary schools were started in rural areas. In an effort to bring democracy to the grass-root level, Panchayat elections were started and the states were given more development responsibilities.

State electricity boards and state secondary education boards were formed. States were made responsible for secondary and higher education. State road transportation corporations were formed and local road building became a state responsibility.

The target growth rate was 5.6%, but the actual growth rate was 2.4%.

On Forestry Sector, the third five year plan laid special emphasis on measures to meet the long term requirements of the country and to ensure more economic and efficient utilization of the valuable forest products. The immediate objective was to increase the output from the existing forests through better techniques of timber extraction, improvement of communications and popularizing the use of less commonly known secondary Indian timber after proper seasoning and preservative treatment. Various schemes implemented during the third five year plan were oriented towards attaining self sufficiency in industrial timbers, fuel wood and other forest products. In order to encourage State Governments to undertake plantations of quick growing species, particularly to meet the requirement of pulp and paper, a new centrally sponsored scheme "Plantation of Quick Growing Species" was introduced. It was accepted as a matter of policy that in order to obtain higher timber yields from the forest areas under exploitation and to reduce the wastage, improved logging tools have to be used. Training of forest officers and field executives in the State Governments and of lessees and forest contractors in logging planning and efficiency studies were started with the establishment of logging training centers set up with the assistance of the United Nations Special Fund.

10.4 Plan Holiday (1966-1969)

Due to miserable failure of the Third Plan the government was forced to declare "plan holidays" (from 1966–67, 1967–68, and 1968–69). Three annual plans were drawn during this intervening period. During 1966–67 there was again the problem of drought. Equal priority was given to agriculture, its allied activities, and industrial sector. The government of India declared "Devaluation of Rupee" to increase the exports of the country. The main reasons for plan holidays were the war, lack of resources and increase in inflation.



10.5 Fourth Five Year Plan (1969-1974):

At this time Indira Gandhi was the prime minister. The government nationalised 14 major Indian banks and the Green Revolution in India advanced agriculture. In addition, the situation in East Pakistan (now Bangladesh) was becoming dire as the Indo-Pakistan War of 1971 and Bangladesh Liberation War took funds earmarked for industrial development. India also performed the Smiling Buddha underground nuclear test (Pokhran-1) in Rajasthan on May 18, 1974, partially in response to the United States deployment of the Seventh Fleet in the Bay of Bengal. The fleet had been deployed to warn India against attacking West Pakistan and extending the war. The target growth rate was 5.6%, but the actual growth rate was 3.3%.

During this plan period, three main objectives laid down in this plan are:

- To increase the productivity of forests,
- To link up forestry development with various forest based industries and
- To develop forests as a support to rural economy.

Emphasis was laid on measures to meet the immediate and long term agricultural and industrial requirements. Further efforts were made at creating large scale plantation of valuable quick growing species and species of economic and industrial importance. Concerted efforts at regenerating areas, where forest produce was removed for industrial uses, were taken. The object was to achieve self sufficiency in forest products as early as possible, specially for major forest based industries such as pulp, paper newsprint, wood panel products and matches so that the imports of these items may be replaced and some sizeable exports of pulp and wood panel products built up. In the last two years of the Plan period several important developments have taken place like promulgation of Wild Life (Protection) act, 1972, and launching of Project Tiger in 1973.

10.6 Fifth Five Year Plan (1974-1978)

The Fifth Five-Year Plan laid stress on employment, poverty alleviation and justice. The plan also focused on self-reliance in agricultural production and defence. In 1978 the newly elected Morarji Desai government rejected the plan. The Electricity Supply Act was amended in 1975, which enabled the central government to enter into power generation and transmission.



The Indian national highway system was introduced and many roads were widened to accommodate the increasing traffic. Tourism also expanded. The twenty-point programme was launched in 1975. It was followed from 1974 to 1979.

The Minimum Needs Programme (MNP) was introduced in the first year of the Fifth Five-Year Plan (1974–78). The objective of the programme is to provide certain basic minimum needs and thereby improve the living standards of the people. It is prepared and launched by D.P.Dhar. The target growth rate was 4.4% and the actual growth rate was 4.8%.

In Forestry Sector, the primary objective was

- To take up a dynamic programme of production forestry, aiming at clear felling and creating large scale man made forests with the help of institutional financing.
- To develop farm forestry and to improve degraded forests so as to increase the fuel and timber supply in the rural areas. A network of State Forest Corporations was proposed to be created for the establishment and management of man-made forests and cater to needs of forest based industries.
- Special efforts were proposed to be made to prepare a number of projects in various States, for immediate and long term benefits in terms of increased raw materials for industries and additional revenues at different levels of investment.

10.7 Rolling Plan (1978-1980):

The Janata Party government rejected the Fifth Five-Year Plan and introduced a new Sixth Five-Year Plan (1978–1980). This plan was again rejected by the Indian National Congress government in 1980 and a new Sixth Plan was made. The Rolling Plan consisted of three kinds of plans that were proposed. The First Plan was for the present year which comprised the annual budget and the Second was a plan for a fixed number of years, which may be 3, 4 or 5 years. The Second Plan kept changing as per the requirements of the Indian economy. The Third Plan was a perspective plan for long terms i.e. for 10, 15 or 20 years. Hence there was no fixation of dates for the commencement and termination of the plan in the rolling plans. The main advantage of the rolling plans was that they were flexible and were able to overcome the rigidity of fixed Five-Year Plans by mending targets, the object of the exercise, projections and allocations as per the changing conditions in the country's economy. The main disadvantage of this plan was that if the targets were revised each year, it became difficult to achieve the targets laid down in the five-year period and it



turned out to be a complex plan. Also, the frequent revisions resulted in the lack of stability in the economy.

10.8 Sixth five year Plan (1980-1985):

The Sixth Five-Year Plan marked the beginning of economic liberalisation. Price controls were eliminated and ration shops were closed. This led to an increase in food prices and an increase in the cost of living. This was the end of Nehruvian socialism. The National Bank for Agriculture and Rural Development was established for development of rural areas on 12 July 1982 by recommendation of the Shivaraman Committee. Family planning was also expanded in order to prevent overpopulation. More prosperous areas of India adopted family planning more rapidly than less prosperous areas, which continued to have a high birth rate. Military Five-Year Plans became coterminous with Planning Commission's plans from this plan onwards.

The Sixth Five-Year Plan was a great success to the Indian economy. The target growth rate was 5.2% and the actual growth rate was 5.7%.

In this plan period, the emphasis was on increasing the productivity through proper land and water management. It was also felt that the preservation of the genetic and species diversity is essential for the management of the ecosystem and for the sustainable utilization of the resources. This would help in a big way in the future survival and development of the people. The necessity for constitution the Biosphere Reserves was also felt.

10.9 Seventh Five Year Plan (1985-1990)

The Seventh Five-Year Plan was led by the Congress Party with Rajiv Gandhi as the prime minister. The plan laid stress on improving the productivity level of industries by upgrading of technology.

The main objectives of the Seventh Five-Year Plan were to establish growth in areas of increasing economic productivity, production of food grains, and generating employment through "Social Justice".

As an outcome of the Sixth Five-Year Plan, there had been steady growth in agriculture, controls on the rate of inflation, and favourable balance of payments which had provided a strong base for the Seventh Five-Year Plan to build on the need for further economic growth. The Seventh Plan had strived towards socialism and energy production at large. The thrust



areas of the Seventh Five-Year Plan were: social justice, removal of oppression of the weak, using modern technology, agricultural development, anti-poverty programmes, full supply of food, clothing, and shelter, increasing productivity of small- and large-scale farmers, and making India an independent economy.

Based on a 15-year period of striving towards steady growth, the Seventh Plan was focused on achieving the prerequisites of self-sustaining growth by the year 2000. The plan expected the labour force to grow by 39 million people and employment was expected to grow at the rate of 4% per year.

Under the Seventh Five-Year Plan, India strove to bring about a self-sustained economy in the country with valuable contributions from voluntary agencies and the general populace.

The target growth rate was 5.0% and the actual growth rate was 6.01% and the growth rate of per capita income was 3.7%.

On Forestry sector, the basic approach was sustainable development in harmony with the environment. Most of the programmes for environmental management dealt with planning for eliminating or at least minimizing environmental degradation. One of the major objectives of the Eco-development programme was the restoration of already degraded eco-systems through practical field schemes such as land reclamation, afforestation, cleaning of water bodies, etc. The programme is also geared towards arresting further damage to eco-systems and the promotion of a conservation based development strategy

Further emphasis on Research and Training was stressed. Botanical Survey of India (BSI), Zoological Survey of India (ZSI) was reoriented to deal with the lower forms of the life like fungi, bacteria, invertebrates, etc. Man and Biosphere Programme was also oriented towards the ecosystem development.

Implementation of the Biosphere Reserves Programme started in the Seventh Plan with the Department of Environment acting as the nodal agency. The conservation programmes in the Reserves was to be supplemented by a strong component of research studies on the living and non-living resources, rare and endangered species, socio-economic interactions with local/ surrounding populations and ethnobiological relationships



Eco-development programme like restoration of already degraded eco-systems through practical field schemes such as land reclamation, afforestation, cleaning of water bodies, etc. was to be strengthened in this Plan Period.

10.10 Annual Plan (1990-1992)

The Eighth Plan could not take off in 1990 due to the fast changing economic situation at the centre and the years 1990–91 and 1991–92 were treated as Annual Plans. The Eighth Plan was finally formulated for the period 1992–1997.

10.11 Eighth Five Year Plan (1992-97)

1989–91 was a period of economic instability in India and hence no Five-Year Plan was implemented. Between 1990 and 1992, there were only Annual Plans. In 1991, India faced a crisis in foreign exchange (forex) reserves, left with reserves of only about US\$1 billion. Thus, under pressure, the country took the risk of reforming the socialist economy. P.V. Narasimha Rao was the ninth prime minister of the Republic of India and head of Congress Party, and led one of the most important administrations in India's modern history, overseeing a major economic transformation and several incidents affecting national security. At that time Dr. Manmohan Singh (later prime minister of India) launched India's free market reforms that brought the nearly bankrupt nation back from the edge. It was the beginning of liberalization, privatisation and globalization (LPG) in India.

Modernization of industries was a major highlight of the Eighth Plan. Under this plan, the gradual opening of the Indian economy was undertaken to correct the burgeoning deficit and foreign debt. Meanwhile, India became a member of the World Trade Organization on 1 January 1995. The major objectives included, controlling population growth, poverty reduction, employment generation, strengthening the infrastructure, institutional building, tourism management, human resource development, involvement of Panchayati rajs, Nagar Palikas, NGOs, decentralisation and people's participation.

Energy was given priority with 26.6% of the outlay.

The target growth rate was 5.6% and the actual growth rate was 6.8%.

To achieve the target of an average of 5.6% per annum, investment of 23.2% of the gross domestic product was required. The incremental capital ratio is 4.1. The saving for investment was to come from domestic sources and foreign sources, with the rate of



domestic saving at 21.6% of gross domestic production and of foreign saving at 1.6% of gross domestic production.

The major objectives for this Plan were:

- a) To protect the natural environment;
- b) To regenerate and restore degraded ecosystems and increase their productivity and to generate employment through these activities;
- c) To decentralise control over nature and natural resources;
- d) To develop and share an understanding of nature and natural processes;
- e) To formulate a national policy for environment and an appropriate institutional and legal framework in support of the policy;
- f) To ensure co-ordinated and integrated Governmental action aimed at conserving nature and sustainable use of natural resources;
- g) To make individuals and institutions more accountable to the people for their actions impinging on environment and ecosystem; and
- h) To monitor the state of environment

10.12 Ninth Five year Plan (1997-2002)

The Ninth Five-Year Plan came after 50 years of Indian Independence. Atal Bihari Vajpayee was the prime minister of India during the Ninth Plan. The Ninth Plan tried primarily to use the latent and unexplored economic potential of the country to promote economic and social growth. It offered strong support to the social spheres of the country in an effort to achieve the complete elimination of poverty. The satisfactory implementation of the Eighth Five-Year Plan also ensured the states' ability to proceed on the path of faster development. The Ninth Five-Year Plan also saw joint efforts from the public and the private sectors in ensuring economic development of the country. In addition, the Ninth Five-Year Plan saw contributions towards development from the general public as well as governmental agencies in both the rural and urban areas of the country. New implementation measures in the form of Special Action Plans (SAPs) were evolved during the Ninth Plan to fulfill targets within the stipulated time with adequate resources. The SAPs covered the areas of social infrastructure, agriculture, information technology and Water policy.



Budget

The Ninth Five-Year Plan had a total public sector plan outlay of 859,200 crore (US\$120 billion). The Ninth Five-Year Plan also saw a hike of 48% in terms of plan expenditure and 33% in terms of the plan outlay in comparison to that of the Eighth Five-Year Plan. In the total outlay, the share of the center was approximately 57% while it was 43% for the states and the union territories.

The Ninth Five-Year Plan focused on the relationship between the rapid economic growth and the quality of life for the people of the country. The prime focus of this plan was to increase growth in the country with an emphasis on social justice and equity. The Ninth Five-Year Plan placed considerable importance on combining growth oriented policies with the mission of achieving the desired objective of improving policies which would work towards the improvement of the poor in the country. The Ninth Plan also aimed at correcting the historical inequalities which were still prevalent in the society.

Objectives

The main objective of the Ninth Five-Year Plan was to correct historical inequalities and increase the economic growth in the country. Other aspects which constituted the Ninth Five-Year Plan were:

- Population control.
- Generating employment by giving priority to agriculture and rural development.
- Reduction of poverty.
- Ensuring proper availability of food and water for the poor.
- Availability of primary health care facilities and other basic necessities.
- Primary education to all children in the country.
- Empowering the socially disadvantaged classes like Scheduled castes, Scheduled tribes and other backward classes.
- Developing self-reliance in terms of agriculture.
- Acceleration in the growth rate of the economy with the help of stable prices.

Strategies

- Structural transformations and developments in the Indian economy.
- New initiatives and initiation of corrective steps to meet the challenges in the economy of the country.
- Efficient use of scarce resources to ensure rapid growth.
- Combination of public and private support to increase employment.



- Enhancing high rates of export to achieve self-reliance.
- Providing services like electricity, telecommunication, railways etc.
- Special plans to empower the socially disadvantaged classes of the country.
- Involvement and participation of Panchayati Raj institutions/bodies and Nagar Palikas in the development process.

Performance

- The Ninth Five-Year Plan achieved a GDP growth rate of 5.4% against a target of 6.5%
- The agriculture industry grew at a rate of 2.1% against the target of 4.2%
- The industrial growth in the country was 4.5% which was higher than that of the target of 3%
- The service industry had a growth rate of 7.8%.
- An average annual growth rate of 6.7% was reached.

The Ninth Five-Year Plan looks through the past weaknesses in order to frame the new measures for the overall socio-economic development of the country. However, for a well-planned economy of any country, there should be a combined participation of the governmental agencies along with the general population of that nation. A combined effort of public, private, and all levels of government is essential for ensuring the growth of India's economy.

The target growth was 7.1% and the actual growth was 6.8%.

In Forestry sector, the objectives were

- Empowering the people through information generation, dissemination and access
- Involving the Industry in both the private and the public sector.
- Integrating environment with decision making through valuation of environmental impacts; evolving market based economic instruments as an alternative to the command and control form of environmental regulation; appropriate pricing of natural resources based on their long-term marginal cost of supply; appropriate fiscal reforms and natural resource accounting.
- Evolving the rights for common property resources.
- Inter-sectoral coordination and cooperation.
- Ensuring scientific and technological inputs.
- Participation of people (particularly women) in the management and sharing of usufruct through Joint Forest Management.



- Involvement of NGOs for awareness building and as an interface between forest department and the people would be encouraged during the Ninth Plan.

10.13 Tenth Five year Plan (2002-2007)

The main objectives of the Tenth Five-Year Plan:

- Attain 8% GDP growth per year.
- Reduction of poverty rate by 5% by 2007.
- Providing gainful and high-quality employment at least to the addition to the labour force.
- Reduction in gender gaps in literacy and wage rates by at least 50% by 2007.
- 20-point program was introduced.
- Target growth: 8.1% – growth achieved: 7.7%.
- The Tenth Plan was expected to follow a regional approach rather than sectoral approach to bring down regional inequalities.
- Expenditure of 43,825 crore (US\$6.1 billion) for tenth five years.

Out of total plan outlay, 921,291 crore (US\$130 billion) (57.9%) was for central government and 691,009 crore (US\$97 billion) (42.1%) was for states and union territories.

The main objectives of this plan are:

- Bringing one third geographical area under the forest cover.
- Adopting watershed approach to develop and maintain the forest cover.
- The livelihood needs of the people living adjoining to the forests would be addressed.
- JFM would be given more thrust for the regeneration of the degraded forests.
- Efforts would be taken to reduce the import of the timber and the timber requirement would be met from the community lands, private farm lands and degraded lands.
- Food for work programme would be extensively implemented in the forest pockets to ensure food security and productive employment.
- Efforts would be taken on protecting the natural forests to have a better carbon trading potential to increase the market avenues for forest protection and management.
- The conservation and protection of the medicinal plants is given priority.



- The bio-diesels coming from plants like Jatropa, pongamia etc., would be promoted to encourage the livelihood opportunities of the rural masses.
- It was also decided to merge all Afforestation programmes under National Afforestation and Eco-development Board (NAEB) into one scheme called 'National Afforestation Programme' and it would be implemented through Forest Development Agency (FDA)

10.14 Eleventh Five year Plan (2007-2012)

- It was in the period of Manmohan Singh as a prime minister.
- It aimed to increase the enrolment in higher education of 18–23 years of age group by 2011–12.
- It focused on distant education, convergence of formal, non-formal, distant and IT education institutions.
- Rapid and inclusive growth (poverty reduction).
- Emphasis on social sector and delivery of service therein.
- Empowerment through education and skill development.
- Reduction of gender inequality.
- Environmental sustainability.
- To increase the growth rate in agriculture, industry and services to 4%, 10% and 9% respectively.
- Reduce total fertility rate to 2.1.
- Provide clean drinking water for all by 2009.
- Increase agriculture growth to 4%.

10.15 Twelveth Five year Plan (2012-2017)

The Twelfth Five-Year Plan of the Government of India has been decided to achieve a growth rate of 8.2% but the National Development Council (NDC) on 27 December 2012 approved a growth rate of 8% for the Twelfth Plan.

With the deteriorating global situation, the Deputy Chairman of the Planning Commission Montek Singh Ahluwalia has said that achieving an average growth rate of 9 percent in the next five years is not possible. The Final growth target has been set at 8% by the endorsement of the plan at the National Development Council meeting held in New Delhi.



The objectives of the Twelfth Five-Year Plan were:

- To create 50 million new work opportunities in the non farm sector.
- To remove gender and social gap in school enrolment.
- To enhance access to higher education.
- To reduce malnutrition among children aged 0–3 years.
- To provide electricity to all villages.
- To ensure that 50% of the rural population have accesses to proper drinking water.
- **To increase green cover by 1 million hectare every year.**
- To provide access to Binkang services to 90% of households.

10.16 Financial Achievements during Last 12 Years in Forestry Sector:

The Budget provision in Forestry Sector under Plan & Non- Plan head during the last twelve years for the State is summarized below (Table No 10. 1)

Table No 10.1 Budget Provision in last twelve years (For the State)			
Year	Figures (Rs. in lakhs)		
	Non-Plan	Plan	Total
2008-09	35038.2	21001.2	56039.5
2009-10	37817.8	21609.2	59426.9
2010-11	37069.4	24204.3	61273.6
2011-12	38309	28648.5	66957.5
2012-13	27952.8	36873.2	64826.1
2013-14	25791.5	39351	65142.5
2014-15	30722.2	25885.7	56607.9
2015-16	23040.9	20378.8	43419.7
2016-17	24637.8	18093.3	42731.1
2017-18	30600	10057.8	40657.8
2018-19	30599.9	21989.2	52589.1
2019-20	32304.4	83963	116267

10.16.1 Expenditure on Forest Research

The programme named as Forest Research with the budget provision under the Programme Expenditure Scheme “Training Programme” envisages to support special research schemes on the following themes:



1. Tree breeding / improvement activities of commercially important trees and important indigenous species including NTFPs,
2. Standardisation of nursery & establishment techniques of medicinal plants and NTFP species.
3. Sustainable harvest techniques for NTFPs and medicinal plants.
4. Propagation of improved varieties of Bamboo and Canes.
5. Application of bio-fertiliser.
6. Development of agro-forestry models in different agro-climatic zones and
7. Development of seed production areas for major species.

Apart from that, during the current year, the budget provision of Rs.30.00 lakh has been made for Silviculture Researches on tree improvement, nursery & plantation techniques and plant ecological studies with up-gradation of research facilities as per the approved Quinquennial Research Programme.





CHAPTER-11

PAST SYSTEM OF MANAGEMENT

11.1 General History of the Forest:

The history of forest management has been collected from the inspection note of Sri A.N Grieve from 1912 to 1927 and the first Working Plan of this Division. Bengal Nagpur Railway had opened Sambalpur branch during the year 1893. Since then sleepers were exploited from this forest. The Rairakhol State was brought under the management of Government on the death of Raja Gour Chandra Jenamani Deo during 1906. The first sleeper lease commenced from 1907 and was granted to M/s B. Baroach and Company. M/s B. Baroach and Company had transferred the sleeper lease to the Bengal Timber Trading Company Limited in 1910. The Bengal Timber Trading Company took the lease of the entire forest area of the state continuously until 1927.

The forest of Rairakhol State were extensive and containing sound and valuable growth. The forest was severely affected by shifting cultivation and sleeper collection. Practically, no attempt was made to stop it. The forest was not managed systematically but it was considered as the main source of revenue to the State. The resultant crop, which remained in the forest, was mostly young with some over matured unsound trees and non-sleeper miscellaneous species.

The first attempt towards conservation of forest area was made after the State was placed under the management of the Government. During the year 1908, demarcation of forest blocks started with a view to constitute them as Reserve Forest, but nothing was achieved until 1911. Dr A.R Grieve, the Agency Forest Officer visited the forest during January 1912 and he proposed formation of six Reserve Forest namely Landakot, Kholgarh, Hatidhara, Landimal, Rahan and Rail. He introduced the first systematic forest management in the State. Survey and demarcation of those forest blocks started in the year 1912 and continued up to 1927-28. Those forest blocks were declared as Reserve Forest in the year 1912 but their Survey and creations of boundary pillars were completed in the year 1929.

The Forest Rules of Rairakhol state were first framed and published in the year 1925. Agency Forest Officer had also framed a set of Rules for sleeper operation in Landakot Reserve Forest. The other forests were left to work out in turn till the lease granted to Bengal Timber



Trading Company, which was expired in the year 1927. The Forest Rules were revised in 1936 and reprinted.

11.2. Past System of management:

11.2.1 Mr F.A. Hart Prescription:

i) Selection –Cum- Improvement System:

In 1931 Mr.F.A Hart, the Agency Forest Officer introduced **Selection-cum-Improvement system of working** with a felling cycle of 30 years. He had set up four felling series with exploitable girth of 135 cm (4'6") in each felling series.

Basing on enumeration data the yield was fixed in term of number of exploitable trees in four felling series. Only Sal is considered for prescribing the annual yield. An extent of 25 % of total trees in approaching girth class (3'6" to 4'6") was taken into consideration for computing the yield regulation. The above mentioned prescriptions were implemented from 1931-32 to 1941-42. Only sal trees were marked until 1939-40. But in Kholgarh block, Bija over 5' girth at breast height were felled.

ii) Coppice System of Working:

Rahan block was set aside to work under Coppice System for supplying of small timber and firewood to the people of Sonapur State in the year 1927 and 1928. The coupes in different felling series were sold by auction, but the result of the sale value was unsatisfactory in 1929. Then it was decided to work the coupe departmentally. There were four felling series formed for coppice coupes. The coupes worked under Coppice System in different felling series from 1931-32 to 1940-41.

Result:

Mr. Hart calculated the annual yield by taking 25 % of the total trees of approach class. He considered that the above number of trees might attend exploitable girth during the felling cycle. This resulted in over exploitation and the percentage of unsoundness increased due to adverse edaphic factor.



11.2.2 Mooney's Plan (1942 to 1957):

This was the first regular Working Plan of Rairakhol State, which was prescribed for the management of 14 number of Reserve Forest covering an area of 309178.00 acres. It came into operation from October 1942 and continued up to 1960. Revision of this Plan could not be completed in time, which resulted in continuity of the Plan period from September 1957 to 1960. During the above period the forests were managed under three Working Circles as furnished below.

- Selection Working Circle,
- Coppice Working Circle,
- Bamboo Working Circle

i) Selection Working Circle

This Working Circle covered an area of 253760.00 acres. Rail, Landimal, Hatidhara, Kholgarh, Landakot and a portion of Khalasuni (8000.0 acres) had been allotted to this Working Circle. The blocks allotted to three felling series and the details are given in the table below.

Table No 11.1 Selection Working Circle : Mooney Working Plan					
Sl. No.	Name of the felling series	Area in acres	No. of block	No of trees to be felled	DBH in cm (Exploitable Diameter for Sal)
1	Eastern	104960.00	3	12000	45
2	Western	140800.00	2	10000	45
3	Khalasuni	8000.00	1 (part)	500	50

Silvicultural System: The silvicultural system prescribed was Selection followed by Improvement. The object was to remove all exploitable along with defective trees that were silviculturally available. The rotation was fixed at 120 years with an object to produce trees of 45 cm diameter at breast height (d.b.h). Main felling in the coupe was prescribed in the year of working and improvement felling was prescribed in the same year but following the main felling.

As per Hart's prescription 12 number of coupes had been worked and Mooney's Plan period was 15 years. So felling cycle was fixed to 27 years. But in case of Khalasuni felling series, the felling cycle was fixed at 15 years. This was being done to regularize the works in future.



Non-Sal Species - Felling of a limited numbers of other marketing species were also prescribed. The exploitable diameter at breast height as fixed is given in the table below.

Table No 11.2 Exploitable DBH Non-Sal Species : Mooney working plan

Sl. No.	Name of species	Diameter at breast height (DBH in cm).
1	Mundi, Asan and Piasal	50
2	Sisoo	40
3	Bandhan and Dhaura	35

Result:

The entire areas allotted to Selection Working Circle were exploited for sleeper supply. The leaseholder did not remove all the unsound trees against the provision in the lease. They only removed the best stems out of the trees marked. It was found that the area yielded more exploitable trees than the number prescribed. In eastern felling series three extra coupes and in Khalasuni felling series two extra coupes had been worked. The retention of exploitable tree was very negligible as nothing was prescribed.

Mohanty's Plan pointed out that the felling in Mooney's Plan was heavy. Improvement felling and thinning were neglected due to want of fund. The exploitable girth fixed for Sal was quite high and this resulted unsoundness.

ii) **Coppice Working Circle:**

Nadia, Tal, Suani, Rengali-Badmal and Chargarh Reserve Forest were included in Coppice Working Circle. Seven felling series were formed over 22525.00 acres of land. The system prescribed was **Coppice with Standard**. Five to ten trees per acre of healthy principal species with in the limit from 20 cm to 25 cm diameter were selected as standard. Rotation of 40 years was prescribed. Practically there was very poor demand on small timber and firewood by the local people for which works were not done in the coupes.

Result:

Chargarh and Rengali-Badmal felling series were regularly worked out up to 1960-61 or before commencement of Mohanty's Plan. Silvicultural operation and fire protection were not properly done due to paucity of fund and want of staff.



iii) **Bamboo Working Circle:**

An area of 53693.00 acres had been allotted to this Working Circle. Five felling series had been formed. The Working Circle overlapped a portion of Selection Working Circle of Khalasuni, Hatidhara, and Kholgarh blocks. Four year cutting cycle was adopted. The area allotted to four coupes in each felling series was on equi-productive basis. Eight cutting rules had been given such as

- a) All Bamboos must be cut within twelve inches of the ground.
- b) Culms of less than 2 years growth may not be cut.
- c) In addition to all culms of the first and second year, five older culms must be left in each clump.
- d) Clump contains ten culms or less may not be worked.
- e) All dead, top-broken and badly malformed bamboos will be removed.
- f) As far as possible, culms will be cut evenly from all over the clump and not from the periphery only.
- g) Bamboos may not be cut in the year of flowering, but after shedding their seeds all dead bamboo clumps may be clear felled.
- h) Bamboo coupes will be worked in sequence.

Result:

M/s Orissa Paper Mill Limited worked on Hatidhara and Khalasuni felling series from 1.9.1944 to 31.8.1952 with a minimum royalty of Rs.5000.00 per year at the rate of Rs.0.50 per hundred bamboos. Again Khalasuni, Hatidhara and Bindhybasini felling series were leased out to M/s Titilagarh Paper Mill from 1.10.1954 to 30.9.1966 with a minimum royalty of Rs.9000.00 per year at the rate of Rs.1.50 per hundred bamboos. The working result by the paper mill on long-term lease basis was below satisfactory. The extraction path was quite extensive. The leaseholder had sub-let the bamboo area to petty contractor, who had over exploited and not given proper attention towards the hilltop crops. They worked as per their immediate best interest.

Tenants worked in Sagmalia 'A' and 'B' felling series to meet their need. Since the tenant's cutting was irregular, then the bamboo operation was conducted by departmentally and the



produce was sold to them. Improvement works and removal of dry bamboos had not been under taken, which resulted fire hazard and reduction of clumps.

11.2.3: Sri A.P. Mohanty's Plan (1961-62 to 1980-81):

Sri A.P. Mohanty, A.I.F.C, Plan covered 14 Reserve Forest of total 247851.1 acres. The following six Circles were prescribed as detailed in Table No 11.3

Table No 11.3 working Circle Prescribed in Sri A.P. Mohanty's plan			
Sl. No.	Name of the Working Circle	Area allotted in acre	Area in ha.
1	Selection-cum-Improvement W.C	195116.6	78963.7
2	Coppice Working Circle	28669.7	11602.0
3	Plantation Working Circle	24064.8	9743.0
4	Bamboo Working Circle	62171.0	25160.9
5	Khair Working Circle	20251.0	8195.2
6	Minor Forest Produce Working Circle	x	X

i) Selection-cum-Improvement Working Circle:

The Working Circle covered an area of 195116.10 acres having good timber bearing blocks. The main object of the Working Circle was to remove large unsound trees, harvesting of exploitable trees, retention of vegetation cover on the steep hills and eroded areas and infuse regeneration of all natural valuable species through silvicultural manipulation. Ten felling series had been formed covering Rail, Bindhybasini and part of Landakot, Kholgarh, Hatidhara, Khalasuni, Landimal, Tal and Rahan blocks. The silvicultural system was **Selection-cum-Improvement felling**. The rotation was fixed to 120 years with 20 years felling cycle. The exploitable diameter at breast height for different species was fixed as detailed at Table no 11.4



Table No 11.4 Exploitable diameter for different species during Mohanty's plan

Name of species	Name of felling series	Exploitable girth in cm (GBH)
Sal	Balikiary, Brahmani, Kholgarh, Terbeda, Hatidhara, Rail, Landimal,	120
Sal	Khalasuni	150
Sal	Sagmalia, Tal	105
Blja, Asan, Kurum, Mundi, Semul	All felling series	150
Dhaura	All felling series	135
Sisoo	All felling series	120
Bandhan	All felling series	090
Others	All felling series	135

Results:

The exploitation was made through contractor after auction. Only the big contractors monopolized and captured the coupes. The area of coupe was too big that the work could not be completed in time. The working period in most of coupes were extended and there by subsidiary silvicultural operation delayed. The marking rules were not rigidly enforced.

An area of 305.25 ha having poor quality crops in Hatidhara block had been clear felled and Planted up with teak and semul and enriched the area. An area of 725.90 ha of best sal forest in Kholgarh block had been clear felled and converted into cultivable land (657.42 ha) and re-settlement (68.48 ha) of the displaced person of Rengali dam project vide Government order No.10F (con's) 56 / 87-18943 / FF and AH dt.27.10.1987. But the converted area had not been compensated.

ii) Coppice Working Circle:

An area of 28669.7 acre had been allotted to this Working Circle and distributed to 9 felling series. The silvicultural system prescribed was Coppice with Standard. A rotation of 60 years in case of Burda, Mochibahal and Kisinda felling series and 40 years in case of remaining felling series had been prescribed. The retention of 25 to 38 well shaped thrifty and healthy trees of 15 to 25 cm diameter per hector had been prescribed as standard. The yield had been regulated on area basis.



Result:

Clear felling invited heavy grazing, forest fire and very poor regeneration. These areas had lost potential of growing large size timber. The produce obtained from the coupe should be first made available to meet the requirement of local people then the balance would be sold. But this was not done and the coupes were sold to contractor or handed over to Orissa Forest Development Corporation Limited. This resulted scattered illicit felling.

iii) **Plantation Working Circle:**

An area of 24064.8 acres had been allotted to this regular Plantation Working Circle. It comprised of plain having miscellaneous crops and badly eroded area, which was suitable for teak Plantation. The species prescribed for Plantation were Teak, Bija, Bandhan, Kurum, Sisoo, Khair, Sabai and Eucalyptus.

Result:

During the Plan period only 757.00 acres within the Working Circle and 1444.00 acres outside the working area were achieved against the target of 5960.00 acre. The deviation was due to uncertainty of budget allocation and non-adherence to Plan's prescription.

iv) **Bamboo Working Circle:**

An area of 62171.00 acres was allotted to this Working Circle, which was further distributed into 8 felling series. The cutting cycle was 4 years. The bamboo bearing area of Kholgarh, Hatidhara, Rahan and whole of Khalasuni, Sagmalia and Bindhybasini under this Working Circle were leased out to M/s Titagarh Paper Mill.

Result:

It revealed from cutting report and enumeration that clumps had deteriorated in Rahan, Sagmalia and Bindhybasini due to over cutting and theft. Rahan felling series had not been worked during the Plan period. Production was rapidly declining in successive cutting cycle. This was due to violation of cutting rules and checking of irregular cutting in inaccessible portion.



v) **Khair Working Circle:**

An area of 20251.00 acre of land was allotted to this Working Circle. The silvicultural system prescribed was Selection System. The exploitable girth was fixed to 60 cm at base of the tree. Twenty coupes had been formed in the available area of Khair. Some khesara forest adjoining to reserve forest was included for which coupe area had not been precisely laid down in the map.

Result: This Working Circle had not been worked in the Plan period.

vi) **Minor Forest Produce Working Circle:**

This Working Circle included cultivation of Tasar cocoon, exploitation of Genduligum, Mahua flower, Sal seed and other minor forest produce. During the Plan period several minor forest produces were leased out.

11.2.4 Sri A. N. Nath's Plan (1982-83 to 2001-02):

The area covered in this plan included 19 blocks covering an area of 107613.0 ha. In order to achieve the objectives five Working Circle were constituted. These are

- Selection Working Circle,
- Coppice Working Circle,
- Teak Plantation Working Circle,
- Rehabilitation Working Circle &
- Bamboo Overlapping Working Circle.

i) **Selection Working Circle:**

An area of 92940.00 ha from 14 number of reserve forests was allotted to this Working Circle, which was further distributed into 17 felling series. The main object of this Working Circle was to improve the condition and composition of crop through silvicultural practices. The natural regeneration of principal species was encouraged through tending operation. The silvicultural system prescribed was Selection System. Prescription for artificial regeneration was made in under stocked area, which was further supplemented by thinning in congested patches. A rotation of 120 years with felling cycle of 20 years was prescribed. The exploitable girth for different species was fixed in all the proposed felling series basing on enumeration data. The exploitable Girth (GBH) is indicated in Table No 11.5



Table No 11.5 Exploitable girth for different species was fixed

Name of the felling series	Name of species	Exploitable g.b.h in cm
Khalasuni, Ushahara	Sal	150
Dhalpur, Sodo, Balikiary, Brahmani, Bantloi, Kholgarh, Rail, Terbeda, Koing, Hatidhara, Tal, Landimal, Sagmalia, Goudgad, Hitasara	Sal	120
Sagmalia	Sisoo	150
	Haldu	180
	Bija,Mundi,Semul	150
	Bandhan,Khair	090
	All other's	135
Balance felling series	Bija,Asan,Haldu Mundi,Semul	150
	Sisoo	120
	Bandhan,Khair	090
	All other's	135

Result:

There was ban on tree felling vide Government letter No.27161/FandE dt.12.11.1992 address to Principal Chief Conservator of Forests and the same was communicated to all Divisional Forest Officers vide memo No-21302 (38) dt.17.11.1992 from Head Office. Basing on the fact above 136 (8 x 17) coupes due for working during 1994-95 to 2001-02 had not been operated as per prescription. So during the Plan period 12 coupes should have been worked out of 20 coupes in each felling series. As a whole out of 340 (17 x 20) coupes in the Selection Working Circle only 204 (12 x 17) coupes should have been worked out as per prescription due to implementation of ban on tree felling.

But as per record 191 coupes out of 204 (12 x17) had been exploited by Orissa Forest Development Corporation Limited during the Plan period. In the stock map and present condition of the forest, it is clearly understood that in the working coupes of Landakot, Hatidhara, Bindhybasini and Sagmalia reserve forests, over exploitation had been done. The sound silvicultural operation after exploitation had not been done. Climber cutting had not been done at the time of selection marking. Over and above it is a fact that the working prescription was not followed properly. Tree had not been exploited in the area covering 149 coupes in the prescribed Plan. At present the trees attended over an exploitable girth



affected by disease and there by reduces quality and quantity of timber. Due to nonworking of coupe the suppressed trees could not grow properly. Climbers increased and suppressed the growth of the trees. Incidence of ground fire increases which reduce natural regeneration. The details of worked and un-worked coupes during the Plan period are given in the table below.

iii) Coppice Working Circle:

An area of 6694.00 ha was allowed to this Working Circle from Landakot, Hatidhara, Rengali-Badmal, Chargarh and Rahan blocks, which was further distributed into 7 felling series. Out of 140 Coupes (7x20) only 68 coupes could be workedout and balance 72 coupes were not workedout due to “Ban on Tree Felling”. The system prescribed was Clear Felling with Reserve system. Reservation by area, species and trees were the main prescription. In addition to that some other trees were left as standard at the time of clear felling to promote natural regeneration. The rotation of 60 years in case of Burda and Mochibahal felling series and 40 years for the remaining felling series had been prescribed depending on requirement and growth rate.

Result:

Consequence upon ban on trees felling 23 (20x2 – 8x2 – 1) number of coupes out of 40 coupes under 60 years rotation and 45 (20x5 – 8x5 – 15) number of coupes out of 100 coupes under 40 years rotation were worked during the Plan period. This Division has a number of Khesara forest scattered through out the areas of the division. So there is no shortage of small wood and firewood to meet the demand of local people except for some village in Birmharajpur Sub-division of Subarnapur District. Also forest fire is another problem, which was seen in every year. By clear felling the area without strong fire protection and grazing invited devastation of natural forest and soil erosion. This was happened in most of the worked out area. In over all, the main objects of this Working Circle could not be achieved during the Plan period.

iv) Teak Plantation Working Circle:

An area of 1707.00 ha including all old teak Plantation was allotted to this Working Circle, which was further, distributed into 3 planting series namely Rengali, Badherna and Rukunipur.



Result:

Plantation as per the prescription had not been taken up during the Plan period. No special improvement works had been taken up in the old teak Plantation. Due to heavy demand of teak in the locality as well as other places like Sambalpur, Angul, Denkanal, Cuttack, Bhubanaswar etc, it was noticed that the old teak Plantation area was in the pressure of illicit removal.

v) Rehabilitation Working Circle:

An area of 4980.00 ha had been allotted to this Working Circle, which was further distributed into 7 re-habilitation series. All the degraded areas in different blocks were included in this newly created Working Circle. The main objects of this Working Circle were (i) To improve the productive capacity of the depleted forest through rehabilitation measure. (ii) To improve the soil and moisture conservation measure. (iii) To afford effective measures against grazing, fire and theft. (iv) To check further destruction of natural crop.

Result:

Different works as per the prescription were not implemented during the Plan period due to less allotment. The area has been developed up to some extent by nature and protection.

vi) Bamboo Overlapping Working Circle:

An area of 25706.00 ha had been allotted to this Working Circle, which was further distributed into 8 felling series. All the bamboo-bearing areas were allotted to this Working Circle. The system prescribed was culms selection -cum -clump improvement system. The cutting cycle of 4 years was adopted in all felling series. Each cutting series was further divided into 4 annual coupes.

Result:

The annual yield had been regulated by area basis. The outturn of annual coupe varied considerably due to continuous theft during the Plan period. During the Plan period out of 160 Coupes (8x20) only 68 Coupes were workedout and 92 coupes were not workedout due to “**Not Economical for Working**”.



vii) Management of Wild Life:

The reserve forests constitute 44 % of the total geographical area of this Division. The total area of forest status is very significant for its composition, compactness, distribution and climatic condition. It creates a favorable condition for growth and multiplication of different wild lives. As per census figure during 1979 the population of tiger and elephant were 3 and 51 respectively in this Division. Leopard, other carnivores, herbivorous, birds and reptiles were pettily available in this tract.

Constitution of Shooting Block - In 10 Reserve forests, 10 number of shooting block had been constituted for hunting of certain category of animals, whose multiplication may endanger the forests or to other animals and birds.

Result:

Construction of road in the forest increased speedy vehicular traffic and there by increased poaching. The Wild Life Protection Rule (Orissa) 1974 was framed by the state Government under the provision of Indian Wild Life Protection Act 1972. The population of tiger came to an end during the Plan period. The populations of other wild animals were in decreasing order during the Plan period. The reasons for descending order of wild life population were forest fire, shortage of water during summer and poaching.

viii) Management of Minor Forest Produces:

All most all varieties of minor forest produces are available in this tract of forests. But the local people are collecting some of the items for their use or for selling. The MFP items available in this division are Kendu Leaves, Sal Seed, Siali Leaves and Fibers, Tasar Cocoon, Myrobalans, Mahua Flowers.

Result:

During the Plan period tasar cocoon was leased out to Orissa Co-operative Tasar and Silk Federation Limited and collection of all the minor forest produce were vested to Panchayats during the year 2000.



11.2.5 Working Schemes for DPF:

For management of 13 DPF covering an area of 7188.02 ha Working Schemes were prepared and implemented.

11.2.5.1 M.R Panda's First Scheme (1981-82 to 1990-91):

The scheme covered 13 Demarcated Protected Forest blocks covering an area of 7188.02 ha. Selection and Bamboo over lapping Working Circle were formed in this scheme.

Result:

Out of total 80 coupes only 47 coupes were worked during the Scheme period. No developmental works had been taken up in the worked out coupes as per prescription. During the Scheme period 40 coupes were to be worked. But coupe working started during the year 1982-83, where both coupe No.i and ii were worked in the same year. Again the Scheme period extended from 1991-92 to 2001-02 vide memo No.20378 (5) dt.22.4.1994 of P.C.C.F, Orissa for execution of balance 40 coupes, which had been formed in the Scheme up to 2001-02.

Bamboo Over Lapping Working Circle:

The total area allotted to this Working Circle was 1449.99 ha in Giripur, Tikira and Sagjori blocks, which was further distributed into two cutting series. Four coupes in each cutting series with 4 years cutting cycle had been fixed.

Result:

Out of 16 bamboo coupes only 4 coupes were worked during the Scheme period. No improvement works in the bamboo coupes were taken up as per prescription during the Scheme period.

11.2.5.2 M.R Panda's Second Scheme (1982-83 to 1991-92):

In this Scheme 5 number of demarcated protected forest blocks covering an area of 997.182 ha was included. All the blocks were allotted to Selection Working Circle and only one felling series was formed with felling cycle of 20 years. Exploitable girth of different species was fixed but rotation had not been fixed.



Result – Out of 20 annual coupes only 11 coupes were worked out during the Scheme period. No developmental works had been taken up during the Scheme period as per prescription. Scheme was extended up to 2001-02.

Bamboo Over Lapping Working Circle – This over lapping Working Circle extended an area of 852.703 ha in Bhalukhol and Kendumundi blocks. Only one cutting series with cutting cycle of 4 years was fixed.

Result – Any bamboo coupes were not worked out during the Scheme period. Restocking and other silvicultural works for improvement of the clumps had not been taken up during the Scheme period.

11.2.6 Joint Forest Management:

The Orissa Village Forest Rules, 1985, envisage formation of Village Forest Committee for protection of Village Forest. The State Government vide resolution No.17240 dt.01.08.1988 and No.13638 dt.01.10.1988 introduced the concept of Joint Forest Management in the State for protection of Reserve Forests by the committee. Subsequently another resolution was issued by the Government vide No.29825 dt.11.12.1990, which envisages protection of Reserve Forests and Protected Forests by the community and enjoy the benefits as per section-24 of Orissa Forest Act 1972.

The concept of Participatory Forest Management was introduced vide Government resolution No.16700 dt.03.07.1993. Emphasis was laid on formation of Van Sangrakshyna Samiti in the villages adjoining to the Degraded Forest to protect and manage the Forest through Joint Forest Management. The Samiti has the right to collect royalty free small timber and firewoods, 100 % of the interim yield and 50 % of the final harvest.

11.2.7 Forest Development Agency (FDA):

Forest Development Agency has been launched in this Division vide registration No.SBL-5693-53 of 2002-03 dt.13.09.2002 by Registrar of Societies, Sambalpur. Ministry of Environment and Forests, Government of India, under National Afforestation Program have funded Rairakhol FDA for the period of five years (2002-03 to 2006-07) vide letter No.NAEB: 16119 / 2002-B-III dt.25.11.2002 of MoEF, GOI.

The second phase project proposal under Rairakhol FDA has been submitted to Conservator of Forests, Sambalpur Circle, vide memo No.2065 dt.21.07.2003 of Divisional Forest Officer, Rairakhol, which covers 33 VSS. An estimate of Rs.202.23 lakhs has been proposed to take up



different works over 1500.0 ha in the protected area of the VSS. The second phase program me was not approved during this period.

11.2.8 Sri Sankarsan Behera Plan: (2007-08 to 2016-17)

The outgoing Plan was by Sri Sankarsan Behera. It was for the period 2007-08 to 2016-17. This plan includes part of the areas coming under Birmaharajpur Sub division and subsequently transferred to Subarnapur Division. (These are under erst while Rampur range and Mochibahal Range). The total area included in this Plan was 107488.52 ha (RF, PRF, DPF, and VF).

For management of forests two independent Working Circle and Six Overlapping Working Circle were constituted. These Working Circles are

- i. Selection Working Circle (88543.15 ha)
- ii. Rehabilitation Working Circle (18945.37)
- iii. Plantation (O) Working Circle,
- iv. Non Timber Forest Produce (O) Working Circle,
- v. Bamboo (O) Working Circle,
- vi. Protection (O) Working Circle,
- vii. Joint Forest Management (O) Working Circle,
- viii. Wild Life Management (O) Working Circle.

11.2.8.1 Prescription & Result:

i) Selection Working Circle:

An area of 88543.15 ha as per GIS, which includes pure Sal Forest in plain area and Miscellaneous Forest in the hill terrain having various age groups were allotted to this Working Circle. In this area trees, which have attained exploitable girth and whose extraction will not create permanent gap in the canopy, are targeted for harvesting during this plan.

Nine Felling series were constituted. The Felling series wise area is furnished below (Table No 11.6).



Table No 11.6 Area allotted to different felling series

Sl. No.	Felling Series	Range	GIS area in ha
1	Suani	Charmal	11269.67
2	Balikiary	Giripur	14620.82
3	Kholgarh	Giripur	10914.17
4	Brahmani	Mochibahal	5413.57
5	Landimal	Naktideul	14026.78
6	Rail	Naktideul	11289.54
7	Tal	Rairakhol	4757.23
8	Hatidhara	Rampur	8282.93
9	Terbeda	Rampur	7968.44
	Total area		88543.15

The Rotation Period and Exploitable Girth were prescribed. The Species wise Rotation Year & Exploitable Girth was furnished at Table No 11.7 and 11.8

Table No 11.7 Species wise Rotation Year & Exploitable Girth

Sl No	Name of species	Rotation in years
1	Sal	120
2	Bija	100
3	Sisoo	130
4	Teak	60
5	Eucalyptus	15
6	Asan	100
7	Mundi	60
8	Kendu	120
9	Bandhan	100
10	Kasi	80
11	Tentala	120



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Table No 11.8 Exploitable girth at breast height

Name of the Blocks	Name of the trees	Exploitable GBH in cm
Landakot, Kholgarh, Hatidhara, Tal, Landimal and Rail	1. Sal	135
	2. Bija, Haldu and Mundi	120
	3. Bandhan and Sisoo	105
	4. Asan, Dhaura and Semul	150
	5. All other species	135
In balance 14 number of blocks	1. Sal	120
	2. Bija, Haldu and Mundi	135
	3. Bandhan and Sisoo	105
	4. Asan, Dhaura and Semul	165
	5. All other species	150

Basing on Smith's Safeguard Formula, it is expected to harvest 54062 trees from 88543.15 ha i.e. 1.64 trees per ha. The year wise expected production is furnished at Table No 11.9

Table No 11.9 Year wise trees to be harvested in deferent felling series

Year	Name of felling series and trees to be harvested										GIS area in ha
	Suani	Baliki ari	Kholgarh	Brahmani	Rail	Landimal	Tal	Hatidhara	Terbeda	Total trees	
2007-08	521	731	798	374	791	711	357	519	599	5401	9375.45
2008-09	576	960	449	393	866	895	266	578	424	5407	8482.86
2009-10	549	825	567	354	956	735	266	707	449	5408	9236.14
2010-11	647	978	666	415	635	771	290	563	444	5409	8712.81
2011-12	633	856	735	415	447	685	249	906	477	5403	9972.76
2012-13	398	886	719	274	759	807	393	669	498	5403	8702.43
2013-14	534	920	642	257	503	870	218	1023	435	5402	9106.07
2014-15	461	757	526	415	1085	494	249	854	565	5406	8044.11
2015-16	529	808	621	395	711	966	207	591	575	5403	8617.72
2016-17	573	809	509	218	1003	732	415	629	532	5420	8292.80
Total	5421	8530	6232	3510	7756	7666	2910	7039	4998	54062	88543.15



Considering the coupe working from 2007-08 to 2016-17, 88543.15 ha of Forest has been worked out as regular coupe and 51619 trees have been marked and felled. Number of trees marked per ha is 1.71 and productivity is 0.281 cum per ha.

There is no failure in the implementation of the prescription under Selection Working Circle except working of 2007-08 and 2009-10 coupes during 2009-10 and 2010-11 respectively due to late approval of the Working plan and as per instruction of the Govt. of India MoEF to recast the proposal for working of timber coupe of 2009-10 vide No. 9-17/2002 ROHQ dt. 17.02.2010. As per working plan prescription 48847 nos. of trees are to be felled from 2007-08 to 2015-16 but 46422 nos. of tree marked and felled from 2007-08 to 2015-16. The balance 2225 nos. of tree could not be marked and felled during the year 2007-08, 2008-09, 2009-10, 2010-11 & 2013-14 due to no availability of exploitable girth class as per para no. 2.8 of working plan.

Subsidiary Silvicultural Operation:

Subsidiary Silvicultural Operation has been carried out after coupe working. The year wise achievement is furnished at Table No 11.10

Table No 11.10 SSO taken up in Timber Coupes.

Sl. No.	Coupe year	Name of the Coupe	Total coupe area as per W.P	S.S.O work out		
				Area	Percolation Pits in nos.	LBCD in nos.
1	2008-09	Terbeda SWC-II	463.72	300	0	0
2		Hatidhara SWC-II	933.39	733.39	0	0
3		Kholgarh SWC-II	1178.31	742.03	0	0
4		Balikiari SWC-II	1512.65	2165.93	0	0
5		Lndimal SWC-II	1123.24	1073.21	0	0
6		Rail SWC-II	1010.49	1060.49	0	0
7		Tal SWC-II	407.46	407.46	0	0
8		Suani SWC-II	1217.42	1217.42	0	0
9		Brahamani SWC-II	636.18	636.18	0	0
		Total	8482.86	8336.11		
1	2010-11	Hatidhara SWC-I	755.91	751.91	0	0
2		Kholgarh SWC-I	1704.44	1704.44	0	0
3		Balikiari SWC-I	1456.28	1456.28	0	0
4		Lndimal SWC-I	907.52	907.52	0	0



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Table No 11.10 SSO taken up in Timber Coupes.

Sl. No.	Coupe year	Name of the Coupe	Total coupe area as per W.P	S.S.O work out		
				Area	Percolation Pits in nos.	LBCD in nos.
5		Rail SWC-I	1115.90	1115.9	0	0
6		Suani SWC-I	1201.85	1201.85	0	0
7		Brahamani SWC-I	731.85	731.85	0	0
8		Terbeda SWC-I	953.59	953.59	0	0
9		Tal SWC-I	548.11	548.11	0	0
		Total	9375.45	9371.45		
1	2011-12	Terbeda SWC-III	668.50	668.5	0	0
2		Hatidhara SWC-III	524.59	524.59	0	0
3		Kholgarh SWC-III	1569.58	1569.58	0	0
4		Balikiari SWC-III	1118.13	1064.85	0	0
5		Lndimal SWC-III	921.80	921.8	0	0
6		Rail SWC-III	1300.95	1300.95	0	0
7		Tal SWC-III	406.00	406.0	0	0
8		Suani SWC-III	2140.24	2140.24	0	0
9		Brahamani SWC-III	586.35	586.35	0	0
		Total	9236.14	9182.86		
10		Terbeda SWC-IV	814.94	814.94	786	829
11		Hatidhara SWC-IV	518.75	518.75	465	
12		Kholgarh SWC-IV	1262.55	-	-	-
13		Balikiari SWC-IV	1671.42	-	-	-
14		Lndimal SWC-IV	965.49	431.18	-	1117
15		Rail SWC-IV	1391.21	255	-	255
16		Tal SWC-IV	534.52	534.52	542	541
17		Suani SWC-IV	1036.18	-	-	-
18		Brahamani SWC-IV	517.75	517.75	-	512
		Total	8712.81	3072.14	1793	3254
1	2012-13	Terbeda SWC-V	517.52	417.52	408	207
2		Hatidhara SWC-V	1064.48	838.2	470	243
3		Kholgarh SWC-V	1308.95	1002.21	896	-
4		Balikiari SWC-V	1861.54	1405.08	755	-
5		Lndimal SWC-V	2036.68	1310.63	2420	-
6		Rail SWC-V	1049.04	1049.04	469	89
7		Tal SWC-V	420.09	283.4	500	-



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Table No 11.10 SSO taken up in Timber Coupes.

Sl. No.	Coupe year	Name of the Coupe	Total coupe area as per W.P	S.S.O work out		
				Area	Percolation Pits in nos.	LBCD in nos.
8		Suani SWC-V	1196.710	702	399	24
9		Brahamani SWC-V	517.75	517.75	219	217
		Total	9972.76	7525.83	6536	780
1	2013-14	Terbeda SWC-VI	763.62	330	84	34
2		Hatidhara SWC-VI	729.02	315	1171	95
3		Kholgarh SWC-VI	842.31	360	470	32
4		Balikiari SWC-VI	1098.96	470	1100	236
5		Landimal SWC-VI	2061.88	885	862	59
6		Rail SWC-VI	1416.15	610	634	42
7		Tal SWC-VI	601.38	260	392	395
8		Suani SWC-VI	705.16	300	323	129
9		Brahamani SWC-VI	483.95	287	287	236
		Total	8702.43	3817	5323	1258
1	2014-15	Hatidhara SWC-VII	1143.86	1143.86	0	0
2		Terbeda SWC-VII	935.98	935.98	0	0
3		Suani SWC-VII	873.97	873.97	0	0
4		Balikiary SWC-VII	1463.19	1463.19	0	0
5		Kholgarh SWC-VII	787.86	787.86	0	0
6		Rail SWC-VII	745.06	745.06	0	0
7		Landimal SWC-VII	2168.02	2168.02	0	0
8		Tal SWC-VII	488.87	488.87	0	0
9		Brahamani SWC-VII	493.19	493.19	0	0
		Total	9100	9100		
1	2015-16	Hatidhara SWC-VIII	1046.28	1046.28	0	0
2		Terbeda SWC-VIII	408.35	408.35	0	0
3		Suani SWC-VIII	770.43	770.43	0	0
4		Balikiary SWC-VIII	1374.23	1374.23	0	0
5		Kholgarh SWC-VIII	850.08	850.08		0
6		Rail SWC-VIII	1495.63	1495.63	0	0
7		Landimal SWC-VIII	1157.28	1157.28	0	0
8		Tal SWC-VIII	420.09	420.09	0	0
9		Brahamani SWC-VIII	517.63	517.63	0	0
		Total	8040.00	8040.00		



Table No 11.10 SSO taken up in Timber Coupes.

Sl. No.	Coupe year	Name of the Coupe	Total coupe area as per W.P	S.S.O work out		
				Area	Percolation Pits in nos.	LBCD in nos.
	2016-17					
1		Terbeda SWC-IX	840.24	840	0	0
2		Suani SWC-IX	1291.35	1290	0	0
3		Balikiary SWC-IX	1131.1	1130	0	0
4		Kholgarh SWC-IX	1536.23	1530	0	0
5		Rail SWC-IX	541.42	540	0	0
6		Landimal SWC-IX	993.33	990	0	0
7		Tal SWC-IX	1361.78	1360	0	0
8		Brahamani SWC-IX	311.61	310	0	0
9		Hatidhara SWC-IX	610.66	610	0	0
		Total	8617.72	8600.00	0	0
		Div Total	63582.45	50405.39	13652	5292

The achievement is about 79.28 %.

Result:

After coupe working, the regeneration is quite satisfactory and inferred as very good. Timely operation has yielded a good result. The exploitable Girth Prescribed seems to be at lower side and it needs upward revision.

ii) Rehabilitation Working Circle:

An area of 18945.37 ha as per GIS were allotted to this Working Circle. The area, which were allotted to Rehabilitation and Coppice Working Circle in the previous plan has been kept in this Working Circle. Trees of various age groups are available but the number of trees, which have attained exploitable girth, is very less. But availability of pole crop above 1 ft girth varies from 350 to 400 numbers per ha. Most of the area is under heavy pressure of illicit felling through out the year. The local people are cutting poles, which is locally called 'Medha' for construction of their thatched house, fencing their cultivated land and firewood. Only coppice and damaged shoots are seen in those areas. The soil is highly eroded and there by less fertile. This Working Circle is constituted for increasing the number of growing stock by artificial regeneration.



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For improvement of forest 9 (nine) Treatment Series were constituted. Out of 9 treatment Series two series were transferred to Subarnapur Division on Reorganization from 2010. At present this division has 7 Rehabilitation Series. Rehabilitation Series and corresponding area is furnished at table No 11.11

Table No 11.11 Rehabilitation Series Constituted

Sl. No.	Name of R.S	Name of Ranges	GIS area in ha.
1	Rasibeda	Charmal	1957.22
2	Bindpur	Naktideul	1986.67
3	Nadia	Naktideul	1515.71
4	Chadchadi	Naktideul	2832.13
5	Hatlimunda	Mochibahal	2580.71
6	Chargarh	Mochibahal	2761.23
7	Butukhaman	Rairakhol	1819.71
8	Durdura	Rairakhol	1800.74
9	Badhindol	Rampur	1691.25

(NB SI no 5 and 7 have been transferred to Subarnapur Division)

The area assigned to be rehabilitated in different year is furnished at Table No 11.12 below.

Table No 11.12 Annual rehabilitation area

Year	Name of Rehabilitation Series									Total area in ha.
	Rasi	Bind	Nadia	Chadc	Hatil	Charg	Butu	Durd	Badh	
2007 -08	268.55	57.86	150.51	299.55	349.19	354.80	100.55	249.22	173.54	2003.77
2008 -09	251.07	299.29	144.09	277.88	234.05	318.94	130.24	302.47	239.81	2197.84
2009 -10	257.76	270.14	146.73	251.30	289.20	241.27	170.28	177.15	167.97	1971.80
2010 -11	151.76	160.27	86.38	272.83	246.38	232.14	154.14	182.97	141.45	1628.32
2011 -12	174.73	166.57	184.38	252.23	198.38	361.10	173.18	102.21	241.45	1854.23
2012 -13	204.72	287.50	220.44	244.20	229.91	198.41	189.77	197.57	201.50	1974.02
2013 -14	227.83	308.92	217.14	249.82	219.34	199.51	171.04	182.38	107.50	1883.48
2014 -15	93.62	189.41	209.44	301.21	269.31	214.51	324.86	137.18	134.26	1873.80
2015 -16	164.56	160.66	128.14	374.46	285.34	165.60	169.09	142.25	136.23	1726.33
2016 -17	162.62	86.05	28.46	308.65	259.61	474.95	236.56	127.34	147.54	1831.78

Against the assigned area actual treatment carriedout during the assigned year is furnished at Table No 11.13



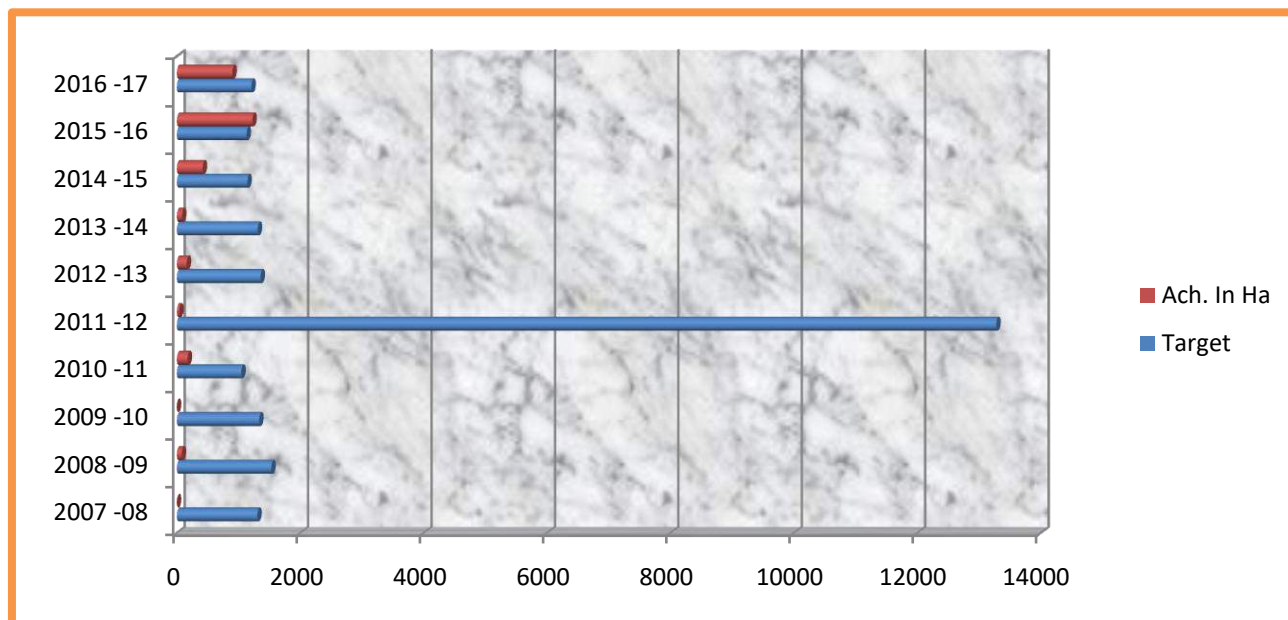
Table No 11.13 Area treated under Rehabilitation vis a vis Target (In Ha)

Year	Area prescribed in Plan for treatment	Area actually Treated	Remark
2007 -08	1304.81	0.0	Steps taken to Rehabilit the Forest is extremely poor.
2008 -09	1531.08	80.0	
2009 -10	1335.17	0.0	
2010 -11	1044.83	175.0	
2011 -12	13280.46	40.0	
2012 -13	1356.77	160.0	
2013 -14	1310.72	85.0	
2014 -15	1142.45	420.0	
2015 -16	1129.65	1225.0	
2016 -17	1208.27	900.0	
Total	24644.21	3085.0	

(NB Area Transferred to Subarnapur Division has been excluded)

Result:

There is deviation in implementation of the prescription. ANR with gap plantation based on area allotted in each year in the working plan has not been taken up during that year due to lack of funds.





iii) Plantation (Over lapping) Working Circle:

An area of 3707.72 ha as per plantation record were allotted to this Working Circle. All degraded area with blank patches is included in this Working Circle. The area under Proposed Reserve Forest and Demarcated Protected Forest were also been included in this Working Circle for increasing the growing stock by artificial method.

Result:

During Plan Period 586 ha in SWC, 2185 ha in RWC are has been taken up to enrich the forest. The total area achieved is 2771 ha against a target of 3707.72 ha which constitutes about 75% of the target. The enrichment of Forest through tree planting is considered to be a successful step. To maintain biodiversity and improvement of the local ecosystem plantation to the tune of 2834.393 ha over the working plan period was taken up in Selection Working Circle (586ha)/outside WP area (2248.393ha) and the rest 2185 ha was taken up in Rehabilitation Working Circle. Tending operation was carried out in the plantation raised in the preceding years. Soil and moisture conservation measures were taken up in the plantation area to improve the survival as well as growth of the plant. The plantations were completely protected from fire and grazing.

iv) Bamboo (Over lapping) Working Circle:

An area of 14420.31 ha of bamboo bearing forest has been allotted to this Working Circle. Six cutting series were constituted for executing Bamboo operation and Harvesting. The series constituted are as furnished at Table No 11.14.

Table No 11.14 Bamboo Cutting series			
Sl No.	Name of Range	Name of cutting series	Area in ha.
1	Charmal	Sagmalia west	1767.11
2	Charmal and Mochibahal	Sagmalia east	1848.42
3	Rairakhol	Rahan	2738.37
4	Rampur	Bindhybasini	755.91
5	Rampur	Hatidhara	5037.15
6	Rampur	Kholgarh	1864.51
		Total	14011.47



During the plan period no bamboo coupe was worked out by OFDC Ltd indicating “Working Un Economical”. Simultaneous Silvicultural Operation has been carried out to improve the Crop. The year wise details are furnished below (Table No 11.15)

Table No 11.15 Simultaneous Silvicultural Operation in Bamboo Coupe

Sl. No.	Year	Name of cutting series	Area in ha.
1	2009-10	Bindhyabasini BC ‘D’	180.00
2		Hatidhara BC ‘A’	359.00
3		Kholgar BC ‘A’	378.00
4		Rahan BC ‘A’	379.29
1	2010-11	Sagmalia B/C ‘A’	170.00
2		Hatidhara BC ‘A’	400.00
1	2011-12	Kholgar BC ‘B’	130.00
2		Sagmalia East BC ‘B’	440.00
1	2012-13	Sagmalia BC ‘D’	271.28
1	2013-14	Bindhyabasini BC ‘A’	181.99
2		Hatidhara BC ‘A’	1110.89
3		Kholgarh B/C ‘A’	378.62
4		Rahan B/C ‘A’	379.95
5		Sagmalia East B/C ‘A’	424.50
6		Sagmalia West B/C ‘A’	459.03
7		Sagmalia East BC ‘D’	565.66
8		Hatidhara BC ‘D’	188.36
1	2014-15	Bindhyabasini BC ‘B’	196.00
2		Hatidhara BC ‘B’	600.00
3		Kholgarh BC ‘B’	270.00
4		Hatidhara BC ‘B’	100.00
5		Hatidhara BC ‘D’	569.00
6		Sagmalia East BC ‘B’	440.00
7		Sagmalia West BC ‘B’	430.00
8		Rahan BC ‘B’	350.00
9		Sagmalia East BC ‘D’	45.00
1	2015-16	Bindhyabasini BC ‘C’	170.00
2		Hatidhara BC ‘C’	1000.00
3		Kholgarh BC ‘C’	455.44
4		Sagmalia East BC ‘C’	373.13



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5		Sagmalia West BC'C'	315.13
6		Rahan BC'C'	686.30
1	2016-17	Bindhayabasini B/C-D	180.00
2		Hatidhara B/C-D	630.00
3		Kholgarh B/C-D	650.00
4		Sagmalia West B/C-D	530.00
5		Rahan B/C-D	950.00
6		Sagmalia East B/C-D	560.00
7		Hatidhara B/C-D	500.00
	G. Total		16396.57

Result:

Due to Non working of bamboo, the available Bamboo clumps have been found conjected. The Bamboo forest is observed to be in a path of degradation. Regular Bamboo working along with adequate SSO is strongly desired to improve the bamboo forest.

v) Non Timber Forest Produce (Over lapping) Working Circle:

The entire area under management was allotted to this Working Circle.

vi) Protection (Over lapping) Working Circle:

This Working Circle overlaps the entire forest area managed in this revision. The ground flora and its favorable condition for regeneration are disturbed due to heavy forest fire. Theft has been noticed in bordering areas, old plantation area in Hatidhara block and Bija trees in all blocks. Outsiders from Bihar, Jharkhand and Sundergarh are encroaching the reserve forest area for cultivation and construction of houses. Extraction of stones, boulder and chips for construction of road and building are common in this Division. The Wild animals are gradually decreasing due to poaching. Their protection against poachers is badly required. In very few patches podu cultivation is operating.

Result:

Protection against Enchroachment, Illicit felling, Fire and poaching of animals is being provided with available staffs and resources. The level of protection need to be augmented and continue to have a better result.



vii) Joint Forest Management (Over lapping) Working Circle:

The system of joint management by local people and Forest Department have been introduced in this Division during the year 1993 vide resolution No.16700/ Fand E dt.03.07.1993. Since then 140 VSSs have been formed. They are protecting 13319.82 ha of forest. The plantation and other activities under Revised Long Term Action Plan and National Afforestation Programme has been taken up in the protected areas of different Van Samrakhyan Samiti.

Result:

The micro plans should be prepared for each VSS by adopting the 'Participatory Rural Appraisal' technique (PRA) irrespective of whether money for implementation is available or not. Planning should be done first and effort should be made to obtain fund from different sources like State Budget, District Budget, DRDA, MP and MLA grants and any other sources. While preparing the micro plans, tools like GIS should also be used for better planning. For this, the help of ORSAC and NGGOs can also be taken.

It is important that the motivation level of the people to protect the forests should be sustained for a long period for the forest to respond to the protection provided. The gestation period for the forest to provide return is quite long. During which period there may be conflicts amongst group of people or stakeholders. Most of the time it is difficult for the forest department personnel to keep up the motivation level at the village level due to the multifarious role of its staff. To sustain the motivation at the community level it is advisable to identify the genuine NGOs or eminent persons (like teachers, doctors, Village level workers etc.) closely associated with the people, who can convince them and keep up their motivation level and enthusiasm. These persons and institutions should be encouraged and if possible some remuneration/incentives should be given.

In each VSS, the efforts have been made to create sustainable income generating activities. Income generating activities (IGA) like Sericulture, Pisciculture, Vermiculture and Apiculture etc. have not been taken up in this division through VSS due to paucity of funds. Women are active in some of the VSS and they have set an example of advantage of woman empowerment.



viii) Wildlife (Over lapping) Working Circle:

An area of 107488.52 ha as per GIS has been allotted to this Working Circle. An area of 125000.00 ha out of 222300.00 ha of geographical area of this Division is included in the Sambalpur Elephant Reserve. But an area of 42691.00 ha of forest comes under the Sambalpur Elephant Reserve.

Result:

Water bodies were dug up to facilitate water to the wildlife during the hot summer over the period of this working plan. Anti poaching and Anti smuggling check gates have established at Mochibahal, Kadaligarh, Kutasingha, Nactideul, Rampur and Hiraloi to control poaching. Further three numbers of watch tower have been constructed inside Rahan RF, R.Badmal RF and Tal RF to monitor the movement of Wildlife and to prevent poaching. JFM committee also been supported with the supply of smoke less Chula, Khali pressing machine for the lively hood support.

Due to non-implementation of the prescription to the projected extent the expected outcome could not be obtained. Awareness among the people have been created through celebration of Wild Life Week, Elephant Day etc. Similarly prompt actions have been taken to arrest the Wild Life offenders for which the crime has been kept under control. Rescue operations gave a good impact on the public for protection of Wild Life. On the other hand elephant depredation particularly crop damage during harvest period is very much felt during the plan period.

11.2.9 Management under Annual Working Scheme:

The outgoing Plan has expired on 31st March 2017. Though the PWPR (Preliminary Working Plan Report) has been approved in time, the final working plan could not be prepared and submitted in time. To continue working annual working schemes have been prepared on the same line of outgoing plan with same working Circles. The target and achievement under different working circle in 2017-18 to 2020-21 are furnished at Table No 11.16.



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Table No 11.16 Summary of approved annual Working Scheme.

Sl No	Working Circle	Unit	2017-18		2018-19		2019-20		2020-21	
			Targ.	Achmt.	Targ.	Achmt.	Targ.	Achmt.	Targ.	Achmt.
1	SWC	Ha	9066.47	9066.47	7618.23		9236.14		8712.81	8712.81
	SSO (Timber Coupe)		9000.0	9000.0	9066.0	9066.0	9256.14	9256.14	Nil	
2	RWC	Ha	355.00	355.0	1212.14	1212.14	1335.17	1335.17	1227.8	1227.8
3	Plantation (O)WC	Ha	120.0	120.0	140	140	140	140	140	140
4	Bamboo (O) WC	Ha	3084.98	3084.98	2860.28	2860.28	3631.86	3631.86	1212.14	1212.14
	SSO (Bamboo Coupe)		3000.0	3000.0	2800.0	2800.0	3631.86	3000.0	1100.00	1100.0
5	JFM (O) WC	No								
		Area in Ha	14078.88	14078.88	14078.88	14078.88	14078.88	14078.88	14078.78	14078.88



11.3. Special works of improvement undertaken.

During Plan period special works has been taken up to improve

- a- Infrastructures like buildings as provided under Para 1.1.4.
- b- Improvement of Central Nursery at Charmal.
- c- Improvement of communication net work.
- d- Involvement of People through FDA.
- e- Implementation of Ama Jungal Yojana

11.4 Past Yield, Revenue and Expenditure:

The yield from Forest Resources is from Timber, Fire wood. Yield from other NTFP are not recorded and documented. The yield from these count are as furnished below (Table No 11.17)

Table No 11.17: Past Yield, Revenue and Expenditure						
Year	Timber production (in cum)	Timber from Other Sources	Total Timber	Firewood (in stack) 12'x3'x3' Size	Firewood from other sources	Total
2007-08	2004.07	165.887	2169.957	906	873	1779
2008-09	1327.582	29.633	1357.215	701	385	1086
2009-10	1652.4525	10.225	1662.678	1048	299.5	1347.5
2010-11	1942.393	79.021	2021.414			
2011-12	2435.735	48.764	2484.499	933	438	1371
2012-13	2888.26	160.3717	3048.632	1451	27	1478
2013-14	3342.705	202.8919	3545.597	1009	209	1218
2014-15	3058.941	300.696	3359.637	1157	234	1391
2015-16	3628.491	184.963	3813.454	1274	335	1609
2016-17	1244.09	168.128	1412.218	1098	146	1244
Total	23524.72	1350.581	24875.3	10617	3149.5	13766.5



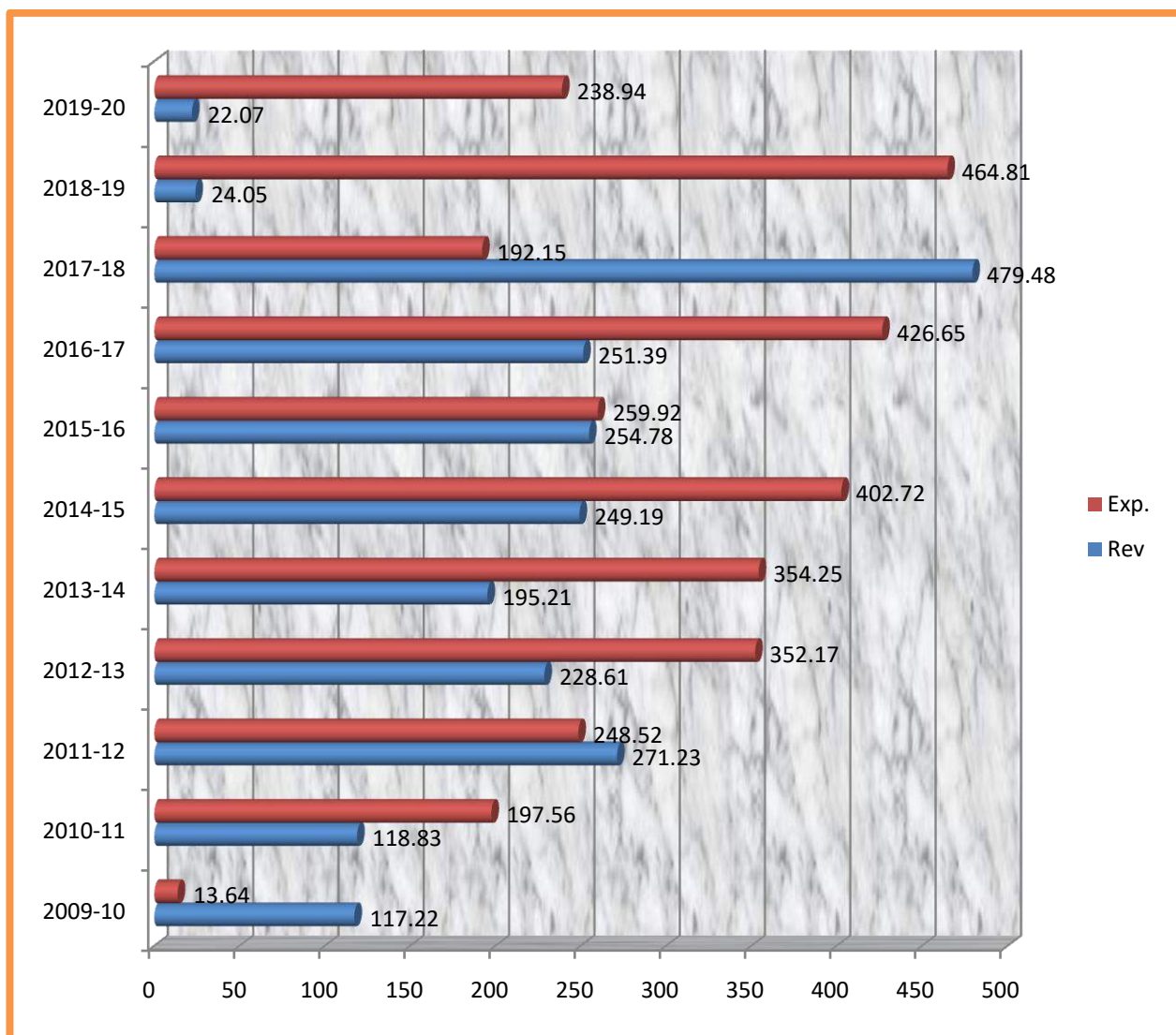
11.4.1 Revenue & Expenditure.

The revenue received & expenditure incurred during plan period in this division is as given at Table No 11.18

Table 11.18 Revenue & Expenditure (in lakh Rs)			
Year	Revenue	Expenditure	Ratio Rev: Exp
2007-08	-	-	-
2008-09	-	-	-
2009-10	117.22	13.64	1: 0.12
2010-11	118.83	197.56	1: 1.66
2011-12	271.23	248.52	1:0.92
2012-13	228.61	352.17	1:1.54
2013-14	195.21	354.25	1: 1.81
2014-15	249.19	402.72	1: 1.62
2015-16	254.78	259.92	1: 1.02
2016-17	251.39	426.65	1: 1.70
2017-18	479.48	192.15	1: 0.40
2018-19	24.05	464.81	1: 19.33
2019-20	22.07	238.94	1: 10.83



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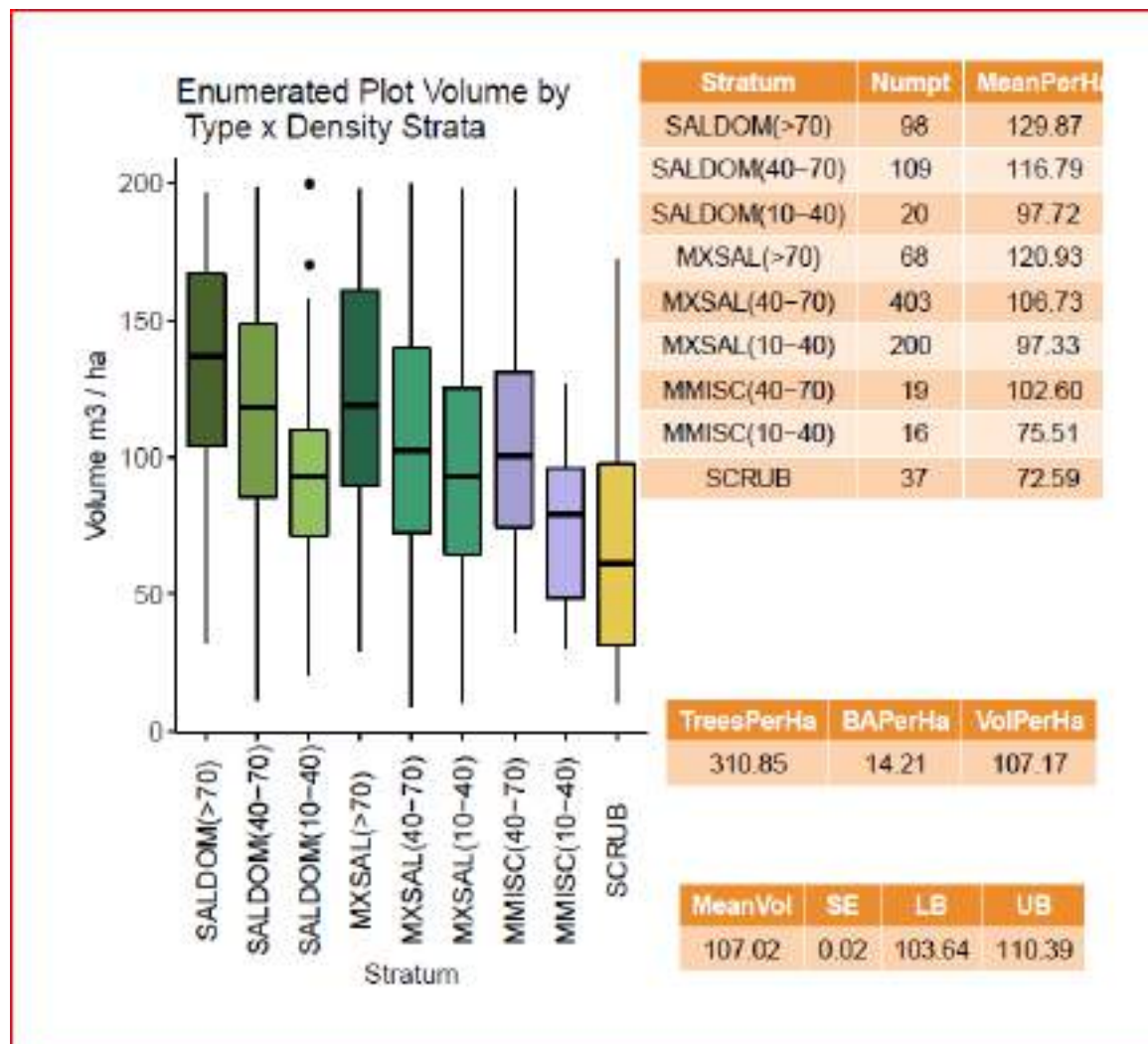


CHAPTER-12

STATISTICS OF GROWTH AND YIELD

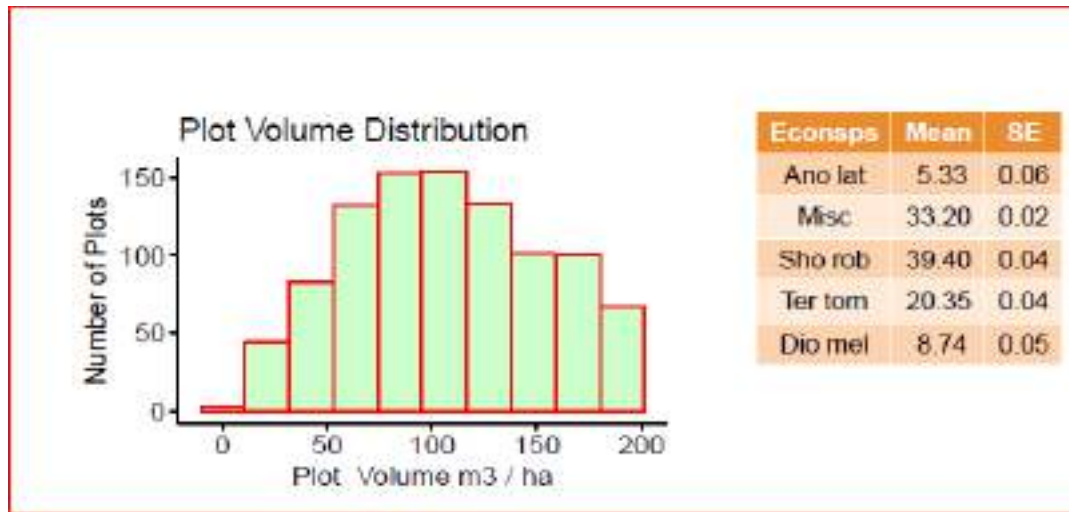
12.1 Statistics of Forest Carbon Stock:

Rairakhol Forest Division is one of the good moist forests of the State. It is a combination of Plane Forests, Hill Forests, Valley Forests and Riparian Forests. To assess the Growing stock Sample enumeration has been taken up over 1133 points. Analysis by NRSC has been carried out over 970 Sample points through various modeling by NRSC, Hyderabad. The growing stock has been assessed. The relevant portion is furnished below to indicate the growing stock position in Rairakhol Division.





Revised working plan of Rairakhol Division (2021-22 to 2030-31)



The overall crop density and other parameters have been assessed and furnished at Table No 12.1

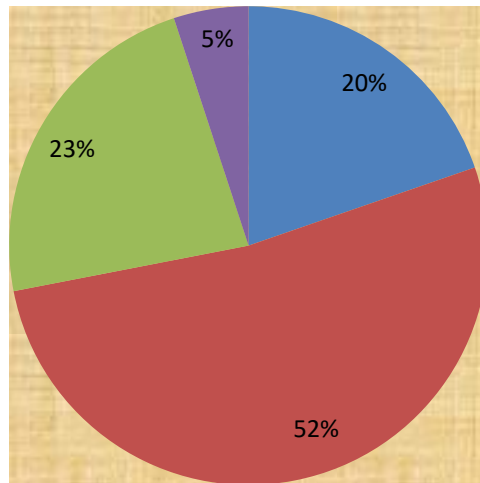
Table No 12.1 Stand volume parameters – Rairakhol Division							
Criteria							
No of trees / ha	Basal Area per ha (M ³)	Volume per Ha (in M ³)	Mean Volume (in M ³)	Standard Error	LB (in M ³)	UB (in M ³)	
310.85	14.21	107.17	107.02	0.02	103.64	110.39	

The Overall crop density and area under each density class has been furnished by ORSAC. The details are as given below (Table No 12.2).

Table No 12.2 Forest Area under Different density Class (Sal & Non sal)					
Category	Area under different Density class (in Ha)				Total
	>70%	40-70%	10-40%	<10%	
Sal Forest (SFC)	17223.37	45658.04	20098.03	4417.16	87396.6
No of Plots in SFC	165	486	186	30	867
Density Class %	19.71	52.24	23.00	5.05	100.00
Non Sal Forest (Non- SFC)	296.75	4580.75	9900.29	1285.33	16063.12
No of Plots in Non SFC	1	45	50	7	103
Density %	1.85	28.52	61.63	8.00	100.00
Div. Total					
Area (All)	17520.12	50238.79	29998.32	5702.49	103459.7
Sample plots	166	531	236	37	970
% (area)	16.93	48.56	29.00	5.51	100.00

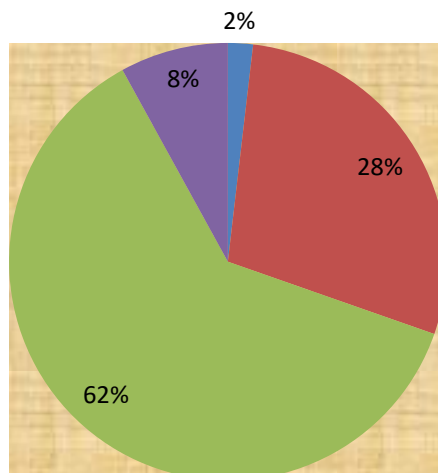


Sal Forest (SFC)



- Area under different Density class (in Ha) >70%
- Area under different Density class (in Ha) 40-70%
- Area under different Density class (in Ha) 10-40%
- Area under different Density class (in Ha) <10%

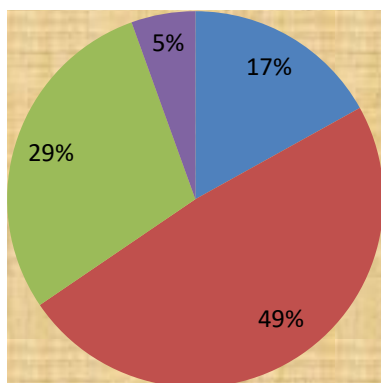
Non Sal Forest



- Area under different Density class (in Ha) >70%
- Area under different Density class (in Ha) 40-70%
- Area under different Density class (in Ha) 10-40%
- Area under different Density class (in Ha) <10%



Area SF & NSF



- Area under different Density class (in Ha) >70%
- Area under different Density class (in Ha) 40-70%
- Area under different Density class (in Ha) 10-40%
- Area under different Density class (in Ha) <10%

It is observed that Non Sal Forest area (15.52%) and Sal Forest is of 84.48%. The species composition in Most of the Forest is Moist Sal. Non Sal Forest is of Dryer Tract. Due to biotic interference Sal forests are becoming dryer and being replaced by miscellaneous forest. From Bio diversity point of view though mixed forest are preferable from other aspect Sal should be maintained at a Climax stage in this tract. All out efforts are to be made to improve moisture regime to protect Sal at this Climatic Stage.

12.2 Annual Increment:

From various growth data volume equation for some important species has been derived, this is quite close to ground reality. The increment varies in different age classes. The higher increment is recorded in two phases of the trees. One during young phase i.e. within 20 years and then 40- 50 years when it responded to thinning process and put diameter growth. The increment assessed for various species is as given at **Table No 12.3**

Table No: 12.3 Average Annual increment of few important species						
Name of Species	Growth in in cum					Annual increment predicted in Cum
	10-20 Yr	20-30 Yr	30-40Yr	40-50 Yr	50-60Yr	
Sal	0.02655	0.346908	0.28793	0.618398	0.995039	0.045497
Bija	0.068848	0.12334	0.27832	0.396387	0.648105	0.0303
Asan	0.15082	0.367031	0.577969	0.69	1.0425	0.056566
Arjun	0.145079	0.446425	0.712149	0.657187	1.058907	0.060395
Dhaura	0.158614	0.483691	0.614414	0.295781	0.457969	0.040209



The Forest is the greatest Carbon sink. It is associated with bio mass production and retention over a long period. No systematic carbon sequestration has been assessed; an attempt has been made to predict the carbon stock of Rairakhol Division.

The available Biomass over one hectare of Forest is projected at 107.02cum (Leaves / braches etc not included)

The forest area (RF/ DFP/ PRF / PF) of the Division is 100943.7 ha. The total Growing Estimated to be 101.28 lakh cum (10.1 MCum). Taking average wood density at 0.7 T/ cum and 30 ton of Bio Mass contains 11.7 T carbon, the forest of Rairakhol Division may contain 40.262 lakh Tons of carbon equivalent to 147.628 Lakh Tons of Carbon Dioxide. All steps will be initiated to induce growth through silvicultural operation to enhance the carbon sink to grow 3-4% every year.

12.2.1 Forest Block Wise Carbon Stock:

There are Reserved Forests, DPF, PRF and PF in the division. The total area under natural forest is 100943.7 ha. The carbon Stock of each Forest block is furnished below.

Table 12.4 Carbon stock of each Forest Block

Sl No	Name of RF/PRF/DPF/PF	Area in Ha.(Notified)	Growing Stoch Cum/ ha	Density T/ Cum	Total G. Stock in 10 ³ Tons	Carbon Equivalent in 10 ³ T	CO ₂ equivalent 10 ³ T
	RF						
1	Bindhybasini (B)	726.00	107.02	0.7	54.388	21.211	77.774
2	Chargarh (B)	425.00	107.02	0.7	31.838	12.417	45.529
3	Hatidhara(A)	7609.00	107.02	0.7	570.021	222.308	815.129
4	Kholgarh (A)	19280.1	107.02	0.7	1444.349	563.296	2065.420
5	Landakot (A)	24697.0	107.02	0.7	1850.151	721.559	2645.716
6	Landimal (A)	13864.0	107.02	0.7	1038.608	405.057	1485.209
7	Nadia (B)	937.00	107.02	0.7	70.194	27.376	100.378
8	Rahan (A)	3192.00	107.02	0.7	239.125	93.259	341.949
9	Rail (A)	11389.0	107.02	0.7	853.196	332.746	1220.070
10	Rengali-Badmal(B)	1137.00	107.02	0.7	85.177	33.219	121.803
11	Sagmalia (B)	3099.00	107.02	0.7	232.158	90.542	331.987
12	Suani (B)	687.00	107.02	0.7	51.466	20.072	73.596
13	Tal (B)	2009.00	107.02	0.7	150.502	58.696	215.218
	PRF						
14	Berhampura	815.78	107.02	0.7	61.113	23.834	87.392



Table 12.4 Carbon stock of each Forest Block

Sl No	Name of RF/PRF/DPF/PF	Area in Ha.(Notified)	Growing Stoch Cum/ ha	Density T/ Cum	Total G. Stock in 10 ³ Tons	Carbon Equivalent in 10 ³ T	CO ₂ equivalent 10 ³ T
15	Kalia	239.15	107.02	0.7	17.916	6.987	25.619
16	Koilpadar	317.08	107.02	0.7	23.754	9.264	33.968
17	Mochibahal	1733.80	107.02	0.7	129.886	50.655	185.737
18	Podabalanda	157.89	107.02	0.7	11.828	4.613	16.914
19	Purunapani	1012.14	107.02	0.7	75.823	29.571	108.428
20	Sagjori	801.31	107.02	0.7	60.029	23.411	85.842
21	San-Rengali	281.37	107.02	0.7	21.079	8.221	30.142
22	Satasama	343.44	107.02	0.7	25.728	10.034	36.792
23	Siaripani	376.16	107.02	0.7	28.180	10.990	40.297
24	Talab	593.11	107.02	0.7	44.432	17.329	63.538
25	Goudpali	042.10	107.02	0.7	3.154	1.230	4.510
26	Chadchadi	1791.49	107.02	0.7	134.208	52.341	191.917
27	Rasibeda	70.34	107.02	0.7	5.269	2.055	7.535
28	Rohinigadia	309.72	107.02	0.7	23.202	9.049	33.179
29	Hemantkhol	218.22	107.02	0.7	16.348	6.376	23.377
	DPF						
30	Amjhari	159.90	107.02	0.7	11.979	4.672	17.130
31	Amjhari-Dhadrakhol	452.63	107.02	0.7	33.908	13.224	48.489
32	Bad-Hindol	583.41	107.02	0.7	43.706	17.045	62.499
33	Bahaljharan	146.57	107.02	0.7	10.980	4.282	15.702
34	Balikiari	46.35	107.02	0.7	3.472	1.354	4.965
35	Budbuda	068.49	107.02	0.7	5.131	2.001	7.337
36	Dhadrakhol	273.30	107.02	0.7	20.474	7.985	29.278
37	Hintrei	73.95	107.02	0.7	5.540	2.161	7.922
38	Jarasingha	178.00	107.02	0.7	13.335	5.201	19.069
39	Kusumbahali	269.72	107.02	0.7	20.206	7.880	28.894
40	Lampaphuli	198.86	107.02		0.000	0.000	0.000
41	Penthabahal	31.00	107.02	0.7	2.322	0.906	3.321
42	Phulkusum	87.40	107.02	0.7	6.547	2.554	9.363
43	Podamal	143.72	107.02	0.7	10.767	4.199	15.396
44	Terbeda	37.80	107.02	0.7	2.832	1.104	4.049
	PF						



Table 12.4 Carbon stock of each Forest Block

Sl No	Name of RF/PRF/DPF/PF	Area in Ha.(Notified)	Growing Stoch Cum/ ha	Density T/ Cum	Total G. Stock in 10 ³ Tons	Carbon Equivalent in 10 ³ T	CO ₂ equivalent 10 ³ T
45	Khajurijharan	38.393	60.00	0.6	1.382	0.539	1.976
	VF						
46	Bindpur	30.0	60.00	0.6	1.080	0.421	1.544
A	Div Total	100973.693			7546.784	2943.246	10791.902

12.2.2 Carbon Stock (TOF)

Table 12.5 Carbon stock of Plantations Raised (TOF)

Sl No	Name of Forest Block	Area in Ha.	Growing Stoch Cum/ ha	Density T/ Cum	Total G. Stock in 10 ³ Tons	Carbon Equivalent in 10 ³ T	CO ₂ equivalent 10 ³ T
1	Maulabhanja K.F	30	75	0.7	1.575	0.614	2.252
2	Terbeda K.F	50	75	0.7	2.625	1.024	3.754
3	Brahmani K.F	70	75	0.7	3.675	1.433	5.255
4	Sandimunda K.F	5	75	0.7	0.263	0.102	0.375
5	Laiza K.F	40	75	0.7	2.100	0.819	3.003
6	Chhatrapur K.F	30	75	0.7	1.575	0.614	2.252
7	Kalindra K.F	6.5	75	0.7	0.341	0.133	0.488
8	Paikmal K.F	30	75	0.7	1.575	0.614	2.252
9	Dalkhaman K.F	7.8	75	0.7	0.410	0.160	0.586
10	Daincha K.F	40	75	0.7	2.100	0.819	3.003
11	Gaudpali K.F	50	75	0.7	2.625	1.024	3.754
12	Dimirikuda KF	50	75	0.7	2.625	1.024	3.754
13	Dhalpur KF	50	75	0.7	2.625	1.024	3.754
14	Balikiari KF	50	75	0.7	2.625	1.024	3.754
15	Badbahal KF	10	75	0.7	0.525	0.205	0.751
16	Tileimal KF	30	75	0.7	1.575	0.614	2.252
17	Kaunsipal KF	50	75	0.7	2.625	1.024	3.754
18	Pithauguda KF	20	75	0.7	1.050	0.410	1.502
19	ChardaposhiKF	25	75	0.7	1.313	0.512	1.877
20	Jaresingha KF	25	75	0.7	1.313	0.512	1.877
21	Jaresingha KF	20	75	0.7	1.050	0.410	1.502



Table 12.5 Carbon stock of Plantations Raised (TOF)

Sl No	Name of Forest Block	Area in Ha.	Growing Stoch Cum/ ha	Density T/ Cum	Total G. Stock in 10 ³ Tons	Carbon Equivalent in 10 ³ T	CO ₂ equivalent 10 ³ T
22	Tikilipada KF	30	75	0.7	1.575	0.614	2.252
23	Sampur	50	75	0.7	2.625	1.024	3.754
24	Baishnabajhuli	55	75	0.7	2.888	1.126	4.129
25	Khajurijharen	50	75	0.7	2.625	1.024	3.754
26	Chudapudug	50	75	0.7	2.625	1.024	3.754
27	Dimirikuda	50	75	0.7	2.625	1.024	3.754
28	Dhalpur	50	75	0.7	2.625	1.024	3.754
29	Gadadharpur	65	75	0.7	3.413	1.331	4.880
30	Lusura	50	75	0.7	2.625	1.024	3.754
31	Arkakud	55	75	0.7	2.888	1.126	4.129
32	Dhaurakhaman	55	75	0.7	2.888	1.126	4.129
33	Badmal	60	75	0.7	3.150	1.229	4.505
34	Suliadadar	20	75	0.7	1.050	0.410	1.502
35	Kunjamura	40	75	0.7	2.100	0.819	3.003
36	Lamtidadar KF	35	75	0.7	1.838	0.717	2.628
37	Ghosramal PF	25	75	0.7	1.313	0.512	1.877
38	Jharbeda	40	75	0.7	2.100	0.819	3.003
39	Hitasara	10	75	0.7	0.525	0.205	0.751
40	Daincha	15	75	0.7	0.788	0.307	1.126
41	Tal-Kholgarh (AR)	10	75	0.7	0.525	0.205	0.751
42	Bhetiaberni	10	75	0.7	0.525	0.205	0.751
43	Gadakhhol	25	75	0.7	1.313	0.512	1.877
44	Tandabira KF	15	75	0.7	0.788	0.307	1.126
45	Maulabhanja VF	30	75	0.7	1.575	0.614	2.252
46	Brahamani KF	70	75	0.7	3.675	1.433	5.255
47	Buruda KF	100	75	0.7	5.250	2.048	7.508
48	Sarapal KF	50	75	0.7	2.625	1.024	3.754
49	Saradhapur KF	80	75	0.7	4.200	1.638	6.006
50	Balikiary KF	50	75	0.7	2.625	1.024	3.754
51	Sahebi VF	100	75	0.7	5.250	2.048	7.508
52	Liburi VF	70	75	0.7	3.675	1.433	5.255



Table 12.5 Carbon stock of Plantations Raised (TOF)

Sl No	Name of Forest Block	Area in Ha.	Growing Stoch Cum/ ha	Density T/ Cum	Total G. Stock in 10 ³ Tons	Carbon Equivalent in 10 ³ T	CO ₂ equivalent 10 ³ T
53	Kadobahali VF	50	75	0.7	2.625	1.024	3.754
54	Govindpur KF	85	75	0.7	4.463	1.740	6.381
55	Badkuda KF	50	75	0.7	2.625	1.024	3.754
56	Laindmal KF	20	75	0.7	1.050	0.410	1.502
57	San-Rengali KF	50	75	0.7	2.625	1.024	3.754
58	Rengali-Badmal KF	50	75	0.7	2.625	1.024	3.754
59	Kasanda VF	20	75	0.7	1.050	0.410	1.502
60	Badbahal KF	10	75	0.7	0.525	0.205	0.751
61	Jatesingha KF	10	75	0.7	0.525	0.205	0.751
62	Fulkusum KF	10	75	0.7	0.525	0.205	0.751
63	Bhalugadia KF	10	75	0.7	0.525	0.205	0.751
64	Koing KF	10	75	0.7	0.525	0.205	0.751
65	Nevrapal KF	10	75	0.7	0.525	0.205	0.751
66	Pipilikani KF	20	75	0.7	1.050	0.410	1.502
67	Kasanda KF	10	75	0.7	0.525	0.205	0.751
68	Sunamudi KF	10	75	0.7	0.525	0.205	0.751
69	Balbaspur KF	10	75	0.7	0.525	0.205	0.751
70	Ladlada KF	10	75	0.7	0.525	0.205	0.751
71	R-Badmal to Govindpur	20	75	0.7	1.050	0.410	1.502
72	Tileimal KF	30	75	0.7	1.575	0.614	2.252
73	Podamal KF	20	75	0.7	1.050	0.410	1.502
74	Penthabahal KF	10	75	0.7	0.525	0.205	0.751
75	Budhikhamar KF	20	75	0.7	1.050	0.410	1.502
76	Kusurda KF	20	75	0.7	1.050	0.410	1.502
77	Laiza	40	75	0.7	2.100	0.819	3.003
78	Chhatrapur KF	30	75	0.7	1.575	0.614	2.252
79	Ghosramal KF	35	75	0.7	1.838	0.717	2.628
80	Hitasara KF	20	75	0.7	1.050	0.410	1.502
81	Dhatukimal KF	40	75	0.7	2.100	0.819	3.003
82	Tudabahal KF	30	75	0.7	1.575	0.614	2.252



Table 12.5 Carbon stock of Plantations Raised (TOF)

Sl No	Name of Forest Block	Area in Ha.	Growing Stoch Cum/ ha	Density T/ Cum	Total G. Stock in 10 ³ Tons	Carbon Equivalent in 10 ³ T	CO ₂ equivalent 10 ³ T
83	Sunamudi KF	30	75	0.7	1.575	0.614	2.252
84	Mochibahl KF	30	75	0.7	1.575	0.614	2.252
85	Badpati	15	75	0.7	0.788	0.307	1.126
86	Kaudiapali	40	75	0.7	2.100	0.819	3.003
87	Khajurijharen	5	75	0.7	0.263	0.102	0.375
88	Khajurijharen	33.39	75	0.7	1.753	0.684	2.507
89	Dalki VSS	20	75	0.7	1.050	0.410	1.502
90	Charbati VSS	40	75	0.7	2.100	0.819	3.003
91	Paikmal KF	30	75	0.7	1.575	0.614	2.252
92	San-Hindol KF	30	75	0.7	1.575	0.614	2.252
93	Bandhantaila KF	40	75	0.7	2.100	0.819	3.003
94	Kausipal KF	50	75	0.7	2.625	1.024	3.754
95	Pithaguda KF	20	75	0.7	1.050	0.410	1.502
96	Lusura KF	100	75	0.7	5.250	2.048	7.508
97	Chhelibahal KF	20	75	0.7	1.050	0.410	1.502
98	Balbaspur KF	30	75	0.7	1.575	0.614	2.252
99	Chhandpur KF	50	75	0.7	2.625	1.024	3.754
100	Gadakhhol KF	50	75	0.7	2.625	1.024	3.754
101	Daincha KF	25	75	0.7	1.313	0.512	1.877
102	Berhampura KF	50	75	0.7	2.625	1.024	3.754
103	Bansajal KF	50	75	0.7	2.625	1.024	3.754
104	Sahebi KF	50	75	0.7	2.625	1.024	3.754
105	Bindpur	40	75	0.7	2.100	0.819	3.003
106	Mochibahal KF	25	75	0.7	1.313	0.512	1.877
107	Telighana KF	25	75	0.7	1.313	0.512	1.877
108	Jaresingha KF	50	75	0.7	2.625	1.024	3.754
109	Saradhapur KF	50	75	0.7	2.625	1.024	3.754
110	Pankimal KF	25	75	0.7	1.313	0.512	1.877
111	Gadakhhol KF	25	75	0.7	1.313	0.512	1.877
112	Samsingha KF	40	75	0.7	2.100	0.819	3.003
113	Dimirimunda KF	35	75	0.7	1.838	0.717	2.628
114	Patupali KF	25	75	0.7	1.313	0.512	1.877



Table 12.5 Carbon stock of Plantations Raised (TOF)

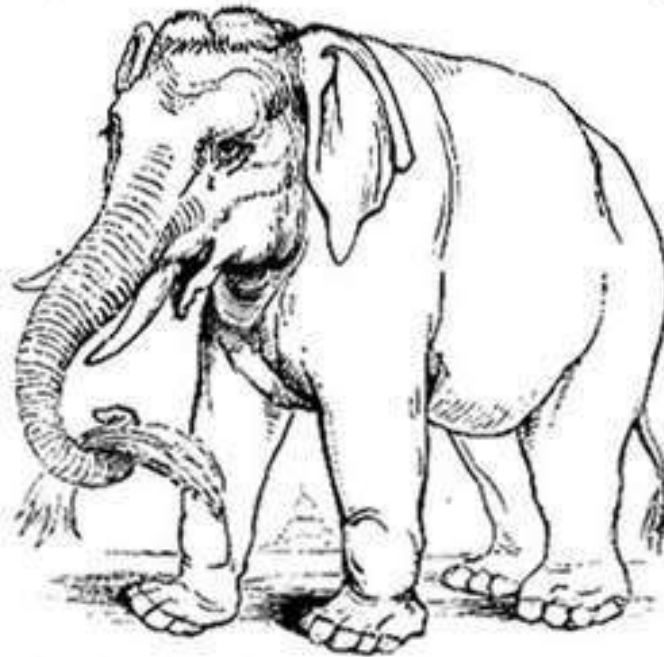
Sl No	Name of Forest Block	Area in Ha.	Growing Stoch Cum/ ha	Density T/ Cum	Total G. Stock in 10 ³ Tons	Carbon Equivalent in 10 ³ T	CO ₂ equivalent 10 ³ T
115	Lampafuli KF	20	75	0.7	1.050	0.410	1.502
116	Rasibeda KF	30	75	0.7	1.575	0.614	2.252
117	Jaresingha KF	5	75	0.7	0.263	0.102	0.375
118	Tikilipada KF	25	75	0.7	1.313	0.512	1.877
119	Sadhumunda VSS	5	75	0.7	0.263	0.102	0.375
120	Telighana VSS	25	75	0.7	1.313	0.512	1.877
B	Division Total	4122.69	9000	84	216.441	84.412	309.511
C	Ave. Pl 414 RKM	64.06	75	0.6	2.883	1.124	4.122
D	Rev. Forest	40596.7	90	0.7	2557.592	997.461	3657.357
B+C+D	Total C. Stock	44783.45			2776.916	1082.997	3970.989
Total C. Stock Division					10323.70	4026.24	14762.89

The carbon Stock of the Division has been estimated to be **4026.24 x10³ Ton of Carbon** which is equivalent to **14762.89 x10³ Tons of Carbon Dioxide**.



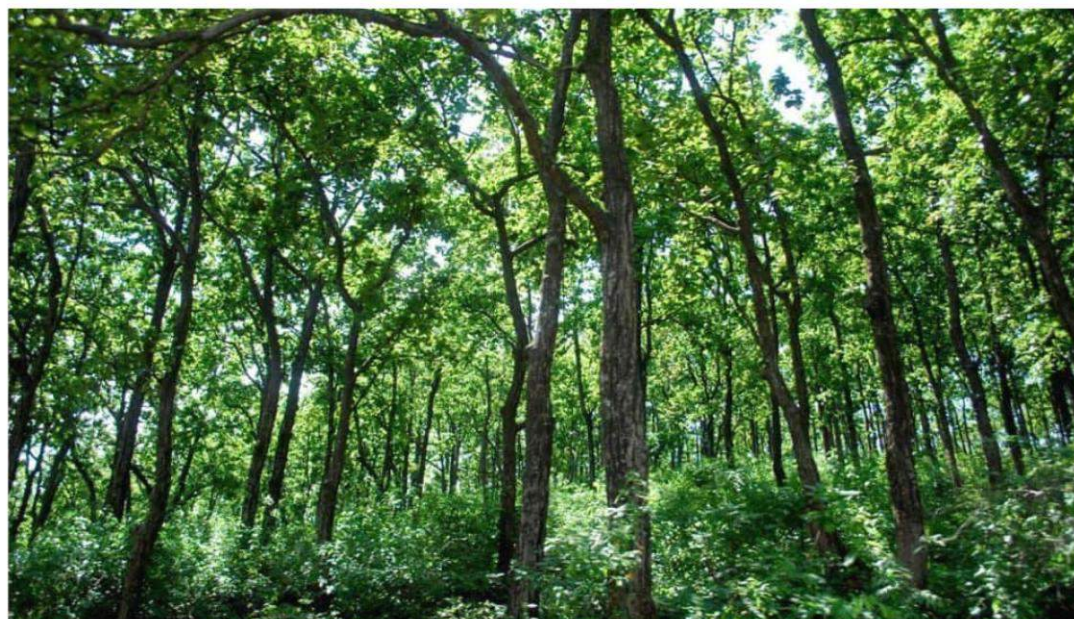


END OF PART-I





REVISED WORKING PLAN OF RAIRAKHOL FOREST DIVISION PART-II



FOR THE PERIOD 2021-22 TO 2030-31

BY

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CHAPTER- 13

BASIS OF PROPOSALS.

13.1: Objectives of Management.

Rairakhhol Forest Division has a vast treasure of Peninsular Moist Sal Forest. Its growing stock matches with the ideal crop distribution both in number of trees in different girth class as well as Biomass distribution. Most of the Forests are Reserved Forests. It is one of the best Elephants landscape. Tal – Kholgarh Elephant Corridor is near to Rairakhhol Township and various developments in the corridor have an effect of elephant movement. Challenge due to various developmental projects has to be addressed also. Khalasuni- Badrama Sanctuary is very close to the division and Eco Sensitive Zone of the Sanctuary extends to the jurisdiction of the division. Some forest blocks of Naktideul Range are coming within proposed Tiger Landscape.

The Forests of Rairakhhol is being managed under “Sustainable Management Practices” and contributes to harvest of Timber to a major extent in the state. It fulfills demand of timber not only of the division but also of the state and outside. Keeping these vital factors in mind the management practices are to be designed with a long term vision. The objectives of this working plan is to provide a basic approach for sustainable management of forests and preserve its biodiversity in light of the National Forest Policy, encompassing the ecological (environmental), economic (production) and social (including cultural) dimensions. The objectives for attaining this goal include conservation of forests and reducing forest degradation, maintenance and enhancement of ecosystem services, enhancement of forest productivity together with establishment of regeneration to improve forest health and vitality as per ecological and silvicultural requirements of the species, progressively increasing the growing stock and carbon sequestration potential, maintenance of biological diversity, sustainable yield of forest produce, prevention of soil erosion and stabilization of the terrain; improvement and regulation of hydrological regime; people’s involvement in planning and management of forests fulfilling socio-economic and livelihood needs of the people. The sector wise objectives are precisely enumerated in following paragraphs.



13.1(i): Dynamics of Forests and Stands.

Forest is a living dynamic entity and changes its species composition, growth pattern, bio diversity in passage of time. This plan aims at

- To enhance species composition towards a climatic climax species of more important and of valuable species.
- To ensure Annual Biomass Production is sustainable throughout the plan period so as to ensure a specific quantum of carbon sequestration.
- To enhance Bio Diversity of a Forest through various management practices & proper documentation.
- To ensure sustainable & dependable production of timber / fuel wood and other available forest produce.
- To enhance availability of NTFP species by conservation, natural regeneration and follow a systematic sustainable harvesting practices.
- To create forests near to habitations / industrial houses to control effect of GHG (Green House Gases)

13.1(ii): Forests and Soil:

The Forests and soil condition and its fertility are like two sides of a coin. Forest enriches the soil organic content and as the soil marched forward, the forest luxuriance also marched forward. When the soil is degraded for many reasons, gradually the forest condition & vegetation degraded. The soil condition & forest covers moves hand in hand. In order to keep the soil health high this plan sets the following objectives to be achieved.

- To follow appropriate management practices to protect the soil against erosion.
- To protect the hill slopes and Forest floor against erosion and restore the humus in forest floor.
- To cover abandoned Shifting Cultivation area with woody vegetation and bring it to Productive Level
- To Protect River banks against erosion and save riparian forests.
- To protect forests against drivers of forest degradation with special importance to Soil conservation.
- To check soil erosion in forest floor – sheet erosion, Rill erosion, Splash erosion, Gully and ravine formation.



- To maintain Soil cover of any form – mostly of woody vegetative / grass cover in forests i.e. enriched undergrowth.
- To maintain adequate humus layer on forest floor.
- To reduce the grazing pressure on forest.

13.1(iii): Forests and Water.

The forests are the store house of water. All the rivulets / springs are originating from forests. The flow of water in springs and rivulets depends upon water holding capacity of Forest floor. Recharge of ground water table mostly depends upon runoff time, conditions for percolation of surface water. Reduced time of collection of runoff water enhances the flood menace in rivers. Availability of surface water also decides the carrying capacity of wildlife of any forest. The composition of forests mostly depends on water regime of forest floor. The objectives set out for this plan are

- To protect and maintain thick vegetation at the origin of rivers, springs and rivulets.
- To treat the catchment area of water body within the forest block or outside to enhance water holding capacity and enhance flow of water in Rivers, Springs and Rivulets.
- To create new water body within the forest blocks and preserve the existing wet land inside the forests and outside.
- To ensure flow of water in springs – especially those are in the catchment area of River Mahanadi and Tikira.
- To create water body to impound the running waters & enhance utilization of water to a greater extent.

13.1(iv): Forest Biodiversity.

The natural forests of importance rich in Bio- Diversity are confined to moist forests of the division mostly in Girishchandrapur, Badmal and Naktideul Range. The vegetation is of moist Sal forest with riparian vegetation along the river banks. The rich floral diversity requires protection and enrichment. This plan aims

- To preserve bio diversity of natural forests,
- To take appropriate steps to prepare Bio- Diversity Register of the locality.
- To prevent mono culture practices in plantations only on economic consideration.
- To encourage natural regeneration in forest blocks.



- To have Concept of Bio- Diversity park grow among the staffs / villagers.

13.1(v): Climate and Forests:

The relation between climate and forests is complementary to each other. The climate influences the forest composition and forest ameliorates the climate of an area in a larger context. During recent past, loss of forests has its effect on climate and a change in climatic behavior is being experienced. Extreme climatic conditions like high rainfall, low rainfall, Cyclonic storm, merging of seasons to summer and rain only are frequently experienced. Duration of other seasons likes autumn, Dew, winter and spring has been marginalized and sometimes not felt. In order to combat climate change the following objectives has been outlined for this plan. These are

- To improve the crop density of forest vegetations.
- To increase tree cover outside the conventional forest land i.e. TOF.
- To reduce emission of Green House Gases at source through public cooperation and create new carbon sink through Farm Forestry / Urban Plantation.
- To bring Village Woodlots of erstwhile **Social Forestry Project** to the management fold and **enhance forest cover & carbon sequestration**.
- To reduce fuel wood dependency by introducing alternate / renewable source of energy through VSS / EDC constituted under JFM Resolution.
- To enhance Solar Energy generation & utilization than conventional energy i.e. fossil fuels, Petroleum etc.

13.1(vi): Socioeconomic Considerations and generation of forest based employment opportunities and livelihood options:

Forest Management is not confined to departmental personals only. It has encompassed community participatory management practices since 1985 and more effectively thereafter. JFM resolution - 1993 has brought revolutionary changes in participatory Forest Management which has been further fortified in JFM Resolution 2011. This resolution (2011) provided a wider scope for participatory forest management, encompassing the Revenue Forests for joint management with villagers. The Committee is designated as **Vana Surakshya Samiti (VSS)** for forests and **Eco- Development Committee (EDC)** for Sanctuary, National Park and other Protected Areas. EDC are actively involved in management of Eco-Tourism, Nature Camps and Tourist Resorts/ barracks/ Complexes. The Panchyat Raj Institutions (PRI) is also involved in the process of Joint Forest Management in accordance



with the JFM Resolution 2011. The objectives intended to be fulfilled / achieved in this plan are as follows.

- To involve VSS in forest management for assigned Forest Fringe areas.
- To enhance / support various forests based livelihood and employment opportunity.
- To strengthen usufruct share ring mechanism for interim / final harvested forest produce from the assigned area.
- To arrange Skill development training camps for VSS on Value addition to NTFP and other Forest Produce.
- To support the VSS to change from traditional fuel wood use to renewable energy resources.
- To protect traditional knowledge / cultural practices and help in documentation of traditional knowledge related to Forest, NTFP and Forest based medicinal practices.
- Strengthening of Village Forest Management through VFC (Village Forest Committee) constituted during erstwhile Social Forestry Project (1985-2003)
- To Involve VSS in Preparing “Peoples Biodiversity Register” and preserve and enhance biodiversity of the area.

13.1(vii): Tools for integrated development:

For overall development of Forest resources / TOF in the division dovetailing of various developmental schemes, make use of modern technology in forest management, Nursery raising, tissue culture etc are required to be implemented / use by Forest personnel. The department is to work hand in hand with the District Administration. Development in Veterinary & Animal Husbandry Sector, Soil Conservation and Water Resource Department are to be integrated with forest activities to make it more scientific, effective and more acceptable for the developing situation. This plan aims

- To develop Forest resources through various Schemes like MANREGA, DPAP, NAP, DMF etc.
- To improve Planting stock through Tissue Culture, other Vegetative Propagation and root trainer nursery.
- To identify and protect plus trees and create improved genetic pool,
- To identify important Seed stand for different important species and improve genetic value & quality of species available in the division.



- To imbibe knowledge on first growing technology in Agriculture / soil conservation to improve forest growing stock.
- To use Satellite related output for forest management with the help of ORSAC, National Institutes of Remote Sensing & Space Application / Forest Research Institute etc.
- Digitization of all forest blocks under administrative control of Forest department and Revenue department.
- To introduce management practices in all revenue forest areas through working schemes.

13.1(viii): Performance Indicators for different objectives of management. (PI)

In order to assess the performance on above outlined broad objectives, a set of performance indicators (PI) has been indicated below. It is required to evaluate / assess the performance in a periodical basis. First year of the Plan (2021-22) may be taken as base value and subsequent results may be compared to evaluate the achievements. The measurable / assessable parameters / attributes are furnished in **Table No 13.1** below.

Table No 13.1: Performance Indicators for different objectives of management.				
Sl No	Objectives	Parameters to be assessed.	Frequency	Remark
1	Dynamics of Forests and Stands.	Species Composition	1 st Yr, 6 th Yr & 10 Yr	Sample Survey Method.
		Annual Biomass Production		Basal area Method. (M ² / Ha)
		Bio Diversity of a Forest		Bio Diversity Index – Sample Survey (NB)
		Sustainable & dependable production of timber / fuel wood		Annual Production Cum Per annum / MT PA
		Area under Man made Forest / Plantation.		Interpretation of Satellite Imagery.
2	Forests and Soil:	Soil Erosion	1 st Yr, 6 th Yr & 10 Yr	Interpretation of Satellite Imagery / Local Observation / measurement of silt in water body.
		Create & maintained Wind Break		
		Gully and ravine formation / Silt		Analysis of Runoff Water &



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		in Run Off		Local observation.
		Humus layer on forest floor		Study of Soil Profile
		Grazing pressure on forest		Random assessment in a particular Forest Block in Nov- Dec.
3	Forests and Water.	Thick vegetation at the origin of rivers, springs and rivulets	1 st Yr, 6 th Yr & 10 Yr	Interpretation of Satellite Imagery / Local Observation
		Flow of water in Rivers, springs and rivulets.		Observation – Recording the quantum of flow of water and Period of Flow.
		Utilization of rain water flowing out of forests		Local observation.
4	Forest Biodiversity	Bio- Diversity Register	1 st Yr, 6 th Yr & 10 Yr	At least one Bio- Diversity Register to be prepared in each range & compare
		Natural regeneration in forest blocks.		Regeneration Survey
5	Climate and Forests	Crop density of forest vegetations.	1 st Yr, 6 th Yr & 10 Yr	FSI Report on Forest cover
		Tree Outside the Forest.		
		Fuel wood dependency and changing over to alternate / renewable source of energy.		Participatory Rural Appraisal. Economic survey Report
6	Socioeconomic Considerations and generation of forest based employment opportunities and livelihood options	Forests based livelihood and employment opportunity.	1 st Yr, 6 th Yr & 10 Yr	Survey on Self employment on Forest Produce/ Value addition.
		Usufruct sharing mechanism for interim / final harvested forest produce	Annual	Records of Forest produce harvest in JFM area & distribution- Manner / Conflict if any.
		Skill development training camps for VSS on Value addition to NTFP	Annual	Survey on Self employment on Forest Produce/ Value addition.
		Documentation of traditional	1 st Yr, 6 th	Documentation and



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		knowledge related to Forest	Yr & 10 Yr	analysis.
7	Tool for integrated development:	To develop Forest resources through various Schemes like MANREGA	Annual	Funds flow from other agencies.
		To improve Planting stock through Tissue Culture, other vegetative propagation		Plantation / Nursery through modern techniques.
		Identify and protect plus trees and create improve genetic pool.		Creation of Genetic Pool
		First growing technology in Agriculture / soil conservation to improve forest growing stock.	Annual	Application of Modern technology & Result evaluation.
		Use Satellite related output for forest management		Self assessment.
		Forest Certification on Sustainable forest Utilization	Plan period	Progress in Product Certification
8	Soil Health & Organic Fertilizer.	Use of Chemical Fertilizer vrs Organic Fertilizer.	Annual	Comparison of use of Chemical Fertilizer and Organic Fertilizer like FYM, Urban Compost, Vermi Compost etc.

(NB: The Sample Points over which periodical regeneration status will be studied in 6th & 10th year are as furnished below.)



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Table No 13.1 (A) sample points to be well marked on ground and regeneration to be studied periodically)

Range	Sl No	Sample points	Compt. No	Block	Beat
Naktideula	1	858	12	Rail RF	Talanali
	2	398	2	Chadchadi PRF	Chadchadi
	3	51		Dhadrakhol DPF	Salebhata
	4	572		Lampaphuli DPF	Kadobahal
Rampur	5	845	17	Hatidhara RF	Brahamani
	6	841		Badhindol DPF	Rampur West Beat
	7	742	7	Hatidhara RF	Dhunkchhali
Charmal	8	706		Berhampura PRF	Berhampura
	9	987	1	Bindhyabasani RF	Hemamura
	10	577	42	Landakot RF	Bantaloi
	11	738		Rasibeda PRF	Charmal
	12	1050	4	Sagmalia RF	Gargadbahal
Mochibahal	13	918		Chargarh	Sagjoree
	14	1030		Chargarh	Sagjoree
	15	754		Mochibahal PRF	Mochibahal
	16	798		R.Badmal RF	Badmal
Rairakhol	17	924		Hemantkhol	Hemantkhol
	18	1002	1	Rahan RF	Tribanpur
	19	1117		Rahan RF	Tribanpur
	20	966	1	Tal RF	Tal
Girishchandrapur	21	67		Talab PRF,	Talab
	22	151	28	Landakot RF	Luhahir
	23	57	1	Kholgarh RF	Girishchandrapur
	24	6	1	Landakot RF	Hiraloi



Table No 13.1 (B) Abstract of sample Points selected for Regeneration study.		
Range	Sample points no	Total
Badabahal	924,1002,1117, 966	4
Badmal	918,1030,754, 798,	4
Charmal	706, 987, 577, 738, 1050	5
GCPur	67,151,57, 6	4
Naktideul	858, 398, 51, 572	4
Redhakhol	845,841,742	3
Total		24 Points

13.2: Method of treatment to be adopted:

The forests of Rairakhol Division are broadly categorized in to five categories i.e.

- i) Moist Peninsular Sal Forest having site quality (II/III) in most blocks.
- ii) Dry Deciduous mixed forests with biotic interference.
- iii) Dry Bamboo forests with moderate juvenility.
- iv) Forests assigned to VSS for Protection, Enrichment & Management.
- v) Village Forests of erstwhile Social Forestry Project.

13.2.1 Natural vegetations having Crop Density > 40%

Forest Blocks having good Sal and Miscellaneous crop previously managed under Selection system and the Crop Density is above 40%. The crop consists of all age classes and having good regeneration. All such blocks constitutes around 85% of the Forest under management and proposed to be managed under **Selection Working Circle**.

13.2.2 Natural vegetations having Crop Density <40%.

The Forest Blocks having natural vegetation and crop density less than 40% is proposed to be treated for Rehabilitation of Degraded Forests with the help of VSS. The treatment for these forest blocks to enhance the regeneration of natural species in normal silvicultural practices i.e. High Forest System mixed with Aided Natural Regeneration, Soil & Moisture Conservation, and Strict protection against fire and closed to grazing. These Forests will be managed under **Rehabilitation Working Circle**.



13.2.3 Plantations Raised within Forest Blocks.

Under various plantation schemes, plantations have been raised in forest blocks in a limited scale. Mixed plantations has merged with natural vegetation and enriched the crop. Special Treatment will not prescribe for these plantations; rather it will be treated at par with the surrounding natural vegetation.

The plantations raised under Social Forestry Project during 1985-2003 will also be brought to management fold. The system to be adopted for SFP plantations is clear felling with standard. Similarly Plantations raised under Compensatory Afforestation and declared as Protected Forest will also be managed at par with SFP Plantation.

13.2.4: Management of Fragile & Sensitive Areas:

There are forest blocks coming within Tal- Kholgarh Elephant Corridor which is very sensitive area. Similarly Forest blocks in Naktideul Range are identified as Tiger Landscape. These Forest blocks are to be maintained as “No Disturbance Zone” and will be managed under “Protection Working Circle”

13.2.5 Management of Bamboo Forests:

Dry deciduous Sal forests / mixed forests are having good bamboo concentration in past and managed under **Bamboo (Overlapping) Working Circle**. During last plan period no bamboo coupe were worked out partly due to degraded nature and partly due to other consideration alike poor demand on Bamboo, Bamboo working seems to be not Cost effective. All bamboo forests with viable commercial potential will be managed under Bamboo (Overlapping) Circle with a 4 years cutting cycle. During plan period two & half cycles will be completed.

13.2.6 Management of Non Timber Forest Produce:

Forests of Rairakhol division are having Siali leaf, Sal Leaf, Siali fiber, Myrobalance, mango, Kendu, Char, Mahula and important MAP (Medicinal & Aromatic Plants). The forest blocks with rich Bio Diversity harbor NTFP species of local importance. The Tribal's knowledge in traditional treatment depends upon herbs / shrubs found in forests. It will be managed under “NTFP (Overlapping) Working Circle”.

13.2.7 Management of Wildlife:

There is no wildlife sanctuary in Rairakhol Division. A part of Naktideul block comes under Eco sensitive Zone of Khalasuni- Badrama Sanctuary. Some Forest Blocks of Naktideul Range



has been considered as Part of Tiger Landscape. Rairakhol Division has a whole considered to be a good habitat for elephant due its dense forest, availability of food and water. For management of Wildlife an **Overlapping Working Circle** will be constituted and the problems related to wildlife management will be addressed suitably.

13.2.8: Participatory Forest Management:

Forest fringe villages have been assigned with responsibility of Protection & Management of Forests and Wildlife under provisions of Joint Forest Management Resolution -2011 and subsequent amendment -2015 and 2019. **“Aama Jungal Yojana”** is also being implemented in the division. Similarly Village Forests created under SIDA Assisted Social Forestry Project is being managed by Village Forest Committee constituted under provisions of Village Forest Rule-1985. These forests will be managed under Participatory Forest Management in JFM Mode. These forests except those of SIDA Assisted Social forestry plantations will be considered & managed under **JFM (Overlapping) working Circle**. **SIDA Assisted Social Forestry Plantations** will be managed under provisions of Village Forest Rule 1985 in JFM Mode also.

13.2.9: Management of Forest Resource outside the Forest area:

Tree Outside the forest (TOF) has been enriched through various plantation programs under different schemes (State plan, Central Plan, Special Schemes). Road side Plantations / Avenue Plantation has been created for aesthetic value. There is a high level meeting / discussion to constitute a Working Circle namely **“Development Working Circle”** on 13.02.2019. After discussion / deliberations, it is decided to constitute a working Circle to manage Forest Resource outside the Forest area vide letter no 3628/ 11F (SFM)-15 / 2018 dated 26.02.2019. **(Annexure-XIII)**. This working circle will comprise the forests created outside the forest area including Avenue Plantations, other plantations of first growing species, other need based plantations like Fuel wood and Fodder Plantations, National Afforestation Program i.e. Plantations taken up under FDA Program. Regulating guidelines for TOF management will be embodied in the **“TOF Working Circle”**.

13.3: Constitution of Working Circles.

With the guiding factors as stated above and taken in to consideration it is felt to have the following Working Circles for scientific management of available forest resources of the Division.



- i. Selection Working Circle (80468.4660 ha)
- ii. Rehabilitation Working Circle (9995.9725ha)
- iii. Plantation Working Circle (455.0830 ha)
- iv. Protection Working Circle (10937.910 Ha)
- v. Bamboo (Overlapping) Working Circle (13821.014ha).
- vi. Non Timber Forest Produce (Overlapping) Working Circle (101761.1785 Ha).
- vii. Wildlife (Overlapping) Working Circle (101761.1785 Ha)
- viii. Joint Forest Management (Overlapping) Working Circle (5506.50 Ha)
- ix. TOF Working Circle (4157.69 ha +414 RKM Avenue Plantation)

All total it is proposed to have Nine Working Circle. Out of these working circles, Four Working Circle will have independent area where as other four Working Circle will have overlapping jurisdiction. The TOF (Tree outside the Forest Area) Working Circle does not cover any RF/ PRF or VF.

13.3.1 Comparison of area proposed for Management vis- a- vis outgoing Plan:

Table No 13.2 Comparison of Area under management in Outgoing plan vrs current Plan

Category of Forests	Area under Out Going Plan	Total area in Ha	Area under this Plan	Total area in ha	Remark
Reserved forest	94050.60	107488.520	88424.75	101900.1730	<i>Forest blocks transferred to Subarnapur Division during 2010 reorganization.</i>
Proposed Reserved forest	9898.74		10112.77		
Demarcated Protected Forest	3481.32		3266.40		
Protected Forest	0		38.393		
Village Forest	57.86		57.86		

13.3.2 SWOT Analysis:

SWOT stands for Strengths, Weaknesses, Opportunities, and Threats, and so a SWOT analysis is a technique for assessing these four aspects of the Division. In the plan it has been indicated under different heads. It is summarized below.

13.3.2.1 Threat: (T)

- (i) Threat to the Forest (Both Natural and Biotic), Chapter 2 Para 2.5
- (ii) Threat to Animals / Wildlife (Chapter3, Para 3.7)



- (iii) Species subjected to Over Exploitation (Chapter 3, Para 3.4)
- (iv) Forest Degradation & its drivers. (Chapter4, Para 4.8)
- (v) Encroachment of forest by people from outside the State is a great threat to forests of Rairakhol division (Described under Para-2.5.2(iii)).

13.3.2.2 Weaknesses: (W)

- vi) Inadequate Man Power (Cadre Strength) (Chapter 9, Para 9.10)
- vii) Budgetary provisions (In adequacy described under Para 9.7, Chapter 9)

13.3.2.3 Opportunities: (O)

- viii) Provisions for Preparation & approval of Site Specific Wildlife Conservation Plan and availability of additional Resource. (Till end of 31st March 21, the following Site Specific wildlife Conservation Plans has been approved with financial implications which provide additional opportunity for a better management.

Sl No	Name of the Project.	Approved Financial projection for the Division. (In Lakh)
1	Rehabilitation and Up-gradation to 4- Laning of Angul to Sambalpur of National Highway 55. (Old name NH-42) from 2 lane to 4 lane	178.81
2	Laying of underground natural gas pipeline along with optical fibre cable of Jagdishpur- Haldia- Bokaro-Dhamra natural Gas pipeline – Odisha Project by GAIL India Ltd.	641.88

- ix) Availability of funds under MANREGA at district level.
- x) Use of Satellite / modern technology for detection of Forest Fire, large scale felling and related study through Google Earth.
- xi) Skill up gradation / development training courses for Staff/ VSS members (Para 9.5 Chapter-9)



13.3.2.4 Strength: (S)

- xii) Adequacy of Legal Provisions (Chapter 9, Para 9.1)
- xiii) Provisions for deployment of additional man power through Squads / DEO,
- xiv) Availability of Modern technology for forest management.

13.3.3 Area allotted to Various Working Circle:

The area allotted to different Working circle is furnished below and at **Annexure -XIV**.

Table No 13.3(a) Area available for management Block wise

Table No 13.3(a) Area availabe for management Block wise						
SI No	Name of Forest Block	Comp no	GIS compt. Area	Area diverted under		Area available for Management
				FC Act 1980	FRA	
Reserved Forests.						
A. Rairakhol Range						
1	Bindhya-basini	1	181.9900			181.9900
	Bindhya-basini	2	264.9400		0.4000	264.5400
	Bindhya-basini	3	308.9800			308.9800
		Total	755.9100	0.0000	0.4000	755.5100
2	Hatidhara	1	482.6600	3.0000		479.6600
	Hatidhara	2	259.4800	3.0000		256.4800
	Hatidhara	3	401.7200	3.0000		398.7200
	Hatidhara	4	524.5900	3.0000		521.5900
	Hatidhara	5	636.9700			636.9700
	Hatidhara	6	296.4200	3.0000		293.4200
	Hatidhara	7	518.7500			518.7500
	Hatidhara	8	521.2000			521.2000
	Hatidhara	9	543.2800		0.2200	543.0600
	Hatidhara	10	280.7700			280.7700
	Hatidhara	11	448.2500			448.2500
	Hatidhara	12	494.4700			494.4700
	Hatidhara	13	551.8100			551.8100
	Hatidhara	14	482.8500			482.8500
	Hatidhara	15	379.6200			379.6200
	Hatidhara	16	243.5600			243.5600
	Hatidhara	17	460.6200		0.2500	460.3700
		Total	7527.0200	15.0000	0.4700	7511.5500



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Table No 13.3(a) Area available for management Block wise

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area diverted under		Area available for Management
				FC Act 1980	FRA	
3	Kholgarh	21	536.1400			536.1400
	Kholgarh	22	417.4500			417.4500
	Kholgarh	23	463.7200			463.7200
	Kholgarh	24	363.2100			363.2100
	Kholgarh	26	305.2900			305.2900
	Kholgarh	25	454.2600			454.2600
	Kholgarh	28	360.6800			360.6800
	Kholgarh	27	202.5100			202.5100
	Kholgarh	29	315.0100			315.0100
	Kholgarh	30	399.8700			399.8700
	Kholgarh	31	363.7500			363.7500
	Kholgarh	32	544.7100			544.7100
	Kholgarh	33	391.2700			391.2700
	Kholgarh	34	862.8500			862.8500
	Kholgarh	35	428.5000			428.5000
	Kholgarh	36	408.3500		0.5060	407.8440
	Kholgarh	37	455.4400			455.4400
	Kholgarh	38	316.8100			316.8100
	Kholgarh	39	378.6200	0.7100		377.9100
		S. Total	7968.4400	0.7100	0.5060	7967.2240
	Range Total		16251.3700	15.7100	1.3760	16234.2840
B. Badbahal Range						
4	Rahan	1	406.7700			406.7700
	Rahan	2	379.9500			379.9500
	Rahan	3	548.1100			548.1100
	Rahan	4	813.4600			813.4600
	Rahan	5	534.5200			534.5200
	Rahan	6	462.3300			462.3300
		Total	3145.1400	0.0000	0.0000	3145.1400
5	Tal	1	840.1800		0.3000	839.8800
	Tal	2	619.1000			619.1000
	Tal	3	601.3800			601.3800



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Table No 13.3(a) Area available for management Block wise

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area diverted under		Area available for Management
				FC Act 1980	FRA	
		Total	2060.6600	0.0000	0.3000	2060.3600
	Range Total		5205.8000	0.0000	0.3000	5205.5000
C. Charmal Range						
6	Landakot	39	261.9900			261.9900
	Landakot	40	395.4900			395.4900
	Landakot	41	378.7000			378.7000
	Landakot	42	396.8900			396.8900
	Landakot	43	308.3100			308.3100
	Landakot	44	283.6700			283.6700
	Landakot	45	207.8400			207.8400
	Landakot	46	315.5200			315.5200
	Landakot	47	168.2100			168.2100
	Landakot	48	221.4300			221.4300
	Landakot	49	310.9600			310.9600
	Landakot	50	341.5400			341.5400
	Landakot	51	221.4700			221.4700
	Landakot	52	209.3500			209.3500
	Landakot	53	324.2700			324.2700
	Landakot	54	236.8100			236.8100
	Landakot	55	310.4200			310.4200
	Landakot	56	552.5500			552.5500
	Landakot	57	268.1300			268.1300
	Landakot	58	383.4100			383.4100
	Landakot	59	194.8100			194.8100
	Landakot	72	274.5200			274.5200
	Landakot	73	167.1400		0.2500	166.8900
	Landakot	74	371.8500			371.8500
	Landakot	78	251.7800			251.7800
	Landakot	79	319.9400			319.9400
	Landakot	80	235.0100			235.0100



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Table No 13.3(a) Area available for management Block wise

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area diverted under		Area available for Management
				FC Act 1980	FRA	
		S Total	7912.0100	0.0000	0.2500	7911.7600
7	Suani	1	352.7900			352.7900
	Suani	2	327.1800	0.0375		327.1425
		Total	679.9700	0.0375	0.0000	679.9325
8	Sagmalia	1	424.5000			424.5000
	Sagmalia	2	440.1300			440.1300
	Sagmalia	3	373.1300			373.1300
	Sagmalia	4	747.1300			747.1300
	Sagmalia	5	459.0300			459.0300
	Sagmalia	6	560.9500			560.9500
		Total	3004.8700	0.0000	0.0000	3004.8700
	Range Total		11596.8500	0.0375	0.2500	11596.5625
D. Badmal Range						
9	Landakot	60	274.1500			274.1500
	Landakot	61	307.9700			307.9700
	Landakot	62	149.7300			149.7300
	Landakot	63	293.1600			293.1600
	Landakot	64	316.6400	3.1500		313.4900
	Landakot	65	269.7100	3.0150		266.6950
	Landakot	66	164.7600			164.7600
	Landakot	67	178.2600			178.2600
	Landakot	68	181.1300			181.1300
	Landakot	69	244.0200			244.0200
	Landakot	70	239.9300			239.9300
	Landakot	71	312.0600			312.0600
		S. Total	2931.5200	6.1650	0.0000	2925.3550
10	R. Badmal	1	361.1000			361.1000
	R. Badmal	2	778.0300			778.0300
		Total	1139.1300	0.0000	0.0000	1139.1300
11	Chargad	1	473.4100			473.4100



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Table No 13.3(a) Area available for management Block wise

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area diverted under		Area available for Management
				FC Act 1980	FRA	
	Range Total		4544.0600	6.1650	0.0000	4537.8950
	E. Naktideul Range					
12	Rail	1	575.4800		0.7000	574.7800
	Rail	2	640.3800			640.3800
	Rail	3	660.5700			660.5700
	Rail	4	767.3200			767.3200
	Rail	5	1049.0400			1049.0400
	Rail	6	623.8900			623.8900
	Rail	7	512.7900			512.7900
	Rail	8	903.3600			903.3600
	Rail	9	440.9500			440.9500
	Rail	10	368.4200			368.4200
	Rail	11	459.7000			459.7000
	Rail	12	667.5100			667.5100
	Rail	13	552.3800			552.3800
	Rail	14	454.3900			454.3900
	Rail	15	556.1000			556.1000
	Rail	16	771.7800			771.7800
	Rail	17	745.0600			745.0600
	Rail	18	540.4200			540.4200
		Total	11289.5400	0.0000	0.7000	11288.8400
13	Landimal	1	907.5200	9.0000		898.5200
	Landimal	2	1123.2400		0.5830	1122.6570
	Landimal	3	921.8000			921.8000
	Landimal	4	965.4900			965.4900
	Landimal	5	678.8700			678.8700
	Landimal	6	868.6500			868.6500
	Landimal	7	489.1600			489.1600
	Landimal	8	547.3900			547.3900
	Landimal	9	736.2000			736.2000



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Table No 13.3(a) Area available for management Block wise

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area diverted under		Area available for Management
				FC Act 1980	FRA	
	Landimal	10	778.2900			778.2900
	Landimal	15	658.3000			658.3000
	Landimal	17	1007.0300			1007.0300
	Landimal	18	502.6900			502.6900
	Landimal	16	1157.2800			1157.2800
	Landimal	11	637.2700			637.2700
	Landimal	12	724.5100			724.5100
	Landimal	13	694.8600			694.8600
	Landimal	14	628.2300			628.2300
		Total	14026.7800	9.0000	0.5830	14017.1970
14	Nadia	1	404.8200			404.8200
	Nadia	2	527.7100			527.7100
		Total	932.5300	0.0000	0.0000	932.5300
	Range Total		26248.8500	9.0000	1.2830	26238.5670
F.Girishchandrapur Range						
15	Landakot	1	185.0700		1.7700	183.3000
	Landakot	2	418.8400			418.8400
	Landakot	3	404.3600			404.3600
	Landakot	4	448.0100		2.9700	445.0400
	Landakot	5	247.5100			247.5100
	Landakot	6	199.5600			199.5600
	Landakot	7	236.4400			236.4400
	Landakot	8	293.6000			293.6000
	Landakot	9	336.3700			336.3700
	Landakot	10	337.7600			337.7600
	Landakot	11	276.8500			276.8500
	Landakot	12	214.5300			214.5300
	Landakot	13	238.3800			238.3800
	Landakot	14	231.7000			231.7000
	Landakot	15	336.8300			336.8300



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Table No 13.3(a) Area available for management Block wise

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area diverted under		Area available for Management
				FC Act 1980	FRA	
	Landakot	16	400.1500			400.1500
	Landakot	17	266.1200			266.1200
	Landakot	18	220.1600			220.1600
	Landakot	19	214.7200			214.7200
	Landakot	20	252.6300			252.6300
	Landakot	21	194.6300			194.6300
	Landakot	22	261.6500			261.6500
	Landakot	23	126.3600			126.3600
	Landakot	24	187.0700			187.0700
	Landakot	25	203.6300			203.6300
	Landakot	26	186.9900			186.9900
	Landakot	27	339.0700			339.0700
	Landakot	28	225.2200			225.2200
	Landakot	29	315.5500		0.9900	314.5600
	Landakot	30	260.9300			260.9300
	Landakot	31	213.3200			213.3200
	Landakot	32	243.4300			243.4300
	Landakot	33	287.4600			287.4600
	Landakot	34	261.7500			261.7500
	Landakot	35	316.6200			316.6200
	Landakot	36	306.7700			306.7700
	Landakot	37	547.3400			547.3400
	Landakot	38	519.2900			519.2900
	Landakot	75	307.9200			307.9200
	Landakot	76	271.7500			271.7500
	Landakot	77	425.1800			425.1800
	Landakot	81	272.4500			272.4500
	Landakot	82	275.6200			275.6200
	Landakot	83	329.0100			329.0100
	Landakot	84	201.2900			201.2900



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Table No 13.3(a) Area available for management Block wise

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area diverted under		Area available for Management
				FC Act 1980	FRA	
	Landakot	85	217.0800			217.0800
	Landakot	86	311.6100			311.6100
	Landakot	87	295.0700			295.0700
		Total	13663.6500	0.0000	5.7300	13657.9200
16	Kholgarh	1	290.0100			290.0100
	Kholgarh	2	396.5500			396.5500
	Kholgarh	3	654.8200			654.8200
	Kholgarh	4	401.8000			401.8000
	Kholgarh	5	408.3300			408.3300
	Kholgarh	6	452.4200			452.4200
	Kholgarh	7	402.8900			402.8900
	Kholgarh	8	543.3500			543.3500
	Kholgarh	9	623.3400			623.3400
	Kholgarh	10	616.6200		0.4000	616.2200
	Kholgarh	11	692.3300			692.3300
	Kholgarh	12	842.3100			842.3100
	Kholgarh	13	787.8600			787.8600
	Kholgarh	14	541.4200			541.4200
	Kholgarh	15	363.0600			363.0600
	Kholgarh	16	399.9500			399.9500
	Kholgarh	17	468.7200			468.7200
	Kholgarh	18	850.0800			850.0800
	Kholgarh	19	732.4400			732.4400
	Kholgarh	20	445.8700			445.8700
		S. Total	10914.1700	0.0000	0.4000	10913.7700
	Range Total		24577.8200	0.0000	6.1300	24571.6900
	Div Total		88424.7500	30.9125	9.3390	88384.4985
Proposed Reserved Forest						
A. Redhakhoh Range						
17	Purunapani		962.3900			962.3900
	Range Total		962.3900	0.0000	0.0000	962.3900



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 13.3(a) Area available for management Block wise

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area diverted under		Area available for Management
				FC Act 1980	FRA	
B. Badbahal Range						
18	Podabalanda		273.9500			273.9500
19	San-Rengali		311.6100			311.6100
20	Hemantakhol		214.9200			214.9200
	Range Total		800.4800	0.0000	0.0000	800.4800
C. Charmal Range						
21	Behrampura		777.3800			777.3800
22	Rasibeda		93.6200			93.6200
23	Siaripani		204.7200			204.7200
	Range Total		1075.7200	0.0000	0.0000	1075.7200
D. Badmal Range						
24	Kalia		318.2600			318.2600
25	Koilipadar		227.8300	2.4900		225.3400
26	Mochibahal		1553.1300			1553.1300
27	Sagjori		610.6600			610.6600
28	Satsama		474.9500			474.9500
	Range Total		3184.8300	2.4900	0.0000	3182.3400
E. Naktideul Range						
29	Chadchadi		2832.1300			2832.1300
30	Rohinigadia		569.4300			569.4300
	Range Total		3401.5600	0.0000	0.0000	3401.5600
F. Girishchandrapur Range						
31	Goudpali		58.2400			58.2400
32	Talab		629.5500			629.5500
	Range Total		687.7900	0.0000	0.0000	687.7900
	Div. Total		10112.7700	2.4900	0.0000	10110.2800
DPF (Demarcated Protected Forest)						
A. Redhakhoh Range						
33	Bada-Hindol		581.3200			581.3200
34	Hinterei		111.5500			111.5500
35	Terbeda		35.9900			35.9900



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 13.3(a) Area available for management Block wise

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area diverted under		Area available for Management
				FC Act 1980	FRA	
	Range Total		728.8600	0.0000	0.0000	728.8600
C. Charmal Range						
36	Kusumbahali		326.4900			326.4900
	Range Total		326.4900			326.4900
E. Naktideul Range						
37	Abmajhari		189.4100			189.4100
38	Abmajhari-Dhadrokhohol		596.4200			596.4200
39	Bahaljharan		128.1400			128.1400
40	Dhadrokhohol		326.8400			326.8400
41	Lampaphuli		426.5800			426.5800
42	Penthabahol		28.4600			28.4600
	Range Total		1695.8500	0.0000	0.0000	1695.8500
F. Girishchandrapur Range						
43	Balikiari		37.6000			37.6000
44	Budbuda		102.4200			102.4200
45	Jarasingha		179.1300			179.1300
46	Phulkusum		86.0500			86.0500
47	Podamal		110.0000			110.0000
	Range Total		515.2000	0.0000	0.0000	515.2000
	Div. Total		3266.4000	0.0000	0.0000	3266.4000
	Div. RF, PRF & DPF		101803.9200	33.4025	9.3390	101761.1785
Village Forest						
A. Naktideul Range						
48	Bindpur		57.86	0	0	57.86
B Redhakhol						
49	Khajurijharan PF		38.393	0	0	38.393
	Div VF+PF		96.253	0	0	96.253
	G.Total		101900.1730	33.4025	9.3390	101857.4315



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 13.3(B) Area allotted to different Working circle

Sl No	Name of Forest Block	Comp no	Area available for Management	Area allotted to							
				SWC	RWC	Pl. WC	Pro.WC	Bamboo (O) WC	NTFP (O) WC	WL (O) WC	JFM(O) WC
Reserved Forests.											
A. Rairakhol Range											
1	Bindhya-basini	1	181.9900	181.9900				181.9900	181.9900	181.9900	
	Bindhya-basini	2	264.5400	264.5400				264.5400	264.5400	264.5400	
	Bindhya-basini	3	308.9800	308.9800				308.9800	308.9800	308.9800	
		Total	755.5100	755.5100	0.0000	0.0000	0.0000	755.5100	755.5100	755.5100	0.0000
2	Hatidhara	1	479.6600	479.6600				479.6600	479.6600	479.6600	
	Hatidhara	2	256.4800	256.4800				256.4800	256.4800	256.4800	
	Hatidhara	3	398.7200	398.7200				398.7200	398.7200	398.7200	
	Hatidhara	4	521.5900	521.5900				521.5900	521.5900	521.5900	50.0000
	Hatidhara	5	636.9700	636.9700				0.0000	636.9700	636.9700	
	Hatidhara	6	293.4200	293.4200				293.4200	293.4200	293.4200	
	Hatidhara	7	518.7500	518.7500				518.7500	518.7500	518.7500	56.0000
	Hatidhara	8	521.2000	521.2000				521.2000	521.2000	521.2000	51.7000
	Hatidhara	9	543.0600	543.0600				543.0600	543.0600	543.0600	
	Hatidhara	10	280.7700	280.7700				280.7700	280.7700	280.7700	50.0000
	Hatidhara	11	448.2500	448.2500					448.2500	448.2500	
	Hatidhara	12	494.4700	494.4700					494.4700	494.4700	
	Hatidhara	13	551.8100	551.8100				551.8100	551.8100	551.8100	
	Hatidhara	14	482.8500	482.8500				482.8500	482.8500	482.8500	



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 13.3(B) Area allotted to different Working circle

Sl No	Name of Forest Block	Comp no	Area available for Management	Area allotted to							
				SWC	RWC	Pl. WC	Pro.WC	Bamboo (O) WC	NTPF (O) WC	WL (O) WC	JFM(O) WC
	Hatidhara	15	379.6200	379.6200					379.6200	379.6200	
	Hatidhara	16	243.5600	243.5600					243.5600	243.5600	
	Hatidhara	17	460.3700	460.3700					460.3700	460.3700	
		Total	7511.5500	7511.5500	0.0000	0.0000	0.0000	4848.3100	7511.5500	7511.5500	207.7000
3	Kholgarh	21	536.1400	536.1400					536.1400	536.1400	50.0000
	Kholgarh	22	417.4500	417.4500					417.4500	417.4500	
	Kholgarh	23	463.7200	463.7200					463.7200	463.7200	
	Kholgarh	24	363.2100	363.2100					363.2100	363.2100	
	Kholgarh	26	305.2900	305.2900				305.2900	305.2900	305.2900	
	Kholgarh	25	454.2600	454.2600					454.2600	454.2600	
	Kholgarh	28	360.6800	360.6800					360.6800	360.6800	
	Kholgarh	27	202.5100	202.5100					202.5100	202.5100	
	Kholgarh	29	315.0100	315.0100					315.0100	315.0100	
	Kholgarh	30	399.8700	399.8700					399.8700	399.8700	
	Kholgarh	31	363.7500	363.7500					363.7500	363.7500	
	Kholgarh	32	544.7100	544.7100					544.7100	544.7100	
	Kholgarh	33	391.2700	391.2700					391.2700	391.2700	
	Kholgarh	34	862.8500	862.8500					862.8500	862.8500	
	Kholgarh	35	428.5000	428.5000					428.5000	428.5000	
	Kholgarh	36	407.8440	407.8440				407.8440	407.8440	407.8440	
	Kholgarh	37	455.4400	455.4400				455.4400	455.4400	455.4400	
	Kholgarh	38	316.8100	316.8100				316.8100	316.8100	316.8100	
	Kholgarh	39	377.9100	377.9100				377.9100	377.9100	377.9100	



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 13.3(B) Area allotted to different Working circle

Sl No	Name of Forest Block	Comp no	Area available for Management	Area allotted to							
				SWC	RWC	Pl. WC	Pro.WC	Bamboo (O) WC	NTPF (O) WC	WL (O) WC	JFM(O) WC
		S. Total	7967.2240	7967.2240	0.0000	0.0000	0.0000	1863.2940	7967.2240	7967.2240	50.0000
	Range Total		16234.2840	16234.2840	0.0000	0.0000	0.0000	7467.1140	16234.2840	16234.2840	257.7000
B. Badbahal Range											
4	Rahan	1	406.7700	0.0000	371.7700	35.0000			406.7700	406.7700	
	Rahan	2	379.9500	0.0000	329.1700	50.7800		379.9500	379.9500	379.9500	50.0000
	Rahan	3	548.1100	548.1100				548.1100	548.1100	548.1100	150.0000
	Rahan	4	813.4600	813.4600				813.4600	813.4600	813.4600	170.0000
	Rahan	5	534.5200	514.5200		20.0000		534.5200	534.5200	534.5200	
	Rahan	6	462.3300	0.0000			462.3300	462.3300	462.3300	462.3300	220.0000
		Total	3145.1400	1876.0900	700.9400	105.7800	462.3300	2738.3700	3145.1400	3145.1400	590.0000
5	Tal	1	839.8800	0.0000		0.3700	839.5100		839.8800	839.8800	
	Tal	2	619.1000	0.0000			619.1000		619.1000	619.1000	
	Tal	3	601.3800	0.0000			601.3800		601.3800	601.3800	
		Total	2060.3600	0.0000	0.0000	0.3700	2059.9900	0.0000	2060.3600	2060.3600	0.0000
	Range Total		5205.5000	1876.0900	700.9400	106.1500	2522.3200	2738.3700	5205.5000	5205.5000	590.0000
C. Charmal Range											
6	Landakot	39	261.9900	261.9900					261.9900	261.9900	
	Landakot	40	395.4900	395.4900					395.4900	395.4900	
	Landakot	41	378.7000	378.7000					378.7000	378.7000	
	Landakot	42	396.8900	396.8900					396.8900	396.8900	



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 13.3(B) Area allotted to different Working circle

Sl No	Name of Forest Block	Comp no	Area available for Management	Area allotted to							
				SWC	RWC	Pl. WC	Pro.WC	Bamboo (O) WC	NTFP (O) WC	WL (O) WC	JFM(O) WC
	Landakot	43	308.3100	308.3100					308.3100	308.3100	
	Landakot	44	283.6700	283.6700					283.6700	283.6700	
	Landakot	45	207.8400	207.8400					207.8400	207.8400	
	Landakot	46	315.5200	315.5200					315.5200	315.5200	
	Landakot	47	168.2100	168.2100					168.2100	168.2100	
	Landakot	48	221.4300	221.4300					221.4300	221.4300	
	Landakot	49	310.9600	310.9600					310.9600	310.9600	
	Landakot	50	341.5400	341.5400					341.5400	341.5400	
	Landakot	51	221.4700	221.4700					221.4700	221.4700	
	Landakot	52	209.3500	209.3500					209.3500	209.3500	
	Landakot	53	324.2700	324.2700					324.2700	324.2700	
	Landakot	54	236.8100	236.8100					236.8100	236.8100	
	Landakot	55	310.4200	310.4200					310.4200	310.4200	
	Landakot	56	552.5500	552.5500					552.5500	552.5500	
	Landakot	57	268.1300	268.1300					268.1300	268.1300	
	Landakot	58	383.4100	383.4100					383.4100	383.4100	
	Landakot	59	194.8100	194.8100					194.8100	194.8100	
	Landakot	72	274.5200	274.5200					274.5200	274.5200	
	Landakot	73	166.8900	166.8900					166.8900	166.8900	
	Landakot	74	371.8500	371.8500					371.8500	371.8500	53.0000



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 13.3(B) Area allotted to different Working circle

Sl No	Name of Forest Block	Comp no	Area available for Management	Area allotted to							
				SWC	RWC	Pl. WC	Pro.WC	Bamboo (O) WC	NTPF (O) WC	WL (O) WC	JFM(O) WC
	Landakot	78	251.7800	251.7800					251.7800	251.7800	
	Landakot	79	319.9400	319.9400					319.9400	319.9400	
	Landakot	80	235.0100	235.0100					235.0100	235.0100	
		S Total	7911.7600	7911.7600	0.0000	0.0000	0.0000	0.0000	7911.7600	7911.7600	53.0000
7	Suani	1	352.7900	352.7900					352.7900	352.7900	30.0000
	Suani	2	327.1425	0.0000	327.1425				327.1425	327.1425	24.4000
		Total	679.9325	352.7900	327.1425	0.0000	0.0000	0.0000	679.9325	679.9325	54.4000
8	Sagmalia	1	424.5000	424.5000				424.5000	424.5000	424.5000	56.3000
	Sagmalia	2	440.1300	440.1300				440.1300	440.1300	440.1300	
	Sagmalia	3	373.1300	373.1300				373.1300	373.1300	373.1300	100.0000
	Sagmalia	4	747.1300	747.1300				747.1300	747.1300	747.1300	
	Sagmalia	5	459.0300	459.0300				459.0300	459.0300	459.0300	
	Sagmalia	6	560.9500	560.9500				560.9500	560.9500	560.9500	
		Total	3004.8700	3004.8700	0.0000	0.0000	0.0000	3004.8700	3004.8700	3004.8700	156.3000
	Range Total		11596.5625	11269.4200	327.1425	0.0000	0.0000	3004.8700	11596.5625	11596.5625	263.7000
D. Badmal Range				0.0000							
9	Landakot	60	274.1500	274.1500					274.1500	274.1500	
	Landakot	61	307.9700	307.9700					307.9700	307.9700	
	Landakot	62	149.7300	149.7300					149.7300	149.7300	
	Landakot	63	293.1600	293.1600					293.1600	293.1600	



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 13.3(B) Area allotted to different Working circle

Sl No	Name of Forest Block	Comp no	Area available for Management	Area allotted to							
				SWC	RWC	Pl. WC	Pro.WC	Bamboo (O) WC	NTFP (O) WC	WL (O) WC	JFM(O) WC
	Landakot	64	313.4900	313.4900					313.4900	313.4900	
	Landakot	65	266.6950	266.6950					266.6950	266.6950	
	Landakot	66	164.7600	164.7600					164.7600	164.7600	
	Landakot	67	178.2600	178.2600					178.2600	178.2600	
	Landakot	68	181.1300	181.1300					181.1300	181.1300	
	Landakot	69	244.0200	244.0200					244.0200	244.0200	50.0000
	Landakot	70	239.9300	239.9300					239.9300	239.9300	
	Landakot	71	312.0600	312.0600					312.0600	312.0600	
	S. Total		2931.52	2925.3550	2925.3550	0.0000	0.0000	0.0000	0.0000	2925.3550	2925.3550
10	R. Badmal	1	361.1000	0.0000	341.1000	20.0000			361.1000	361.1000	
	R. Badmal	2	778.0300	0.0000	778.0300				778.0300	778.0300	
		Total	1139.1300	0.0000	1119.1300	20.0000	0.0000	0.0000	1139.1300	1139.1300	0.0000
11	Chargad	1	473.4100	0.0000	473.4100				473.4100	473.4100	
	Range Total		4537.8950	2925.3550	1592.5400	20.0000	0.0000	0.0000	4537.8950	4537.8950	50.0000
E. Naktideul Range											
12	Rail	1	574.7800	557.1600		17.6200			574.7800	574.7800	
	Rail	2	640.3800	640.3800					640.3800	640.3800	
	Rail	3	660.5700	0.0000			660.5700		660.5700	660.5700	
	Rail	4	767.3200	0.0000			767.3200		767.3200	767.3200	
	Rail	5	1049.0400	0.0000			1049.0400		1049.0400	1049.0400	
	Rail	6	623.8900	0.0000			623.8900		623.8900	623.8900	



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 13.3(B) Area allotted to different Working circle

Sl No	Name of Forest Block	Comp no	Area available for Management	Area allotted to							
				SWC	RWC	Pl. WC	Pro.WC	Bamboo (O) WC	NTFP (O) WC	WL (O) WC	JFM(O) WC
	Rail	7	512.7900	512.7900					512.7900	512.7900	
	Rail	8	903.3600	0.0000			903.3600		903.3600	903.3600	55.0000
	Rail	9	440.9500	440.9500					440.9500	440.9500	
	Rail	10	368.4200	0.0000			368.4200		368.4200	368.4200	
	Rail	11	459.7000	459.7000					459.7000	459.7000	
	Rail	12	667.5100	0.0000			667.5100		667.5100	667.5100	
	Rail	13	552.3800	552.3800					552.3800	552.3800	
	Rail	14	454.3900	454.3900					454.3900	454.3900	
	Rail	15	556.1000	556.1000					556.1000	556.1000	
	Rail	16	771.7800	771.7800					771.7800	771.7800	
	Rail	17	745.0600	745.0600					745.0600	745.0600	
	Rail	18	540.4200	540.4200					540.4200	540.4200	
		Total	11288.8400	6231.1100	0.0000	17.6200	5040.1100	0.0000	11288.8400	11288.8400	55.0000
13	Landimal	1	898.5200	898.5200					898.5200	898.5200	
	Landimal	2	1122.6570	1062.6570		60.0000			1122.6570	1122.6570	
	Landimal	3	921.8000	921.8000					921.8000	921.8000	
	Landimal	4	965.4900	965.4900					965.4900	965.4900	
	Landimal	5	678.8700	678.8700					678.8700	678.8700	
	Landimal	6	868.6500	868.6500					868.6500	868.6500	
	Landimal	7	489.1600	489.1600					489.1600	489.1600	
	Landimal	8	547.3900	547.3900					547.3900	547.3900	273.2000



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 13.3(B) Area allotted to different Working circle

Sl No	Name of Forest Block	Comp no	Area available for Management	Area allotted to							
				SWC	RWC	Pl. WC	Pro.WC	Bamboo (O) WC	NTFP (O) WC	WL (O) WC	JFM(O) WC
	Landimal	9	736.2000	736.2000					736.2000	736.2000	150.0000
	Landimal	10	778.2900	778.2900					778.2900	778.2900	
	Landimal	15	658.3000	658.3000					658.3000	658.3000	
	Landimal	17	1007.0300	1007.0300					1007.0300	1007.0300	
	Landimal	18	502.6900	502.6900					502.6900	502.6900	
	Landimal	16	1157.2800	1157.2800					1157.2800	1157.2800	
	Landimal	11	637.2700	637.2700					637.2700	637.2700	
	Landimal	12	724.5100	724.5100					724.5100	724.5100	
	Landimal	13	694.8600	694.8600					694.8600	694.8600	
	Landimal	14	628.2300	628.2300					628.2300	628.2300	
		Total	14017.1970	13957.1970	0.0000	60.0000	0.0000	0.0000	14017.1970	14017.1970	423.2000
14	Nadia	1	404.8200		404.6700	0.1500			404.8200	404.8200	120.0000
	Nadia	2	527.7100	0.0000	527.7100				527.7100	527.7100	148.0000
		Total	932.5300	0.0000	932.3800	0.1500	0.0000	0.0000	932.5300	932.5300	268.0000
	Range Total		26238.5670	20188.3070	932.3800	77.7700	5040.1100	0.0000	26238.5670	26238.5670	746.2000
F.Girishchandrapur Range											
15	Landakot	1	183.3000	183.3000					183.3000	183.3000	98.0000
	Landakot	2	418.8400	418.8400					418.8400	418.8400	98.0000
	Landakot	3	404.3600	404.3600					404.3600	404.3600	120.0000
	Landakot	4	445.0400	445.0400					445.0400	445.0400	125.0000



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 13.3(B) Area allotted to different Working circle

Sl No	Name of Forest Block	Comp no	Area available for Management	Area allotted to							
				SWC	RWC	Pl. WC	Pro.WC	Bamboo (O) WC	NTPF (O) WC	WL (O) WC	JFM(O) WC
	Landakot	5	247.5100	247.5100					247.5100	247.5100	125.0000
	Landakot	6	199.5600	193.4900		6.0700			199.5600	199.5600	55.0000
	Landakot	7	236.4400	236.4400					236.4400	236.4400	55.0000
	Landakot	8	293.6000	293.6000					293.6000	293.6000	100.0000
	Landakot	9	336.3700	336.3700					336.3700	336.3700	
	Landakot	10	337.7600	337.7600					337.7600	337.7600	
	Landakot	11	276.8500	276.8500					276.8500	276.8500	
	Landakot	12	214.5300	214.5300					214.5300	214.5300	
	Landakot	13	238.3800	238.3800					238.3800	238.3800	
	Landakot	14	231.7000	231.7000					231.7000	231.7000	51.9000
	Landakot	15	336.8300	336.8300					336.8300	336.8300	
	Landakot	16	400.1500	400.1500					400.1500	400.1500	
	Landakot	17	266.1200	266.1200					266.1200	266.1200	
	Landakot	18	220.1600	220.1600					220.1600	220.1600	
	Landakot	19	214.7200	214.7200					214.7200	214.7200	
	Landakot	20	252.6300	242.6300		10.0000			252.6300	252.6300	25.0000
	Landakot	21	194.6300	194.6300					194.6300	194.6300	
	Landakot	22	261.6500	261.6500					261.6500	261.6500	20.0000
	Landakot	23	126.3600	126.3600					126.3600	126.3600	
	Landakot	24	187.0700	187.0700					187.0700	187.0700	
	Landakot	25	203.6300	203.6300					203.6300	203.6300	74.0000



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 13.3(B) Area allotted to different Working circle

Sl No	Name of Forest Block	Comp no	Area available for Management	Area allotted to							
				SWC	RWC	Pl. WC	Pro.WC	Bamboo (O) WC	NTPF (O) WC	WL (O) WC	JFM(O) WC
	Landakot	26	186.9900	186.9900					186.9900	186.9900	73.0000
	Landakot	27	339.0700	339.0700					339.0700	339.0700	
	Landakot	28	225.2200	225.2200					225.2200	225.2200	51.0000
	Landakot	29	314.5600	314.5600					314.5600	314.5600	50.0000
	Landakot	30	260.9300	260.9300					260.9300	260.9300	
	Landakot	31	213.3200	213.3200					213.3200	213.3200	
	Landakot	32	243.4300	243.4300					243.4300	243.4300	
	Landakot	33	287.4600	287.4600					287.4600	287.4600	
	Landakot	34	261.7500	261.7500					261.7500	261.7500	
	Landakot	35	316.6200	316.6200					316.6200	316.6200	
	Landakot	36	306.7700	306.7700					306.7700	306.7700	
	Landakot	37	547.3400	547.3400					547.3400	547.3400	
	Landakot	38	519.2900	519.2900					519.2900	519.2900	
	Landakot	75	307.9200	307.9200					307.9200	307.9200	
	Landakot	76	271.7500	271.7500					271.7500	271.7500	
	Landakot	77	425.1800	425.1800					425.1800	425.1800	
	Landakot	81	272.4500	272.4500					272.4500	272.4500	
	Landakot	82	275.6200	275.6200					275.6200	275.6200	
	Landakot	83	329.0100	329.0100					329.0100	329.0100	
	Landakot	84	201.2900	201.2900					201.2900	201.2900	
	Landakot	85	217.0800	217.0800					217.0800	217.0800	



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 13.3(B) Area allotted to different Working circle

Sl No	Name of Forest Block	Comp no	Area available for Management	Area allotted to							
				SWC	RWC	Pl. WC	Pro.WC	Bamboo (O) WC	NTPF (O) WC	WL (O) WC	JFM(O) WC
	Landakot	86	311.6100	311.6100					311.6100	311.6100	
	Landakot	87	295.0700	295.0700					295.0700	295.0700	
		Total	13657.9200	13641.8500	0.0000	16.0700	0.0000	0.0000	13657.9200	13657.9200	1120.9000
16	Kholgarh	1	290.0100	268.2100		21.8000			290.0100	290.0100	
	Kholgarh	2	396.5500	396.5500					396.5500	396.5500	50.0000
	Kholgarh	3	654.8200	654.8200					654.8200	654.8200	202.3000
	Kholgarh	4	401.8000	401.8000					401.8000	401.8000	26.3000
	Kholgarh	5	408.3300	405.5800		2.7500			408.3300	408.3300	76.3000
	Kholgarh	6	452.4200	452.4200					452.4200	452.4200	106.0000
	Kholgarh	7	402.8900	402.8900					402.8900	402.8900	
	Kholgarh	8	543.3500	0.0000			543.3500		543.3500	543.3500	
	Kholgarh	9	623.3400	623.3400					623.3400	623.3400	
	Kholgarh	10	616.2200	616.2200					616.2200	616.2200	
	Kholgarh	11	692.3300	692.3300					692.3300	692.3300	
	Kholgarh	12	842.3100	842.3100					842.3100	842.3100	
	Kholgarh	13	787.8600	787.8600					787.8600	787.8600	
	Kholgarh	14	541.4200	541.4200					541.4200	541.4200	
	Kholgarh	15	363.0600	363.0600					363.0600	363.0600	
	Kholgarh	16	399.9500	399.9500					399.9500	399.9500	
	Kholgarh	17	468.7200	468.7200					468.7200	468.7200	
	Kholgarh	18	850.0800	850.0800					850.0800	850.0800	116.0000



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 13.3(B) Area allotted to different Working circle

Sl No	Name of Forest Block	Comp no	Area available for Management	Area allotted to							
				SWC	RWC	Pl. WC	Pro.WC	Bamboo (O) WC	NTPF (O) WC	WL (O) WC	JFM(O) WC
	Kholgarh	19	732.4400	732.4400					732.4400	732.4400	
	Kholgarh	20	445.8700	445.8700					445.8700	445.8700	
		S. Total	10913.7700	10345.8700	0.0000	24.5500	543.3500	0.0000	10913.7700	10913.7700	576.9000
	Range Total		24571.6900	23987.7200	0.0000	40.6200	543.3500	0.0000	24571.6900	24571.6900	1697.8000
	Div Total		88384.4985	76481.1760	3553.0025	244.5400	8105.7800	13210.3540	88384.4985	88384.4985	3605.4000
Proposed Reserved Forest											
A. Redhakhoh Range											
17	Purunapani		962.3900	0.000	950.010	12.380			962.390	962.390	100
	Range Total		962.3900	0.000	950.010	12.380	0.000	0.000	962.390	962.390	100
B. Badbahal Range											
18	Podabalanda		273.9500	273.950					273.950	273.950	100
19	San-Rengali		311.6100	311.110		0.500			311.610	311.610	100
20	Hemantakhoh		214.9200	0.000	214.920				214.920	214.920	
	Range Total		800.4800	585.060	214.920	0.500	0.000	0.000	800.480	800.480	200
C. Charmal Range											
21	Behrampura		777.3800	0.000	777.380				777.380	777.380	50
22	Rasibeda		93.6200	0.000	93.620				93.620	93.620	60.5
23	Siaripani		204.7200	0.000	203.720	1.000			204.720	204.720	158.6
	Range Total		1075.7200	0.000	1074.720	1.000	0.000	0.000	1075.720	1075.720	269.1
D. Badmal Range											



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 13.3(B) Area allotted to different Working circle

Sl No	Name of Forest Block	Comp no	Area available for Management	Area allotted to							
				SWC	RWC	Pl. WC	Pro.WC	Bamboo (O) WC	NTFP (O) WC	WL (O) WC	JFM(O) WC
24	Kalia		318.2600	318.260					318.260	318.260	50
25	Koilipadar		225.3400	0.000	217.540	7.800			225.340	225.340	50
26	Mochibahal		1553.1300	1548.130		5.000			1553.130	1553.130	50
27	Sagjori		610.6600	584.410		26.250		610.660	610.660	610.660	
28	Satsama		474.9500	0.000	464.750	10.200			474.950	474.950	
	Range Total		3182.3400	2450.800	682.290	49.250	0.000	610.660	3182.340	3182.340	150
E. Naktideul Range											
29	Chadchadi		2832.1300	0.000			2832.130		2832.130	2832.130	94
30	Rohinigadia		569.4300	0.000	569.430				569.430	569.430	
	Range Total		3401.5600	0.000	569.430	0.000	2832.130	0.000	3401.560	3401.560	94
F. Girishchandrapur Range											
31	Goudpali		58.2400	0.000	58.240				58.240	58.240	
32	Talab		629.5500	626.700		2.850			629.550	629.550	
	Range Total		687.7900	626.700	58.240	2.850	0.000	0.000	687.790	687.790	0
	Div. Total		10110.2800	3662.560	3549.610	65.980	2832.130	610.660	10110.280	10110.280	813.1
DPF (Demarcated Protected Forest)											
A. Redhakhhol Range											
33	Bada-Hindol		581.3200	0.000	569.320	12.000			581.320	581.320	193
34	Hinterei		111.5500	0.000	106.550	5.000			111.550	111.550	37
35	Terbeda		35.9900	0.000	35.990				35.990	35.990	12
	Range Total		728.8600	0.000	711.860	17.000	0.000	0.000	728.860	728.860	242



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 13.3(B) Area allotted to different Working circle

Sl No	Name of Forest Block	Comp no	Area available for Management	Area allotted to							
				SWC	RWC	Pl. WC	Pro.WC	Bamboo (O) WC	NTFP (O) WC	WL (O) WC	JFM(O) WC
B. Charmal Range											
36	Kusumbahali		326.4900	0.000	301.490	25.000			326.490	326.490	108
	Range Total		326.4900	0.000	301.490	25.000	0.000		326.490	326.490	108
E. Naktideul Range											
37	Abmajhari		189.4100	0.000	189.410				189.410	189.410	63
38	Abmajhari-Dhadrokhohol		596.4200	0.000	596.420				596.420	596.420	199
39	Bahaljharan		128.1400	0.000	127.540	0.600			128.140	128.140	43
40	Dhadrokhohol		326.8400	0.000	326.840				326.840	326.840	109
41	Lampaphuli		426.5800	0.000	426.580				426.580	426.580	142
42	Penthabahal		28.4600	0.000	27.960	0.500			28.460	28.460	9
	Range Total		1695.8500	0.000	1694.750	1.100	0.000	0.000	1695.850	1695.850	565
F. Girishchandrapur Range											
43	Balikiari		37.6000	37.600					37.600	37.600	13
44	Budbuda		102.4200	0.000	102.420				102.420	102.420	34
45	Jarasingha		179.1300	177.130		2.000			179.130	179.130	60
46	Phulkusum		86.0500	0.000	82.840	3.210			86.050	86.050	29
47	Podamal		110.0000	110.000					110.000	110.000	37
	Range Total		515.2000	324.730	185.260	5.210	0.000	0.000	515.200	515.200	173.00
	Div. Total		3266.4000	324.7300	2893.3600	48.3100	0.0000	0.0000	3266.4000	3266.4000	1088.0000
Div. RF, PRF & DPF			101761.1785	80468.4660	9995.9725	358.8300	10937.9100	13821.0140	101761.1785	101761.1785	5506.5000

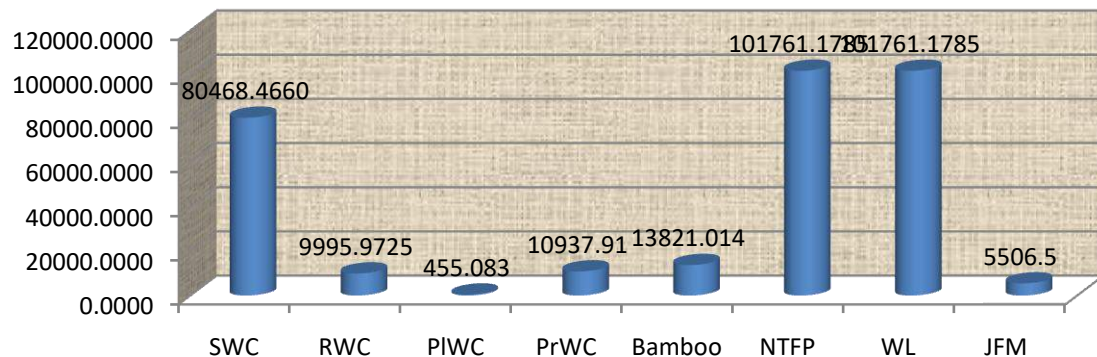


Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 13.3(B) Area allotted to different Working circle

Sl No	Name of Forest Block	Comp no	Area available for Management	Area allotted to							
				SWC	RWC	Pl. WC	Pro.WC	Bamboo (O) WC	NTFP (O) WC	WL (O) WC	JFM(O) WC
Village Forest /PF											
A. Naktideul Range											
48	Bindpur		57.86	0		57.86					
B Redhakhol											
49	Khajurijharan PF		38.393	0		38.393					
	Div VF+PF		96.253	0	0	96.253	0	0	0	0	0
	G.Total		101857.4315	80468.4660	9995.9725	455.0830	10937.910	13821.0140	101761.1785	101761.1785	5506.50
	%		100	79.00	9.81	0.45	10.74	13.57	99.91	99.91	5.41

The divisional area statement & Crop density is at **Annexure -XV**.





13.4: Period of Working Plan and necessity for intermediate revision.

The period of this working Plan is **from 1st April'2021 to 31st March 2031**. The implementation and probable impact of various prescriptions may be reviewed after five years of working, if it is so required





CHAPTER 14

SELECTION WORKING CIRCLE (S.W.C)

14.1 Name of working circle:

The Forest blocks having good crop with crop density above 40% and trees above harvestable diameter / Girth at Breast Height and in approach class are available, it is proposed to harvest silviculturally available trees. Previously these blocks were also managed under Selection Working Circle and are in a good health. There are also areas / patches in the some compartment where congested pole crops are available and diameter growth is hampered due to non availability of adequate space to grow. These pockets coming in the same compartment needs to be thinned to put diameter growth. Other silvicultural operations are also required to retain or improve the stand through silvicultural operations. Hence **“Selection Working Circle”** is constituted for better management. The total Area assigned to this Working Circle is **80468.466 ha**.

14.2 General constitution of working circle:

The forest blocks included in this working circle consists of Moist Sal Forests. Sal is up to 60% and above of the stand. The area assigned to this Working Circle is at **Table No 14.1 below**.



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 14.1 Area assigned to Selection Working Circle (In Ha)

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Area allotted to	
					SWC	JFM(O) WC
Reserved Forests.						
A. Rairakhol Range						
1	Bindhya-basini	1	181.99	181.99	181.99	
	Bindhya-basini	2	264.94	264.54	264.54	
	Bindhya-basini	3	308.98	308.98	308.98	
		Total	755.91	755.51	755.51	
2	Hatidhara	1	482.66	479.66	479.66	
	Hatidhara	2	259.48	256.48	256.48	
	Hatidhara	3	401.72	398.72	398.72	
	Hatidhara	4	524.59	521.59	521.59	50
	Hatidhara	5	636.97	636.97	636.97	
	Hatidhara	6	296.42	293.42	293.42	
	Hatidhara	7	518.75	518.75	518.75	56
	Hatidhara	8	521.2	521.2	521.2	51.70
	Hatidhara	9	543.28	543.06	543.06	
	Hatidhara	10	280.77	280.77	280.77	50
	Hatidhara	11	448.25	448.25	448.25	
	Hatidhara	12	494.47	494.47	494.47	
	Hatidhara	13	551.81	551.81	551.81	
	Hatidhara	14	482.85	482.85	482.85	
	Hatidhara	15	379.62	379.62	379.62	
	Hatidhara	16	243.56	243.56	243.56	
	Hatidhara	17	460.62	460.37	460.37	
		Total	7527.02	7511.550	7511.55	207.70
3	Kholgarh	21	536.14	536.14	536.14	50
	Kholgarh	22	417.45	417.45	417.45	
	Kholgarh	23	463.72	463.72	463.72	
	Kholgarh	24	363.21	363.21	363.21	
	Kholgarh	26	305.29	305.29	305.29	



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 14.1 Area assigned to Selection Working Circle (In Ha)

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Area allotted to	
					SWC	JFM(O) WC
	Kholgarh	25	454.26	454.26	454.26	
	Kholgarh	28	360.68	360.68	360.68	
	Kholgarh	27	202.51	202.51	202.51	
	Kholgarh	29	315.01	315.01	315.01	
	Kholgarh	30	399.87	399.87	399.87	
	Kholgarh	31	363.75	363.75	363.75	
	Kholgarh	32	544.71	544.71	544.71	
	Kholgarh	33	391.27	391.27	391.27	
	Kholgarh	34	862.85	862.85	862.85	
	Kholgarh	35	428.5	428.5	428.5	
	Kholgarh	36	408.35	407.844	407.844	
	Kholgarh	37	455.44	455.44	455.44	
	Kholgarh	38	316.81	316.81	316.81	
	Kholgarh	39	378.62	377.91	377.91	
		S. Total	7968.44	7967.224	7967.224	50.00
	Range Total		16251.370	16234.284	16234.284	257.70
	B. Badbahal Range					
	Rahan	3	548.11	548.11	548.11	150
4	Rahan	4	813.46	813.46	813.46	170
	Rahan	5	534.52	534.52	514.52	
		Total	1896.09	1896.090	1876.09	320
	Range Total		5205.80	5205.500	1876.09	320
	C. Charmal Range					
6	Landakot	39	261.99	261.99	261.99	
	Landakot	40	395.49	395.49	395.49	
	Landakot	41	378.7	378.7	378.7	
	Landakot	42	396.89	396.89	396.89	
	Landakot	43	308.31	308.31	308.31	
	Landakot	44	283.67	283.67	283.67	



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 14.1 Area assigned to Selection Working Circle (In Ha)

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Area allotted to	
					SWC	JFM(O) WC
	Landakot	45	207.84	207.84	207.84	
	Landakot	46	315.52	315.52	315.52	
	Landakot	47	168.21	168.21	168.21	
	Landakot	48	221.43	221.43	221.43	
	Landakot	49	310.96	310.96	310.96	
	Landakot	50	341.54	341.54	341.54	
	Landakot	51	221.47	221.47	221.47	
	Landakot	52	209.35	209.35	209.35	
	Landakot	53	324.27	324.27	324.27	
	Landakot	54	236.81	236.81	236.81	
	Landakot	55	310.42	310.42	310.42	
	Landakot	56	552.55	552.55	552.55	
	Landakot	57	268.13	268.13	268.13	
	Landakot	58	383.41	383.41	383.41	
	Landakot	59	194.81	194.81	194.81	
	Landakot	72	274.52	274.52	274.52	
	Landakot	73	167.14	166.89	166.89	
	Landakot	74	371.85	371.85	371.85	53
	Landakot	78	251.78	251.78	251.78	
	Landakot	79	319.94	319.94	319.94	
	Landakot	80	235.01	235.01	235.01	
		S Total	7912.01	7911.76	7911.760	53.00
7	Suani	1	352.79	352.79	352.79	30.00
		Total	352.79	352.79	352.79	30.00
8	Sagmalia	1	424.5	424.5	424.5	56.30
	Sagmalia	2	440.13	440.13	440.13	
	Sagmalia	3	373.13	373.13	373.13	100.00
	Sagmalia	4	747.13	747.13	747.13	
	Sagmalia	5	459.03	459.03	459.03	



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 14.1 Area assigned to Selection Working Circle (In Ha)

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Area allotted to	
					SWC	JFM(O) WC
	Sagmalia	6	560.95	560.95	560.95	
		Total	3004.87	3004.87	3004.87	156.30
	Range Total		11269.670	11269.420	11269.420	239.30
D. Badmal Range						
9	Landakot	60	274.15	274.15	274.15	
	Landakot	61	307.97	307.97	307.97	
	Landakot	62	149.73	149.73	149.73	
	Landakot	63	293.16	293.16	293.16	
	Landakot	64	316.64	313.49	313.49	
	Landakot	65	269.71	266.695	266.695	
	Landakot	66	164.76	164.76	164.76	
	Landakot	67	178.26	178.26	178.26	
	Landakot	68	181.13	181.13	181.13	
	Landakot	69	244.02	244.02	244.02	50
	Landakot	70	239.93	239.93	239.93	
	Landakot	71	312.06	312.06	312.06	
		S. Total	2931.52	2925.355	2925.355	50.00
	Range Total		2931.520	2925.355	2925.355	50.00
E. Naktideul Range						
12	Rail	1	575.48	574.78	557.16	
	Rail	2	640.38	640.38	640.38	
	Rail	7	512.79	512.79	512.79	
	Rail	9	440.95	440.95	440.95	
	Rail	11	459.7	459.7	459.7	
	Rail	13	552.38	552.38	552.38	
	Rail	14	454.39	454.39	454.39	
	Rail	15	556.1	556.1	556.1	
	Rail	16	771.78	771.78	771.78	
	Rail	17	745.06	745.06	745.06	



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 14.1 Area assigned to Selection Working Circle (In Ha)

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Area allotted to	
					SWC	JFM(O) WC
	Rail	18	540.42	540.42	540.42	
		Total	6249.43	6248.7300	6231.11	
13	Landimal	1	907.52	898.52	898.52	
	Landimal	2	1123.24	1122.657	1062.657	
	Landimal	3	921.8	921.8	921.8	
	Landimal	4	965.49	965.49	965.49	
	Landimal	5	678.87	678.87	678.87	
	Landimal	6	868.65	868.65	868.65	
	Landimal	7	489.16	489.16	489.16	
	Landimal	8	547.39	547.39	547.39	273.20
	Landimal	9	736.2	736.2	736.2	150.00
	Landimal	10	778.29	778.29	778.29	
	Landimal	11	637.27	637.27	637.27	
	Landimal	12	724.51	724.51	724.51	
	Landimal	13	694.86	694.86	694.86	
	Landimal	14	628.23	628.23	628.23	
	Landimal	15	658.3	658.3	658.3	
	Landimal	16	1157.28	1157.28	1157.28	
	Landimal	17	1007.03	1007.03	1007.03	
	Landimal	18	502.69	502.69	502.69	
		Total	14026.78	14017.1970	13957.197	423.20
	Range Total		20276.210	20265.927	20188.307	423.20
F.Girishchandrapur Range						
15	Landakot	1	185.07	183.3	183.3	98
	Landakot	2	418.84	418.84	418.84	98
	Landakot	3	404.36	404.36	404.36	120
	Landakot	4	448.01	445.04	445.04	125
	Landakot	5	247.51	247.51	247.51	125
	Landakot	6	199.56	199.56	193.49	55



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 14.1 Area assigned to Selection Working Circle (In Ha)

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Area allotted to	
					SWC	JFM(O) WC
	Landakot	7	236.44	236.44	236.44	55
	Landakot	8	293.6	293.6	293.6	100
	Landakot	9	336.37	336.37	336.37	
	Landakot	10	337.76	337.76	337.76	
	Landakot	11	276.85	276.85	276.85	
	Landakot	12	214.53	214.53	214.53	
	Landakot	13	238.38	238.38	238.38	
	Landakot	14	231.7	231.7	231.7	51.90
	Landakot	15	336.83	336.83	336.83	
	Landakot	16	400.15	400.15	400.15	
	Landakot	17	266.12	266.12	266.12	
	Landakot	18	220.16	220.16	220.16	
	Landakot	19	214.72	214.72	214.72	
	Landakot	20	252.63	252.63	242.63	25
	Landakot	21	194.63	194.63	194.63	
	Landakot	22	261.65	261.65	261.65	20
	Landakot	23	126.36	126.36	126.36	
	Landakot	24	187.07	187.07	187.07	
	Landakot	25	203.63	203.63	203.63	74
	Landakot	26	186.99	186.99	186.99	73
	Landakot	27	339.07	339.07	339.07	
	Landakot	28	225.22	225.22	225.22	51
	Landakot	29	315.55	314.56	314.56	50
	Landakot	30	260.93	260.93	260.93	
	Landakot	31	213.32	213.32	213.32	
	Landakot	32	243.43	243.43	243.43	
	Landakot	33	287.46	287.46	287.46	
	Landakot	34	261.75	261.75	261.75	
	Landakot	35	316.62	316.62	316.62	



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 14.1 Area assigned to Selection Working Circle (In Ha)

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Area allotted to	
					SWC	JFM(O) WC
	Landakot	36	306.77	306.77	306.77	
	Landakot	37	547.34	547.34	547.34	
	Landakot	38	519.29	519.29	519.29	
	Landakot	75	307.92	307.92	307.92	
	Landakot	76	271.75	271.75	271.75	
	Landakot	77	425.18	425.18	425.18	
	Landakot	81	272.45	272.45	272.45	
	Landakot	82	275.62	275.62	275.62	
	Landakot	83	329.01	329.01	329.01	
	Landakot	84	201.29	201.29	201.29	
	Landakot	85	217.08	217.08	217.08	
	Landakot	86	311.61	311.61	311.61	
	Landakot	87	295.07	295.07	295.07	
		Total	13663.65	13657.920	13641.85	1070.90
16	Kholgarh	1	290.01	290.01	268.21	
	Kholgarh	2	396.55	396.55	396.55	50
	Kholgarh	3	654.82	654.82	654.82	202.30
	Kholgarh	4	401.8	401.8	401.8	26.30
	Kholgarh	5	408.33	408.33	405.58	76.30
	Kholgarh	6	452.42	452.42	452.42	106
	Kholgarh	7	402.89	402.89	402.89	
	Kholgarh	9	623.34	623.34	623.34	
	Kholgarh	10	616.62	616.22	616.22	
	Kholgarh	11	692.33	692.33	692.33	
	Kholgarh	12	842.31	842.31	842.31	
	Kholgarh	13	787.86	787.86	787.86	
	Kholgarh	14	541.42	541.42	541.42	
	Kholgarh	15	363.06	363.06	363.06	
	Kholgarh	16	399.95	399.95	399.95	



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 14.1 Area assigned to Selection Working Circle (In Ha)

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Area allotted to	
					SWC	JFM(O) WC
	Kholgarh	17	468.72	468.72	468.72	
	Kholgarh	18	850.08	850.08	850.08	116
	Kholgarh	19	732.44	732.44	732.44	
	Kholgarh	20	445.87	445.87	445.87	
	S. Total		10370.820	10370.4200	10345.870	570.90
	Range Total		24034.470	24028.340	23987.720	1641.80
	Div Total		79969.04000	79928.82600	76481.17600	2932.00
Proposed Reserved Forest						
B. Badbahal Range						
	Podabalanda		273.95	273.95	273.95	100
	San-Rengali		311.61	311.61	311.11	100
	Range Total		585.56	585.56	585.06	200
D. Badmal Range						
	Kalia		318.26	318.26	318.26	50
	Mochibahal		1553.13	1553.13	1548.13	50
	Sagjori		610.66	610.66	584.41	
	Range Total		2482.05	2482.05	2450.8	100
F. Girishchandrapur Range						
	Talab		629.55	629.55	626.7	
	Range Total		629.55	629.55	626.7	0
	Div. Total		3697.16	3697.16	3662.56	300
DPF (Demarcated Protected Forest)						
F. Girishchandrapur Range						
	Balikiari		37.60	37.6	37.6	13
	Jarasingha		179.13	179.13	177.13	60
	Podamal		110.00	110.0	110.0	37
	Range Total		326.73	326.73	324.73	110
	Div. Total		326.73	326.73	324.730	110
	Div. RF, PRF & DPF		83992.930	83952.716	80468.466	3342



Table No 14.1 (A) Abstract of Area under SWC – Rairakhol Division						
Sl No	Range	Area under SWC				
		RF	PRF	DPF	Total	%
1	Rairakhol	16234.284	0	0	16234.284	20.18
2	Badbahal	1876.09	585.06	0	2461.150	3.06
3	Charmal	11269.42	0	0	11269.420	14.00
4	Badmal	2925.355	2450.8	0	5376.155	6.68
5	Naktideul	20188.307	0	0	20188.307	25.09
6	GCPur	23987.72	626.7	324.73	24939.150	30.99
	Total	76481.176	3662.6	324.73	80468.466	100.00
	%	95.04	4.55	0.40	100.00	



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14.3 General characteristics of vegetation:

The forest included in this working circle bears a good Sal forests and having trees in different Girth Classes well distributed as detailed in the following Table no 14.2

Table No 14.2 Girth Class wise distribution of Trees in Blocks / Compartments assigned to SIWC

Sl No	Block	Comp. No	Girth Class in cm						Remark
			30- 60	60 - 90	90-120	120-150	>150	Total	NRSC code
1	Bindhya-basini	All	105812	58031	31334	11110	3504	209791	B
2	Hatidhara	All	961740	696719	403216	141493	67941	2271109	HD
3	Kholgarh	21-39	1301054	818501	435461	156209	55122	2766347	KG
4	Rahan	3-5	220238	85396	32275	11162	4783	353854	R
5	Landakot	39-59 72-74 &78-80	894630	794211	361377	128482	53490	2232190	LK
6	Suani	All	99045	43556	16424	2710	1743	163478	S
7	Sagmalia	All	412470	285892	124878	45080	17220	885540	SM
8	Landakot	60-71	637850	301818	74346	21403	10107	1045524	LK
9	Rail	2,7,911 ,13,-18	570017	476309	311993	84399	36838	1479556	RL
10	Landimal	1-14	1522610	1036403	623315	193398	77940	3453666	
11	Landakot	1-38,75-77 & 81-87	1801441	1177860	628655	210669	97421	3916046	LK
12	Kholgarh	1-20	1732725	988648	500298	181815	78901	3482387	KG
13	Podabalanda PRF		33095	15029	6565	2254	869	57812	NRSC-47
14	San-Rengali PRF		64882	23573	8056	2804	1210	100525	NRSC-51

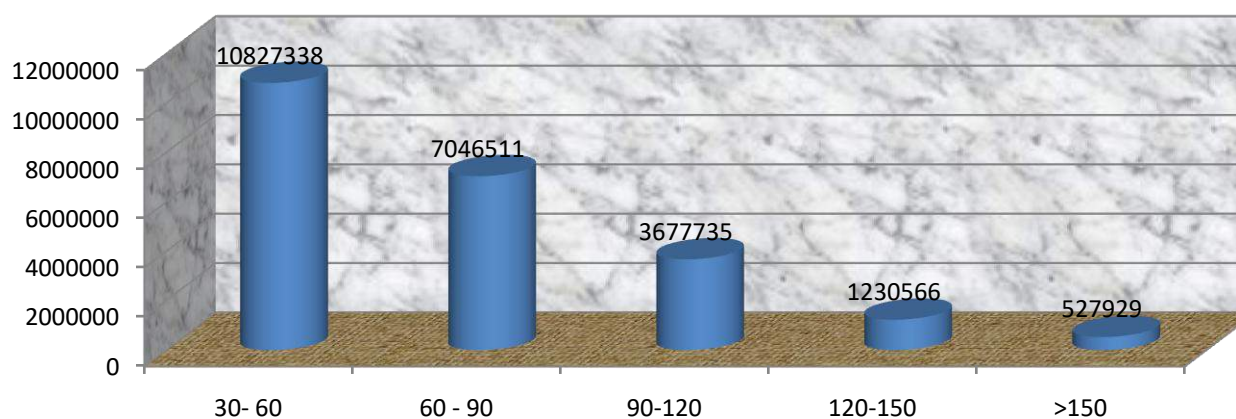


Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 14.2 Girth Class wise distribution of Trees in Blocks / Compartments assigned to SIWC

Sl No	Block	Comp. No	Girth Class in cm						Remark
			30- 60	60 - 90	90-120	120-150	>150	Total	NRSC code
15	Kalia		48956	17491	6260	2383	2369	77459	NRSC-50
16	Mochibahal		225667	107400	44036	14755	5688	397546	NRSC28,30,34
17	Sagjori		60045	37815	20656	5501	5199	129216	NRSC-29
18	Talab		98253	56794	35620	10900	5615	207182	NRSC-7
19	Balikiari		5300	3289	1892	682	311	11474	NRSC-15
20	Jarasingha		17950	13754	6799	1905	974	41382	NRSC-6
21	Podamal		13558	8022	4279	1452	684	27995	NRSC-58
	Total		10827338	7046511	3677735	1230566	527929	23310079	
	Percentage		46.45	30.23	15.78	5.28	2.26	100.00	

No of Trees Estimated





The Stock maps of the representative Blocks assigned to SWC are furnished at Annexure-XVI.

14.4 Felling series, cutting sections and JFM areas:

For administrative convenience and distributed working the forests allotted to this Working Circle are divided to sixteen Felling Series The Range / Forest blocks allotted to different Felling Series is furnished below.

14.4.1 Area allotted to Different Felling Series:

The area assigned to this Working Circle is sub divided in to Sixteen (16) Felling Series. The area allotted to different Felling Series is as follows (**Table No 14.3**)

Table No 14.3 Constitution of Felling Series and area allotted						
Sl No	Name of FS	Range	Name of Block	Comp. No	Area allotted in Ha	FS Total
1	Bidhyabasini	Rairakhol	Bindhya-basini	1	181.99	4382.3
			Bindhya-basini	2	264.54	
			Bindhya-basini	3	308.98	
			Hatidhara	1	479.66	
			Hatidhara	2	256.48	
			Hatidhara	3	398.72	
			Hatidhara	4	521.59	
			Hatidhara	5	636.97	
			Hatidhara	6	293.42	
			Hatidhara	7	518.75	
			Hatidhara	8	521.2	
2	Hatidhara	Rairakhol	Hatidhara	9	543.06	3884.76
			Hatidhara	10	280.77	
			Hatidhara	11	448.25	
			Hatidhara	12	494.47	
			Hatidhara	13	551.81	
			Hatidhara	14	482.85	
			Hatidhara	15	379.62	
			Hatidhara	16	243.56	
			Hatidhara	17	460.37	



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Table No 14.3 Constitution of Felling Series and area allotted

Sl No	Name of FS	Range	Name of Block	Comp. No	Area allotted in Ha	FS Total
3	Kholgarh	Rairakhol	Kholgarh	21	536.14	3818.14
			Kholgarh	22	417.45	
			Kholgarh	23	463.72	
			Kholgarh	24	363.21	
			Kholgarh	25	454.26	
			Kholgarh	26	305.29	
			Kholgarh	27	202.51	
			Kholgarh	28	360.68	
			Kholgarh	29	315.01	
			Kholgarh	30	399.87	
4	Daincha	Rairakhol	Kholgarh	31	363.75	4149.084
			Kholgarh	32	544.71	
			Kholgarh	33	391.27	
			Kholgarh	34	862.85	
			Kholgarh	35	428.5	
			Kholgarh	36	407.844	
			Kholgarh	37	455.44	
			Kholgarh	38	316.81	
			Kholgarh	39	377.91	
5	Rahan	Badbahal	Rahan	3	548.11	2461.15
			Rahan	4	813.46	
			Rahan	5	514.52	
			Podabalanda		273.95	
			San-Rengali		311.11	
6	Charmal	Rairakhol	Landakot	39	261.99	4021.37
			Landakot	40	395.49	
			Landakot	41	378.7	
			Landakot	42	396.89	
			Landakot	43	308.31	



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Table No 14.3 Constitution of Felling Series and area allotted

Sl No	Name of FS	Range	Name of Block	Comp. No	Area allotted in Ha	FS Total
			Landakot	44	283.67	
			Landakot	45	207.84	
			Landakot	46	315.52	
			Landakot	47	168.21	
			Landakot	48	221.43	
			Landakot	49	310.96	
			Landakot	50	341.54	
			Landakot	51	221.47	
			Landakot	52	209.35	
7	Landakot	Rairakhol	Landakot	53	324.27	3890.39
			Landakot	54	236.81	
		Charmal	Landakot	55	310.42	
			Landakot	56	552.55	
			Landakot	57	268.13	
		G C Pur	Landakot	58	383.41	
			Landakot	59	194.81	
		Charmal	Landakot	72	274.52	
			Landakot	73	166.89	
			Landakot	74	371.85	
			Landakot	78	251.78	
			Landakot	79	319.94	
			Landakot	80	235.01	
8	Sagmalia	Charmal	Suani	1	352.79	3357.66
			Sagmalia	1	424.5	
		Badbahal	Sagmalia	2	440.13	
			Sagmalia	3	373.13	
		Charmal	Sagmalia	4	747.13	
		Badmal	Sagmalia	5	459.03	
		Badbahal	Sagmalia	6	560.95	



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Table No 14.3 Constitution of Felling Series and area allotted

Sl No	Name of FS	Range	Name of Block	Comp. No	Area allotted in Ha	FS Total
9	Badmal	Badmal	Landakot	60	274.15	5376.155
			Landakot	61	307.97	
			Landakot	62	149.73	
			Landakot	63	293.16	
			Landakot	64	313.49	
			Landakot	65	266.695	
			Landakot	66	164.76	
			Landakot	67	178.26	
			Landakot	68	181.13	
			Landakot	69	244.02	
			Landakot	70	239.93	
			Landakot	71	312.06	
			Kalia		318.26	
			Mochibahal		1548.13	
			Sagjori		584.41	
10	Rail	Naktideul	Rail	1	557.16	6231.11
			Rail	2	640.38	
			Rail	7	512.79	
			Rail	9	440.95	
			Rail	11	459.7	
			Rail	13	552.38	
			Rail	14	454.39	
			Rail	15	556.1	
			Rail	16	771.78	
			Rail	17	745.06	
			Rail	18	540.42	
11	Naktideul	Naktideul	Landimal	1	898.52	7168.737
			Landimal	2	1062.657	
			Landimal	3	921.8	



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Table No 14.3 Constitution of Felling Series and area allotted

Sl No	Name of FS	Range	Name of Block	Comp. No	Area allotted in Ha	FS Total
			Landimal	4	965.49	
			Landimal	5	678.87	
			Landimal	6	868.65	
			Landimal	7	489.16	
			Landimal	8	547.39	
			Landimal	9	736.2	
12	Landimal	Naktideul	Landimal	10	778.29	6788.46
			Landimal	11	637.27	
			Landimal	12	724.51	
			Landimal	13	694.86	
			Landimal	14	628.23	
			Landimal	15	658.3	
			Landimal	16	1157.28	
			Landimal	17	1007.03	
			Landimal	18	502.69	
13	GCPur	Girishchandrapur	Landakot	1	183.3	6712.12
			Landakot	2	418.84	
			Landakot	3	404.36	
			Landakot	4	445.04	
			Landakot	5	247.51	
			Landakot	6	193.49	
			Landakot	7	236.44	
			Landakot	8	293.6	
			Landakot	9	336.37	
			Landakot	10	337.76	
			Landakot	11	276.85	
			Landakot	12	214.53	
			Landakot	13	238.38	
			Landakot	14	231.7	



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Table No 14.3 Constitution of Felling Series and area allotted

Sl No	Name of FS	Range	Name of Block	Comp. No	Area allotted in Ha	FS Total
			Landakot	15	336.83	
			Landakot	16	400.15	
			Landakot	17	266.12	
			Landakot	18	220.16	
			Landakot	19	214.72	
			Landakot	20	242.63	
			Landakot	21	194.63	
			Landakot	22	261.65	
			Landakot	23	126.36	
			Landakot	24	187.07	
			Landakot	25	203.63	
14	Balikiari	Girishchandrapur	Landakot	26	186.99	6929.73
			Landakot	27	339.07	
			Landakot	28	225.22	
			Landakot	29	314.56	
			Landakot	30	260.93	
			Landakot	31	213.32	
			Landakot	32	243.43	
			Landakot	33	287.46	
			Landakot	34	261.75	
			Landakot	35	316.62	
			Landakot	36	306.77	
			Landakot	37	547.34	
			Landakot	38	519.29	
			Landakot	75	307.92	
			Landakot	76	271.75	
			Landakot	77	425.18	
			Landakot	81	272.45	
			Landakot	82	275.62	



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Table No 14.3 Constitution of Felling Series and area allotted

Sl No	Name of FS	Range	Name of Block	Comp. No	Area allotted in Ha	FS Total
			Landakot	83	329.01	
			Landakot	84	201.29	
			Landakot	85	217.08	
			Landakot	86	311.61	
			Landakot	87	295.07	
15	Luhabir	Girishchandrapur	Kholgarh	1	268.21	5756.47
			Kholgarh	2	396.55	
			Kholgarh	3	654.82	
			Kholgarh	4	401.8	
			Kholgarh	5	405.58	
			Kholgarh	6	452.42	
		Naktideul	Kholgarh	7	402.89	
			Kholgarh	9	623.34	
			Kholgarh	10	616.22	
			Kholgarh	11	692.33	
		Girishchandrapur	Kholgarh	12	842.31	
		16	Jarasingha	Naktideul	Kholgarh	
Girishchandrapur	Kholgarh			14	541.42	
	Kholgarh			15	363.06	
	Kholgarh			16	399.95	
	Kholgarh			17	468.72	
	Kholgarh			18	850.08	
Rairakhol	Kholgarh			19	732.44	
	Kholgarh			20	445.87	
Girishchandrapur	Talab PRF				626.7	
	Balikiari DPF				37.6	
	Jarasingha DPF				177.13	
	Podamal DPF				110	
	Total 16 FS					



Table No 14.3A Abstract of SWC Felling Series – Rairakhol division

Sl No	Name of Felling Series	Area assigned in ha	Name of range	Area Total Range Wise
1	Bidhyabasini	4382.300	Rairakhol	16234.284
2	Hatidhara	3884.760		
3	Kholgarh	3818.140		
4	Daincha	4149.084		
5	Rahan	2461.150	Badbahal	2461.150
6	Charmal	4021.37	Charmal	11269.42
7	Landakot	3890.390		
8	Sagmalia	3357.660		
9	Badmal	5376.155	Badmal	5376.155
10	Rail	6231.110	Naktideul	20188.307
11	Naktideul	7168.737		
12	Landimal	6788.460		
13	GCPur	6712.120	GCPur	24939.150
14	Balikiari	6929.730		
15	Luhabir	5756.47		
16	Jarasingha	5540.830		
	Total	80468.466		80468.466

14.4.2 Cutting Series (Annual Coupe area)

Each Felling Series is divided in to 10 Annual coupes for ease working and ensure flow of Forest Produce in a sustainable manner. The annual Coupe area in (Felling Series wise is furnished at Table No 14.4(I), 14.4(II), 14.4 (III), 14.4(IV) and 14.4(V) etc .



14.4.2.1 Bidhyabasini Felling Series

Table No 14.4(I) Sections of Bidhyabasini Felling Series (BBFS)						
Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
Bidhyabasini Felling Series (BBFS)	2021-22	BBFS-I	Hatidhara	8	521.2	521.20
	2022-23	BBFS-II	Hatidhara	1	479.66	479.66
	2023-24	BBFS-III	Hatidhara	2	256.48	256.48
	2024-25	BBFS-IV	Hatidhara	3	398.72	398.72
	2025-26	BBFS-V	Hatidhara	4	521.59	521.59
	2026-27	BBFS-VI	Hatidhara	5	636.97	636.97
	2027-28	BBFS-VII	Hatidhara	6	293.42	293.42
	2028-29	BBFS-VIII	Hatidhara	7	518.75	518.75
	2029-30	BBFS-IX	Bindhya-basini	1	181.99	446.530
			Bindhya-basini	2	264.54	
	2030-31	BBFS-X	Bindhya-basini	3	308.98	308.98
	Total FS				4382.300	4382.300

14.4.2.2 Hatidhara Felling Series (HFS)

Table No 14.4(II) Hatidhara Felling Series (HFS)						
Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
Hatidhara Felling Series (HFS))	2021-22	HFS-I	Hatidhara	9	543.06	543.06
	2022-23	HFS-II	Hatidhara	10	280.77	280.77
	2023-24	HFS-III	Hatidhara	11	448.25	448.25
	2024-25	HFS-IV	Hatidhara	12	494.47	494.47
	2025-26	HFS-V	Hatidhara	13	551.81	551.81
	2026-27	HFS-VI	Hatidhara	14	482.85	482.85
	2027-28	HFS-VII	Hatidhara	15	379.62	379.62
	2028-29	HFS-VIII	Hatidhara	16	243.56	243.56
	2029-30	HFS-IX	Hatidhara	17 (Part)	230.00	230.00
	2030-31	HFS-X	Hatidhara	17 (Bal)	230.37	230.37
	Total FS				3884.760	3884.760



14.4.2.3 Kholgarh Felling Series (KHFS)

Table No 14.4(III) Kholgarh Felling Series (KHFS)						
Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
Kholgarh Felling Series (KHFS)	2021-22	KHFS-I	Kholgarh	27	202.51	202.51
	2022-23	KHFS-II	Kholgarh	29	315.01	315.01
	2023-24	KHFS-III	Kholgarh	30	399.87	399.87
	2024-25	KHFS-IV	Kholgarh	21	536.14	536.14
	2025-26	KHFS-V	Kholgarh	22	417.45	417.45
	2026-27	KHFS-VI	Kholgarh	23	463.72	463.72
	2027-28	KHFS-VII	Kholgarh	24	363.21	363.21
	2028-29	KHFS-VIII	Kholgarh	26	305.29	305.29
	2029-30	KHFS-IX	Kholgarh	25	454.26	454.26
	2030-31	KHFS-X	Kholgarh	28	360.68	360.68
	Total FS				3818.140	3818.140

14.4.2.4 Daincha Felling Series: (DFS)

Table No 14.4(IV) Daincha Felling Series: (DFS)						
Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
Daincha Felling Series: (DFS)	2021-22	DFS-I	Kholgarh	31	363.75	363.75
	2022-23	DFS-II	Kholgarh	32	544.71	544.71
	2023-24	DFS-III	Kholgarh	33	391.27	391.27
	2024-25	DFS-IV	Kholgarh	34 (P)	430.0	430.0
	2025-26	DFS-V	Kholgarh	34 (B)	432.85	432.85
	2026-27	DFS-VI	Kholgarh	35	428.5	428.5
	2027-28	DFS-VII	Kholgarh	36	407.844	407.844
	2028-29	DFS-VIII	Kholgarh	37	455.44	455.44
	2029-30	DFS-IX	Kholgarh	38	316.81	316.81
	2030-31	DFS-X	Kholgarh	39	377.91	377.91
	Total FS				4149.084	4149.084



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14.4.2.5 Rahan Felling Series:

Table No 14.4(V) Rahan Felling Series (RFS)						
Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
Rahan Felling Series (RFS)	2021-22	RFS-I	Podabalanda		273.95	273.95
	2022-23	RFS-II	San-Rengali		311.11	311.11
	2023-24	RFS-III	Rahan	3 (P)	275.00	275.00
	2024-25	RFS-IV	Rahan	3 (B)	273.11	273.11
	2025-26	RFSV	Rahan	4	200.00	200.00
	2026-27	RFS-VI	Rahan	4	200.00	200.00
	2027-28	RFS-VII	Rahan	4	200.00	200.00
	2028-29	RFS-VIII	Rahan	4	213.46	213.46
	2029-30	RFS-IX	Rahan	5	260.00	260.00
	2030-31	RFS-X	Rahan	5	254.52	254.52
	Total FS				2461.150	2461.150

14.4.2.6 Charmal Felling Series:

Table No 14.4(VI) Charmal Felling Series (CFS)						
Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
Charmal Felling Series (CFS)	2021-22	CFS-I	Landakot	42	396.89	396.89
	2022-23	CFS-II	Landakot	43	308.31	308.31
	2023-24	CFS-III	Landakot	44	283.67	491.51
			Landakot	45	207.84	
	2024-25	CFS-IV	Landakot	46	315.52	315.52
	2025-26	CFS-V	Landakot	47	168.21	389.640
			Landakot	48	221.43	
	2026-27	CFS-VI	Landakot	49	310.96	310.96
	2027-28	CFS-VII	Landakot	50	341.54	341.54
	2028-29	CFS-VIII	Landakot	51	221.47	430.820
			Landakot	52	209.35	
	2029-30	CFS-IX	Landakot	40	395.49	395.49
	2030-31	CFS-X	Landakot	39	261.99	640.690
			Landakot	41	378.7	
	Total FS				4021.37	4021.37



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14.4.2.7 Landakot Felling Series:

Table No 14.4(VII) Landakot Felling Series (LFS)						
Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
Landakot Felling Series (RFS)	2021-22	LFS-I	Landakot	53	324.27	324.27
	2022-23	LFS-II	Landakot	54	236.81	236.81
	2023-24	LFS-III	Landakot	55	310.42	310.42
	2024-25	LFS-IV	Landakot	56	552.55	552.55
	2025-26	LFS-V	Landakot	57	268.13	651.540
			Landakot	58	383.41	
	2026-27	LFS-VI	Landakot	59	194.81	469.33
			Landakot	72	274.52	
	2027-28	LFS-VII	Landakot	73	166.89	166.89
	2028-29	LFS-VIII	Landakot	74	371.85	371.85
	2029-30	LFS-IX	Landakot	78	251.78	486.790
			Landakot	80	235.01	
	2030-31	LFS-X	Landakot	79	319.94	319.94
	Total FS				3890.390	3890.390

14.4.2.8 Sagmalia Felling Series

Table No 14.4(VIII) Sagmalia Felling Series (SFS)						
Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
Sagmalia Felling Series (SFS)	2021-22	SFS-I	Suani	1	352.79	352.79
	2022-23	SFS-II	Sagmalia	1	424.5	424.5
	2023-24	SFS-III	Sagmalia	2	440.13	440.13
	2024-25	SFS-IV	Sagmalia	3	373.13	373.13
	2025-26	SFS-V	Sagmalia	4 (1 st P)	250.0	250.0
	2026-27	SFS-VI	Sagmalia	4(2 nd P)	250.0	250.0
	2027-28	SFS-VII	Sagmalia	4(Bal)	247.13	247.13
	2028-29	SFS-VIII	Sagmalia	5	459.03	459.03
	2029-30	SFS-IX	Sagmalia	6 (P)	280.00	280.00
	2030-31	SFS-X	Sagmalia	6 (B)	280.95	280.95
	Total FS				3357.660	3357.660



14.4.2.9 Badmal Felling Series

Table No 14.4(IX) Badmal Felling Series (BFS)						
Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
Badmal Felling Series (BFS)	2021-22	BFS-I	Mochibahal	(2 nd P)	515.00	515.00
	2022-23	BFS-II	Mochibahal	(Bal)	515.00	515.00
	2023-24	BFS-III	Landakot	69	244.02	483.950
			Landakot	70	239.93	
	2024-25	BFS-IV	Landakot	68	181.13	493.19
			Landakot	71	312.06	
	2025-26	BFS- V	Sagjori		584.41	584.41
	2026-27	BFS-VI	Kalia		318.26	592.41
			Landakot	60	274.15	
	2027-28	BFS-VII	Landakot	61	307.97	457.70
			Landakot	62	149.73	
	2028-29	BFS-VIII	Landakot	63	293.16	606.65
			Landakot	64	313.49	
	2029-30	BFS-IX	Landakot	65	266.695	609.715
			Landakot	66	164.76	
			Landakot	67	178.26	
	2030-31	BFS-X	Mochibahal	(1 st P)	518.13	518.13
	Total FS				5376.155	5376.155



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14.4.2.10 Rail Felling Series:

Table No 14.4(X) Rail Felling Series (RLFS)						
Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
Rail Felling Series (RLFS)	2021-22	RLFS-I	Rail	17	745.06	745.06
	2022-23	RLFS-II	Rail	11	459.7	679.700
			Rail	9 (P)	220.00	
	2023-24	RLFS-III	Rail	9	220.95	773.33
			Rail	13	552.38	
	2024-25	RLFS-IV	Rail	16	771.78	771.78
	2025-26	RLFS- V	Rail	18	540.42	540.42
	2026-27	RLFS-VI	Rail	1	557.16	557.16
	2027-28	RLFS-VII	Rail	2	640.38	640.38
	2028-29	RLFS-VIII	Rail	7	512.79	512.79
	2029-30	RLFS-IX	Rail	14	454.39	454.39
	2030-31	RLFS-X	Rail	15	556.1	556.1
Total FS					6231.110	6231.110

14.4.2.11 Naktideul Felling Series:

Table No 14.4(XI) Naktideul Felling Series (NFS)						
Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
Naktideul Felling Series (NFS)	2021-22	NFS-I	Landimal	5	678.87	678.87
	2022-23	NFS-II	Landimal	6	868.65	868.65
	2023-24	NFS-III	Landimal	7	489.16	489.16
	2024-25	NFS-IV	Landimal	8	547.39	547.39
	2025-26	NFS- V	Landimal	9	736.2	736.2
	2026-27	NFS-VI	Landimal	1	898.52	898.52
	2027-28	NFS-VII	Landimal	2 (P)	530.00	530.00
	2028-29	NFS-VIII	Landimal	2 (B)	532.657	532.657
	2029-30	NFS-IX	Landimal	3	921.8	921.8
	2030-31	NFS-X	Landimal	4	965.49	965.49
Total FS					7168.737	7168.737



14.4.2.12 Landimal Felling Series

Table No 14.4(XII) Landimal Felling Series (LMFS)						
Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
Landimal Felling Series (LMFS)	2021-22	LMFS-I	Landimal	10	778.29	778.29
	2022-23	LMFS-II	Landimal	11	637.27	637.27
	2023-24	LMFS-III	Landimal	12	724.51	724.51
	2024-25	LMFS-IV	Landimal	13	694.86	694.86
	2025-26	LMFS- V	Landimal	14	628.23	628.23
	2026-27	LMFS-VI	Landimal	15	658.3	658.3
	2027-28	LMFS-VII	Landimal	16 (P)	580.0	580.0
	2028-29	LMFS-VIII	Landimal	16 (B)	577.28	577.28
	2029-30	LMFS-IX	Landimal	17	1007.03	1007.03
	2030-31	LMFS-X	Landimal	18	502.69	502.69
	Total FS				6788.460	6788.460



14.4.2.13 GCPur Felling Series

Table No 14.4(XIII) GC Pur Felling Series (GCFS)						
Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
GCPur Felling Series (GCFS)	2021-22	GCFS-I	Landakot	23	126.36	517.06
			Landakot	24	187.07	
			Landakot	25	203.63	
	2022-23	GCFS-II	Landakot	19	214.72	651.98
			Landakot	20	242.63	
			Landakot	21	194.63	
	2023-24	GCFS-III	Landakot	22	261.65	680.49
			Landakot	2	418.84	
	2024-25	GCFS-IV	Landakot	3	404.36	849.40
			Landakot	4	445.04	
	2025-26	GCFS- V	Landakot	5	247.51	677.44
			Landakot	6	193.49	
			Landakot	7	236.44	
	2026-27	GCFS-VI	Landakot	8	293.6	629.97
			Landakot	9	336.37	
	2027-28	GCFS-VII	Landakot	10	337.76	614.61
			Landakot	11	276.85	
	2028-29	GCFS-VIII	Landakot	12	214.53	684.61
			Landakot	13	238.38	
			Landakot	14	231.7	
	2029-30	GCFS-IX	Landakot	15	336.83	736.98
			Landakot	16	400.15	
	2030-31	GCFS-X	Landakot	17	266.12	669.58
			Landakot	18	220.16	
			Landakot	1	183.3	
	Total FS					6712.120



14.4.2.14 Balikiari Felling Series:

Table No 14.4(XIV) Balikiari Felling Series (BKFS)						
Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
Balikiari Felling Series (BKFS)	2021-22	BKFS-I	Landakot	82	275.62	805.92
			Landakot	83	329.01	
			Landakot	84	201.29	
	2022-23	BKFS-II	Landakot	75	307.92	766.66
			Landakot	76	271.75	
			Landakot	26	186.99	
	2023-24	BKFS-III	Landakot	77	425.18	764.25
			Landakot	27	339.07	
	2024-25	BKFS-IV	Landakot	28	225.22	800.71
			Landakot	29	314.56	
			Landakot	30	260.93	
	2025-26	BKFS- V	Landakot	31	213.32	744.21
			Landakot	32	243.43	
			Landakot	33	287.46	
	2026-27	BKFS-VI	Landakot	34	261.75	885.14
			Landakot	35	316.62	
			Landakot	36	306.77	
	2027-28	BKFS-VII	Landakot	37	547.34	547.34
	2028-29	BKFS-VIII	Landakot	38	519.29	519.29
	2029-30	BKFS-IX	Landakot	85	217.08	528.69
			Landakot	86	311.61	
	2030-31	BKFS-X	Landakot	87	295.07	567.52
			Landakot	81	272.45	
	Total FS				6929.730	6929.730



14.4.2.15 Luhabir Felling Series:(LUFS)

Table No 14.4(XV) Luhabir Felling Series (LUFS)						
Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
Luhabir Felling Series (LUFS)	2021-22	LUFS-I	Kholgarh	10	616.22	616.22
	2022-23	LUFS-II	Kholgarh	11	692.33	692.33
	2023-24	LUFS-III	Kholgarh	12	842.31	842.31
	2024-25	LUFS-IV	Kholgarh	1	268.21	664.76
			Kholgarh	2	396.55	
	2025-26	LUFS- V	Kholgarh	3	654.82	654.82
	2026-27	LUFS-VI	Kholgarh	4	401.8	401.8
	2027-28	LUFS-VII	Kholgarh	5	405.58	405.58
	2028-29	LUFS-VIII	Kholgarh	6	452.42	452.42
	2029-30	LUFS-IX	Kholgarh	7	402.89	402.89
	2030-31	LUFS-X	Kholgarh	9	623.34	623.34
	Total FS				5756.47	5756.47

14.4.2. 16 Jarasingha Felling Series

Table No 14.4(XVI) Jarasingha Felling Series (JFS)						
Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
Jarasingha Felling Series (JFS)	2021-22	JFS-I	Kholgarh	13	787.86	787.86
	2022-23	JFS-II	Talab PRF		626.7	626.7
	2023-24	JFS-III	Kholgarh	14	541.42	541.42
	2024-25	JFS-IV	Kholgarh	15	363.06	400.66
			Balikiari DPF		37.6	
	2025-26	JFS- V	Kholgarh	16	399.95	509.95
			Podamal DPF		110.0	
	2026-27	JFS-VI	Kholgarh	17	468.72	645.85
			Jarasingha DPF		177.13	
	2027-28	JFS-VII	Kholgarh	18 (P)	425.00	425.00
	2028-29	JFS-VIII	Kholgarh	18 (B)	425.08	425.08
	2029-30	JFS-IX	Kholgarh	19	732.44	732.44
	2030-31	JFS-X	Kholgarh	20	445.87	445.87
	Total FS				5540.830	5540.830



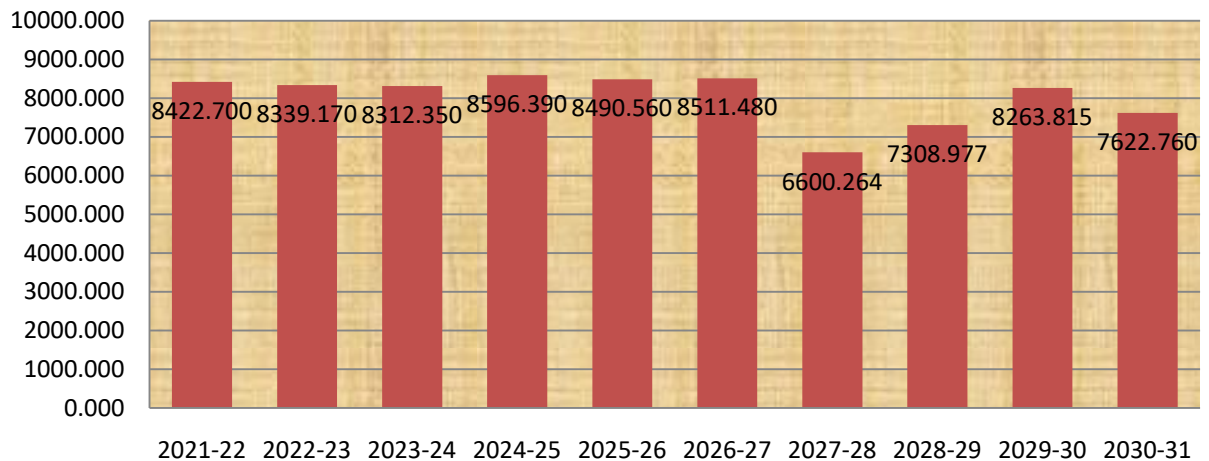
Revised working plan of Rairakhol Division (2021-22 to 2030-31)

14.4.3 Cutting Series Abstract

Felling Series	Table No 14.5 Year of Working										
	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	Total
Bidhyabasini	521.200	479.660	256.480	398.720	521.590	636.970	293.420	518.750	446.530	308.980	4382.300
Hatidhara	543.060	280.770	448.250	494.470	551.810	482.850	379.620	243.560	230.000	230.370	3884.760
Kholgarh	202.510	315.010	399.870	536.140	417.450	463.720	363.210	305.290	454.260	360.680	3818.140
Daincha	363.750	544.710	391.270	430.000	432.850	428.500	407.844	455.440	316.810	377.910	4149.084
Rahan	273.950	311.110	275.000	273.110	200.000	200.000	200.000	213.460	260.000	254.520	2461.150
Charmal	396.890	308.310	491.510	315.520	389.640	310.960	341.540	430.820	395.490	640.690	4021.370
Landakot	324.270	236.810	310.420	552.550	651.540	469.330	166.890	371.850	486.790	319.940	3890.390
Sagmalia	352.790	424.500	440.130	373.130	250.000	250.000	247.130	459.030	280.000	280.950	3357.660
Badmal	515.000	515.000	483.950	493.190	584.410	592.410	457.700	606.650	609.715	518.130	5376.155
Rail	745.060	679.700	773.330	771.780	540.420	557.160	640.380	512.790	454.390	556.100	6231.110
Naktideul	678.870	868.650	489.160	547.390	736.200	898.520	530.000	532.657	921.800	965.490	7168.737
Landimal	778.290	637.270	724.510	694.860	628.230	658.300	580.000	577.280	1007.030	502.690	6788.460
GCPur	517.060	651.980	680.490	849.400	677.440	629.970	614.610	684.610	736.980	669.580	6712.120
Balikiari	805.920	766.660	764.250	800.710	744.210	885.140	547.340	519.290	528.690	567.520	6929.730
Luhabir	616.220	692.330	842.310	664.760	654.820	401.800	405.580	452.420	402.890	623.340	5756.470
Jarasingha	787.860	626.700	541.420	400.660	509.950	645.850	425.000	425.080	732.440	445.870	5540.830
Total	8422.700	8339.170	8312.350	8596.390	8490.560	8511.480	6600.264	7308.977	8263.815	7622.760	80468.466



Revised working plan of Rairakhol Division (2021-22 to 2030-31)



14.5 Blocks, compartments and JFM area:

The Blocks and Compartment assigned to VSS (JFM) has been indicated in Chapter 13 (**Table No 13.3**). It is reproduced here for ready reference(**Table No 14.6**).

Table No: 14.6 Area assigned to Selection Working Circle and assigned to VSS for Protection & Management. (In Ha)

SI No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Area allotted to	
					SWC	JFM(O) WC
Reserved Forests.						
A. Rairakhol Range						
1	Bindhya-basini	1	181.99	181.99	181.99	
	Bindhya-basini	2	264.94	264.54	264.54	
	Bindhya-basini	3	308.98	308.98	308.98	
		Total	755.91	755.51	755.51	
2	Hatidhara	1	482.66	479.66	479.66	
	Hatidhara	2	259.48	256.48	256.48	
	Hatidhara	3	401.72	398.72	398.72	
	Hatidhara	4	524.59	521.59	521.59	50
	Hatidhara	5	636.97	636.97	636.97	
	Hatidhara	6	296.42	293.42	293.42	
	Hatidhara	7	518.75	518.75	518.75	56
	Hatidhara	8	521.2	521.2	521.2	51.70
	Hatidhara	9	543.28	543.06	543.06	



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 14.6 Area assigned to Selection Working Circle and assigned to VSS for Protection & Management. (In Ha)

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Area allotted to	
					SWC	JFM(O) WC
	Hatidhara	10	280.77	280.77	280.77	50
	Hatidhara	11	448.25	448.25	448.25	
	Hatidhara	12	494.47	494.47	494.47	
	Hatidhara	13	551.81	551.81	551.81	
	Hatidhara	14	482.85	482.85	482.85	
	Hatidhara	15	379.62	379.62	379.62	
	Hatidhara	16	243.56	243.56	243.56	
	Hatidhara	17	460.62	460.37	460.37	
		Total	7527.02	7511.550	7511.55	207.70
3	Kholgarh	21	536.14	536.14	536.14	50
	Kholgarh	22	417.45	417.45	417.45	
	Kholgarh	23	463.72	463.72	463.72	
	Kholgarh	24	363.21	363.21	363.21	
	Kholgarh	26	305.29	305.29	305.29	
	Kholgarh	25	454.26	454.26	454.26	
	Kholgarh	28	360.68	360.68	360.68	
	Kholgarh	27	202.51	202.51	202.51	
	Kholgarh	29	315.01	315.01	315.01	
	Kholgarh	30	399.87	399.87	399.87	
	Kholgarh	31	363.75	363.75	363.75	
	Kholgarh	32	544.71	544.71	544.71	
	Kholgarh	33	391.27	391.27	391.27	
	Kholgarh	34	862.85	862.85	862.85	
	Kholgarh	35	428.5	428.5	428.5	
	Kholgarh	36	408.35	407.844	407.844	
	Kholgarh	37	455.44	455.44	455.44	
	Kholgarh	38	316.81	316.81	316.81	
	Kholgarh	39	378.62	377.91	377.91	
		S. Total	7968.44	7967.224	7967.224	50.00
	Range Total		16251.370	16234.284	16234.284	257.70



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 14.6 Area assigned to Selection Working Circle and assigned to VSS for Protection & Management. (In Ha)

SI No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Area allotted to	
					SWC	JFM(O) WC
B. Badbahal Range						
	Rahan	3	548.11	548.11	548.11	150
4	Rahan	4	813.46	813.46	813.46	170
	Rahan	5	534.52	534.52	514.52	
		Total	1896.09	1896.090	1876.09	320
	Range Total		5205.80	5205.500	1876.09	320
C. Charmal Range						
6	Landakot	39	261.99	261.99	261.99	
	Landakot	40	395.49	395.49	395.49	
	Landakot	41	378.7	378.7	378.7	
	Landakot	42	396.89	396.89	396.89	
	Landakot	43	308.31	308.31	308.31	
	Landakot	44	283.67	283.67	283.67	
	Landakot	45	207.84	207.84	207.84	
	Landakot	46	315.52	315.52	315.52	
	Landakot	47	168.21	168.21	168.21	
	Landakot	48	221.43	221.43	221.43	
	Landakot	49	310.96	310.96	310.96	
	Landakot	50	341.54	341.54	341.54	
	Landakot	51	221.47	221.47	221.47	
	Landakot	52	209.35	209.35	209.35	
	Landakot	53	324.27	324.27	324.27	
	Landakot	54	236.81	236.81	236.81	
	Landakot	55	310.42	310.42	310.42	
	Landakot	56	552.55	552.55	552.55	
	Landakot	57	268.13	268.13	268.13	
	Landakot	58	383.41	383.41	383.41	
	Landakot	59	194.81	194.81	194.81	
	Landakot	72	274.52	274.52	274.52	



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 14.6 Area assigned to Selection Working Circle and assigned to VSS for Protection & Management. (In Ha)

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Area allotted to	
					SWC	JFM(O) WC
	Landakot	73	167.14	166.89	166.89	
	Landakot	74	371.85	371.85	371.85	53
	Landakot	78	251.78	251.78	251.78	
	Landakot	79	319.94	319.94	319.94	
	Landakot	80	235.01	235.01	235.01	
		S Total	7912.01	7911.76	7911.760	53.00
7	Suani	1	352.79	352.79	352.79	30.00
		Total	352.79	352.79	352.79	30.00
8	Sagmalia	1	424.5	424.5	424.5	56.30
	Sagmalia	2	440.13	440.13	440.13	
	Sagmalia	3	373.13	373.13	373.13	100.00
	Sagmalia	4	747.13	747.13	747.13	
	Sagmalia	5	459.03	459.03	459.03	
	Sagmalia	6	560.95	560.95	560.95	
		Total	3004.87	3004.87	3004.87	156.30
	Range Total		11269.670	11269.420	11269.420	239.30
D. Badmal Range						
9	Landakot	60	274.15	274.15	274.15	
	Landakot	61	307.97	307.97	307.97	
	Landakot	62	149.73	149.73	149.73	
	Landakot	63	293.16	293.16	293.16	
	Landakot	64	316.64	313.49	313.49	
	Landakot	65	269.71	266.695	266.695	
	Landakot	66	164.76	164.76	164.76	
	Landakot	67	178.26	178.26	178.26	
	Landakot	68	181.13	181.13	181.13	
	Landakot	69	244.02	244.02	244.02	50
	Landakot	70	239.93	239.93	239.93	
	Landakot	71	312.06	312.06	312.06	



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 14.6 Area assigned to Selection Working Circle and assigned to VSS for Protection & Management. (In Ha)

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Area allotted to	
					SWC	JFM(O) WC
		S. Total	2931.52	2925.355	2925.355	50.00
	Range Total		2931.520	2925.355	2925.355	50.00
E. Naktideul Range						
12	Rail	1	575.48	574.78	557.16	
	Rail	2	640.38	640.38	640.38	
	Rail	7	512.79	512.79	512.79	
	Rail	9	440.95	440.95	440.95	
	Rail	11	459.7	459.7	459.7	
	Rail	13	552.38	552.38	552.38	
	Rail	14	454.39	454.39	454.39	
	Rail	15	556.1	556.1	556.1	
	Rail	16	771.78	771.78	771.78	
	Rail	17	745.06	745.06	745.06	
	Rail	18	540.42	540.42	540.42	
		Total	6249.43	6248.7300	6231.11	
13	Landimal	1	907.52	898.52	898.52	
	Landimal	2	1123.24	1122.657	1062.657	
	Landimal	3	921.8	921.8	921.8	
	Landimal	4	965.49	965.49	965.49	
	Landimal	5	678.87	678.87	678.87	
	Landimal	6	868.65	868.65	868.65	
	Landimal	7	489.16	489.16	489.16	
	Landimal	8	547.39	547.39	547.39	273.20
	Landimal	9	736.2	736.2	736.2	150.00
	Landimal	10	778.29	778.29	778.29	
	Landimal	11	637.27	637.27	637.27	
	Landimal	12	724.51	724.51	724.51	
	Landimal	13	694.86	694.86	694.86	
	Landimal	14	628.23	628.23	628.23	



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 14.6 Area assigned to Selection Working Circle and assigned to VSS for Protection & Management. (In Ha)

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Area allotted to	
					SWC	JFM(O) WC
	Landimal	15	658.3	658.3	658.3	
	Landimal	16	1157.28	1157.28	1157.28	
	Landimal	17	1007.03	1007.03	1007.03	
	Landimal	18	502.69	502.69	502.69	
		Total	14026.78	14017.1970	13957.197	423.20
	Range Total		20276.210	20265.927	20188.307	423.20
F.Girishchandrapur Range						
15	Landakot	1	185.07	183.3	183.3	98
	Landakot	2	418.84	418.84	418.84	98
	Landakot	3	404.36	404.36	404.36	120
	Landakot	4	448.01	445.04	445.04	125
	Landakot	5	247.51	247.51	247.51	125
	Landakot	6	199.56	199.56	193.49	55
	Landakot	7	236.44	236.44	236.44	55
	Landakot	8	293.6	293.6	293.6	100
	Landakot	9	336.37	336.37	336.37	
	Landakot	10	337.76	337.76	337.76	
	Landakot	11	276.85	276.85	276.85	
	Landakot	12	214.53	214.53	214.53	
	Landakot	13	238.38	238.38	238.38	
	Landakot	14	231.7	231.7	231.7	51.90
	Landakot	15	336.83	336.83	336.83	
	Landakot	16	400.15	400.15	400.15	
	Landakot	17	266.12	266.12	266.12	
	Landakot	18	220.16	220.16	220.16	
	Landakot	19	214.72	214.72	214.72	
	Landakot	20	252.63	252.63	242.63	25
	Landakot	21	194.63	194.63	194.63	
	Landakot	22	261.65	261.65	261.65	20



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 14.6 Area assigned to Selection Working Circle and assigned to VSS for Protection & Management. (In Ha)

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Area allotted to	
					SWC	JFM(O) WC
	Landakot	23	126.36	126.36	126.36	
	Landakot	24	187.07	187.07	187.07	
	Landakot	25	203.63	203.63	203.63	74
	Landakot	26	186.99	186.99	186.99	73
	Landakot	27	339.07	339.07	339.07	
	Landakot	28	225.22	225.22	225.22	51
	Landakot	29	315.55	314.56	314.56	50
	Landakot	30	260.93	260.93	260.93	
	Landakot	31	213.32	213.32	213.32	
	Landakot	32	243.43	243.43	243.43	
	Landakot	33	287.46	287.46	287.46	
	Landakot	34	261.75	261.75	261.75	
	Landakot	35	316.62	316.62	316.62	
	Landakot	36	306.77	306.77	306.77	
	Landakot	37	547.34	547.34	547.34	
	Landakot	38	519.29	519.29	519.29	
	Landakot	75	307.92	307.92	307.92	
	Landakot	76	271.75	271.75	271.75	
	Landakot	77	425.18	425.18	425.18	
	Landakot	81	272.45	272.45	272.45	
	Landakot	82	275.62	275.62	275.62	
	Landakot	83	329.01	329.01	329.01	
	Landakot	84	201.29	201.29	201.29	
	Landakot	85	217.08	217.08	217.08	
	Landakot	86	311.61	311.61	311.61	
	Landakot	87	295.07	295.07	295.07	
		Total	13663.65	13657.920	13641.85	1070.90
16	Kholgarh	1	290.01	290.01	268.21	
	Kholgarh	2	396.55	396.55	396.55	50



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 14.6 Area assigned to Selection Working Circle and assigned to VSS for Protection & Management. (In Ha)

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Area allotted to	
					SWC	JFM(O) WC
	Kholgarh	3	654.82	654.82	654.82	202.30
	Kholgarh	4	401.8	401.8	401.8	26.30
	Kholgarh	5	408.33	408.33	405.58	76.30
	Kholgarh	6	452.42	452.42	452.42	106
	Kholgarh	7	402.89	402.89	402.89	
	Kholgarh	9	623.34	623.34	623.34	
	Kholgarh	10	616.62	616.22	616.22	
	Kholgarh	11	692.33	692.33	692.33	
	Kholgarh	12	842.31	842.31	842.31	
	Kholgarh	13	787.86	787.86	787.86	
	Kholgarh	14	541.42	541.42	541.42	
	Kholgarh	15	363.06	363.06	363.06	
	Kholgarh	16	399.95	399.95	399.95	
	Kholgarh	17	468.72	468.72	468.72	
	Kholgarh	18	850.08	850.08	850.08	116
	Kholgarh	19	732.44	732.44	732.44	
	Kholgarh	20	445.87	445.87	445.87	
		S. Total	10370.820	10370.4200	10345.870	570.90
	Range Total		24034.470	24028.340	23987.720	1641.80
	Div Total		79969.04000	79928.82600	76481.17600	2932.00
Proposed Reserved Forest						
B. Badbahal Range						
	Podabalanda		273.95	273.95	273.95	100
	San-Rengali		311.61	311.61	311.11	100
	Range Total		585.56	585.56	585.06	200
D. Badmal Range						
	Kalia		318.26	318.26	318.26	50
	Mochibahal		1553.13	1553.13	1548.13	50
	Sagjori		610.66	610.66	584.41	



Table No: 14.6 Area assigned to Selection Working Circle and assigned to VSS for Protection & Management. (In Ha)

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Area allotted to	
					SWC	JFM(O) WC
	Range Total		2482.05	2482.05	2450.8	100
F. Girishchandrapur Range						
	Talab		629.55	629.55	626.7	
	Range Total		629.55	629.55	626.7	0
	Div. Total		3697.16	3697.16	3662.56	300
DPF (Demarcated Protected Forest)						
F. Girishchandrapur Range						
	Balikiari		37.60	37.6	37.6	13
	Jarasingha		179.13	179.13	177.13	60
	Podamal		110.00	110.0	110.0	37
	Range Total		326.73	326.73	324.73	110
	Div. Total		326.73	326.73	324.730	110
	Div. RF, PRF & DPF		83992.930	83952.716	80468.466	3342

From the above it may be seen that the area assigned to VSS is **3342.00 ha** and constitutes about 4.15% of the area assigned to this working circle.

14.6 Special objectives of Management:

Special objectives of management of this working Circle is within the general objectives of the Working Plan. The special objectives are outlines below.

- To remove mature and silviculturally available trees before they become unsound.
- To create openings in the canopy to allow adequate light so as to allow establishment of light demanding species i.e. principally Sal.
- To thin out the congested pole crop to allow diameter growth and also have interim harvest through which the VSS looking after the area will be benefited.
- To allow natural regeneration and cover the entire area with vegetation of climatic species.
- To improve the density of the forest crop as well as stand structure by suitable silvicultural operations.
- To remove dead and unsound trees for creating hygienic condition in the forest.



- vii) To carryout subsidiary silvicultural operations so that conducive situation can be created for better growth of existing crop and natural regeneration.
- viii) To manage the forest to maintain it at this Climatic Stage so as to keep this composition of Forest with majority of Sal.

14.6.1 Analysis of the crop:

The growing Stock of the assigned Blocks/ Compartments are estimated through Sample Point enumeration & subsequent analysis. The crop density (Density Map) has been annexed to this Working Plan for ready reference. From the Satellite data it is observed that most of the blocks / compartments assigned to this working Circle are Sal Forest i.e. Sal constitutes above 30% The other species seen are associates of Sal i.e. Asan, Arjun, Piasal (Bija), Kuruma (Haldu), Kasi. Crop Density wise Sal / Non Sal forest area as reported in the Stock map is furnished at Table No 14. 6



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 14.7 Area under different Density Class in the assigned Area to SIWC. (area in Ha)

Block	Compt. No	Sal Forest				Non Sal Forest				Scrub	Total area
		>70%	40-70%	10-40%	<10	>70%	40-70%	10-40%	<10		
Bindhyabasini	2	0	50.17	73.30	0	0	5.30	78.24	0	23.82	230.83
Hatidhara	2	239.76	75.19	0	0	4.17	5.57	0	0	8.84	333.53
Hatidhara	9	272.51	107.17	21.64	0	8.54	19.71	0.06	0	5.95	435.58
Rahan	3	0	153.45	286.15	0	0	59.09	42.58	0	0	541.27
Kholgarh	30	31.07	316.73	43.34	0	0	6.0	8.71	0	10.79	416.64
Kholgarh	36	216.44	158.58	0	0	9.02	19.68	0	0	16.55	420.27
Kholgarh	14	307.13	149.21	44.31	0	5.75	22.63	0.54	0	5.84	535.41
Rail	1	16.49	389.54	30.33	0	0	16.68	6.25	0	89.33	548.62
Rail	7	31.43	423.31	10.08	0	1.20	50.26	0.04	0	4.0	520.32
Landimal	5	0	33.75	174.61	0	0	0.53	60.53	0	0	269.42
Landimal	8	33.49	25.02	517.0	0	0.08	0.04	29.09	0	0	604.72
Mochibahal	1	133.81	124.06	72.31	0	0.39	5.36	5.04	0	1.41	342.38
Landakot	64	37.27	194.02	47.69	0	0.11	8.18	21.82	0	0	309.09
Landakot	10	16.61	163.64	126.57	0	0.28	14.12	34.34	0	18.76	374.32
Landakot	22	178.17	0	57.07	0	0.4	0	23.36	0	3.18	262.18
Landakot	26	14.17	48.17	65.65	0	1.03	1.39	33.50	0	0.3	164.21
Landakot	27	0	56.73	69.27	0	0	1.47	19.17	0	79.92	226.56
Landakot	76	188.42	80.24	32.99	0	2.04	11.72	6.70	0	0	322.11
Landakot	79	215.55	36.77	22.72	0	6.12	1.13	11.82	0	37.63	331.74
Balikiari	NRSC-15	0	33.15	0	0	0	0.55	0	0	1.39	35.09



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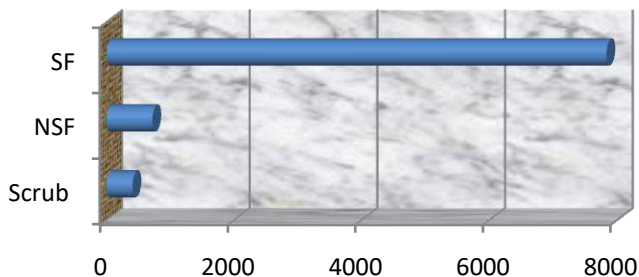
Table No 14.7 Area under different Density Class in the assigned Area to SIWC. (area in Ha)

Block	Compt. No	Sal Forest				Non Sal Forest				Scrub	Total area
		>70%	40-70%	10-40%	<10	>70%	40-70%	10-40%	<10		
Kholgarh	3	230.2	256.2	31.01	0	0.73	15.05	5.65	0	16.84	555.68
Sagmalia	1	310.87	35.56	19.28	0	18.82	1.08	34.07	0	0	419.68
Sagmalia	4	194.05	476.64	31.18	0	1.27	11.12	19.86	0	22.36	756.48
Total		2667.44	3387.3	1776.5	0	59.95	276.66	441.37	0	346.91	8956.13
Percentage		29.78	37.82	19.84	0.00	0.67	3.09	4.93	0.00	3.87	100

On analysis of facts stated above which comprises of 10% of the area taken in to SWC revels as follows:

Table No 14.8 Area taken in SWC revels

Type of Forest	Area in ha	Percentage
Sal Forest	7831.24	87.44
Misc. Forest	718.03	8.02
Scrub Forest	406.86	4.54
Total	8956.13	100





Revised working plan of Rairakhol Division (2021-22 to 2030-31)

As per Stand table the Trees classified as Sal / Non Sal in compartments taken at Random indicates the Percentage of Sal in the forests assigned to SWC is as follows.

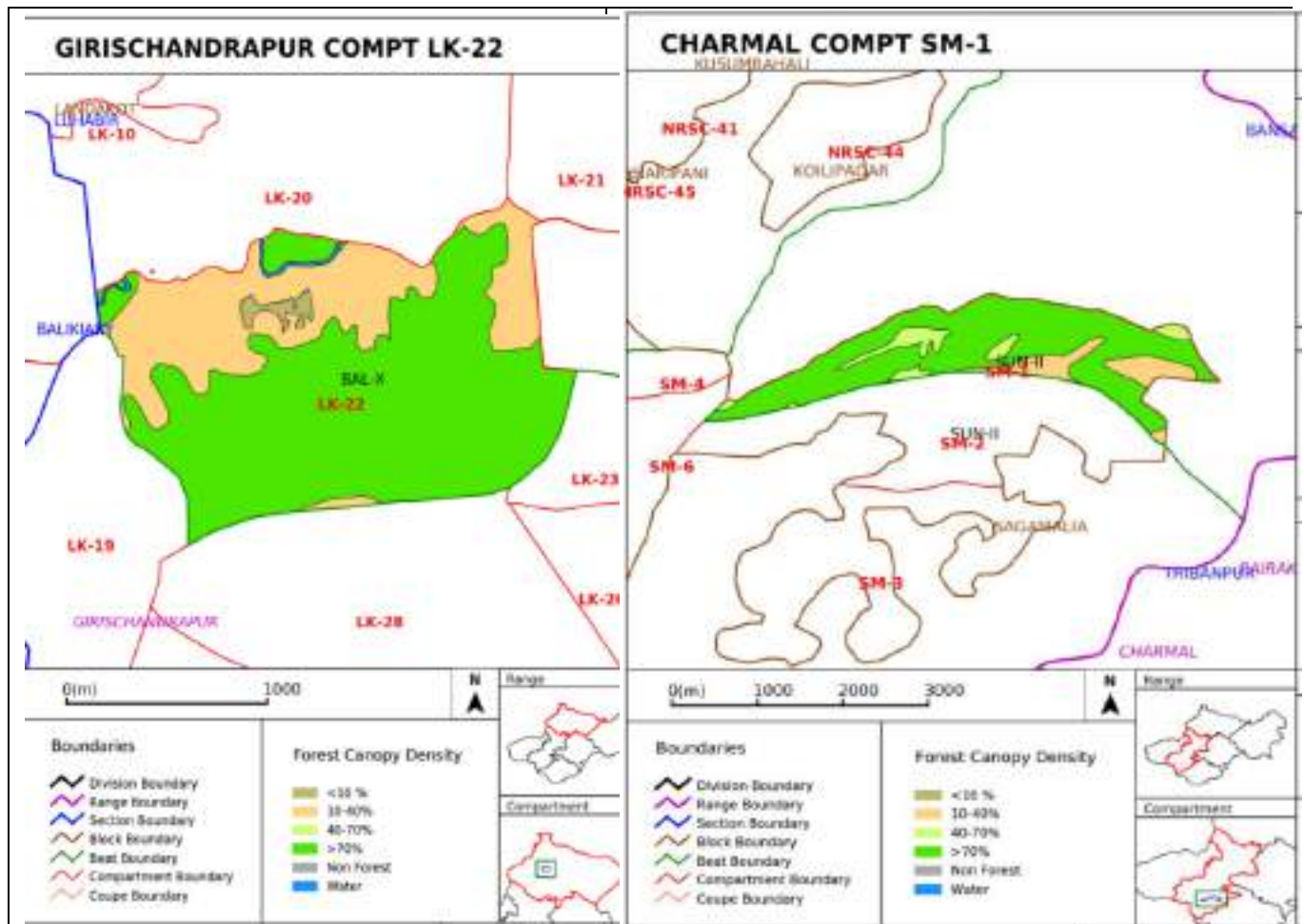
Table No 14.9 % of Sal in the forests assigned to SWC

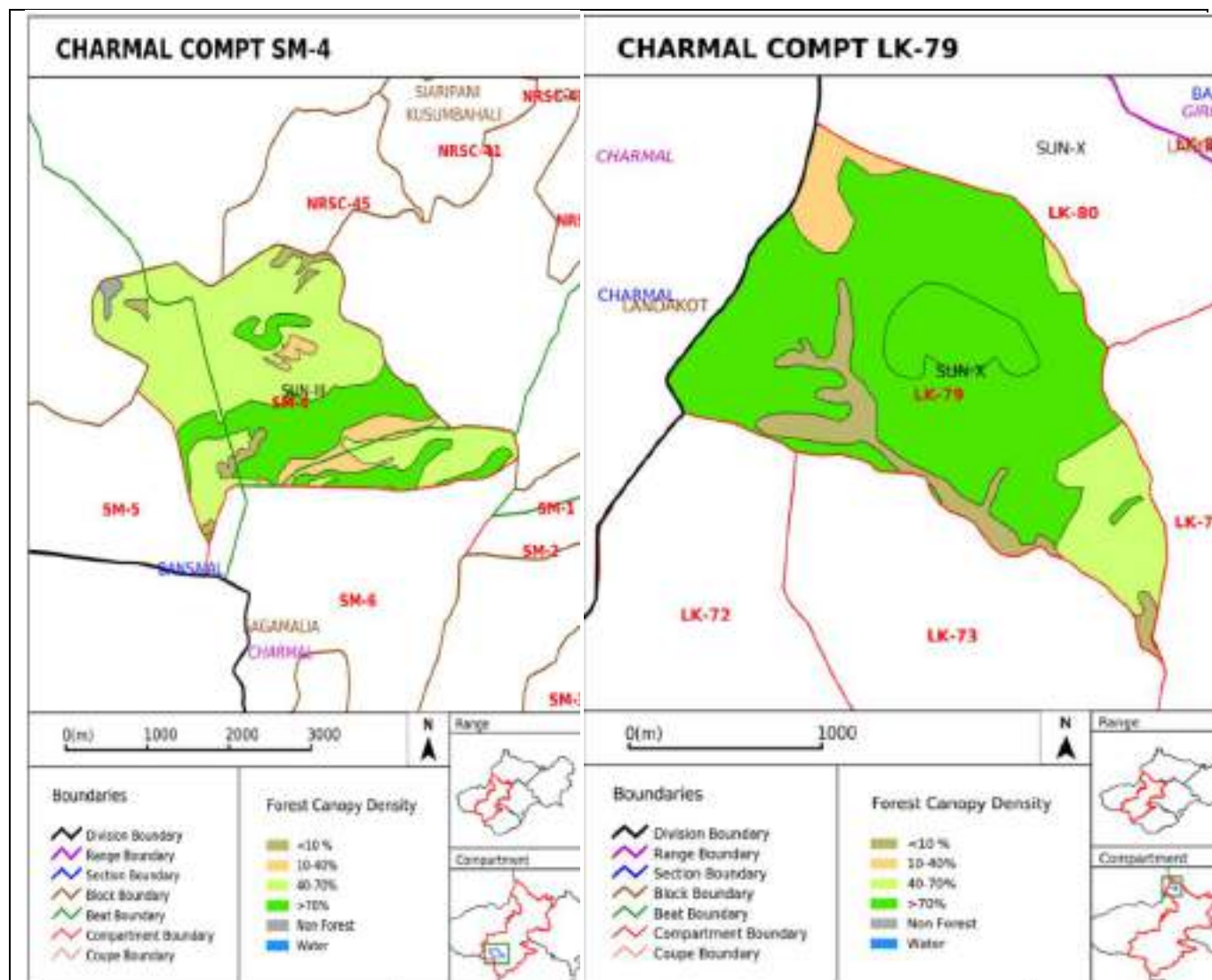
Block	Comp. No	No of trees (Sal)	No of trees (Non Sal)	Total	Sal: Non sal
Balikiari	NRSC-15	3997	7853	11850	1: 1.96
Bindhyabasini	2	19751	53270	73021	1: 2.70
Hatidhara	2	36232	73575	109807	1: 2.03
Hatidhara	9	44893	97754	142647	1: 2.18
Kholgarh	30	66477	102666	169143	1:1.54
Kholgarh	36	31051	124106	155157	1:4.00
Kholgarh	14	53490	116651	170141	1:2.18
Kholgarh	3	58984	127872	186856	1:2.17
Landakot	64	35915	75990	111905	1:2.12
Landakot	10	30183	87772	117955	1:2.91
Landakot	22	25431	54119	79550	1:2.13
Landakot	26	10968	38511	49479	1:3.51
Landakot	27	21031	46374	67405	1:2.21
Landakot	76	30265	70909	101174	1:2.34
Landakot	79	28339	65308	93647	1:2.30
Landimal	5	48919	63993	112912	1:1.31
Landimal	8	62893	86239	149132	1:1.37
Mochibahal	1	40726	76046	116772	1:1.87
Rahan	3	48943	136195	185138	1:2.78
Rail	1	57778	88351	146129	1:1.53
Rail	7	24570	29219	53789	1:1.19
Sagmalia	1	15478	83964	99442	1:5.42
Sagmalia	4	42553	242105	284658	1:5.69
Total		838867	1948842	2787709	1:2.32
Percentage		30.1	69.9	100	



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

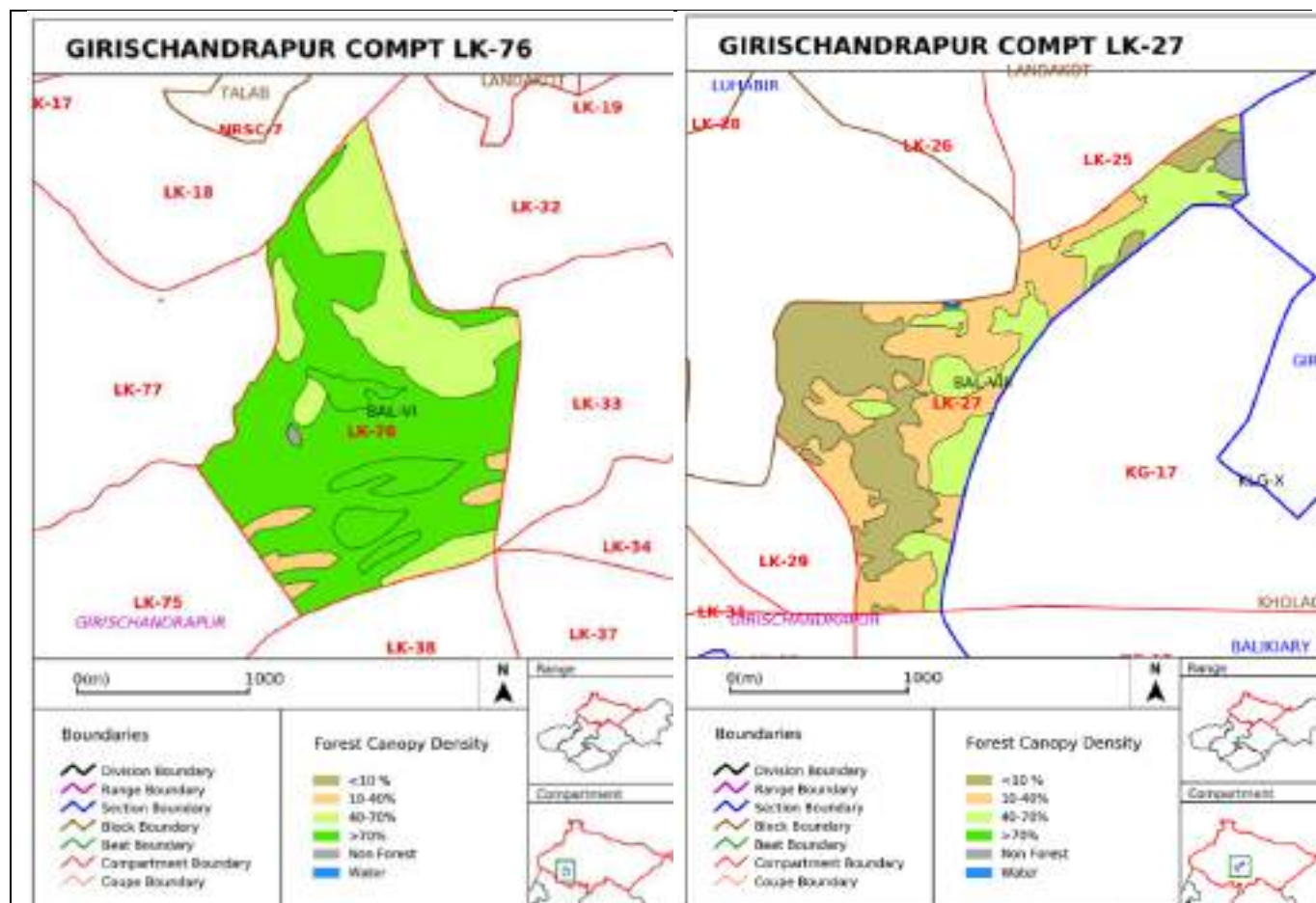
The Sal constitutes 30-31% where as the Misc Crop is 69-70% with a variation of maximum $\pm 1\%$





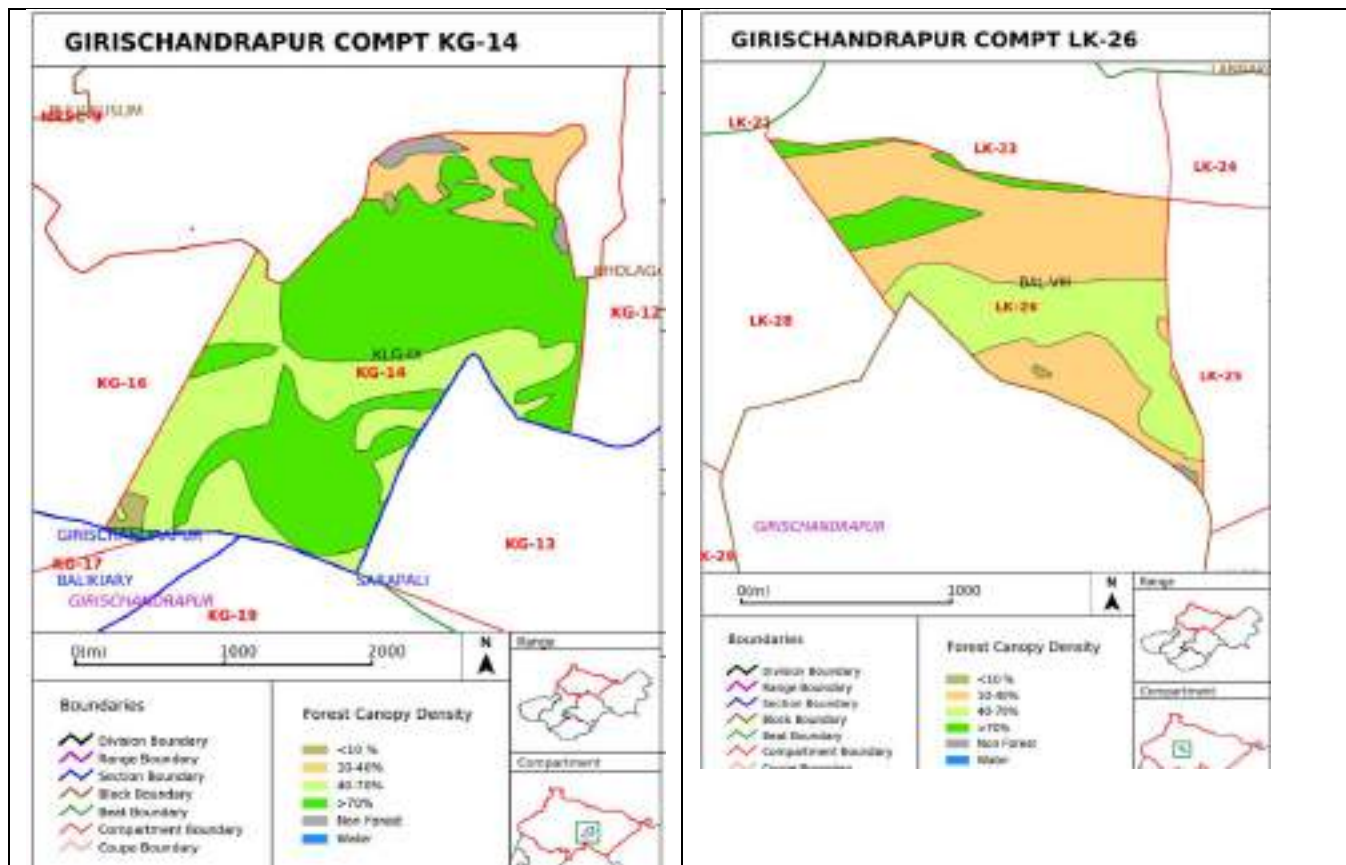


Revised working plan of Rairakhol Division (2021-22 to 2030-31)





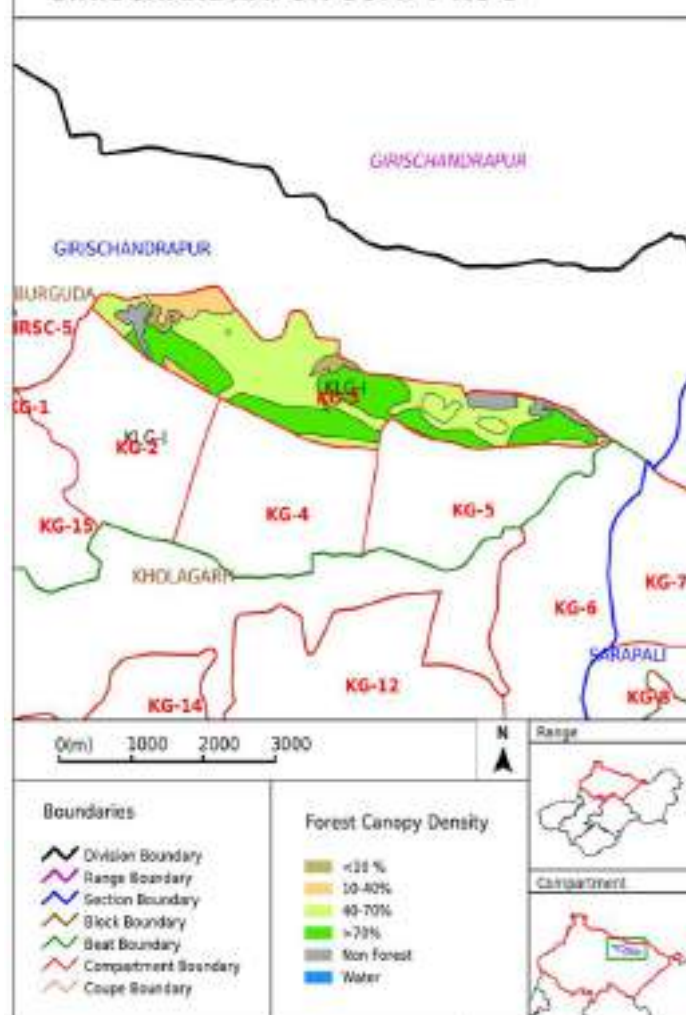
Revised working plan of Rairakhol Division (2021-22 to 2030-31)



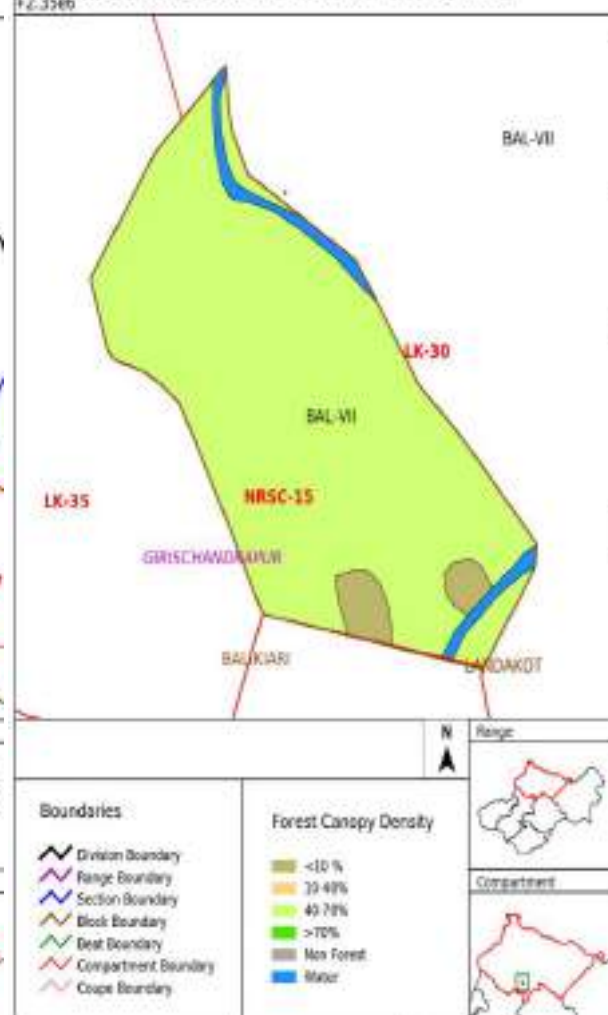


Revised working plan of Rairakhol Division (2021-22 to 2030-31)

GIRISCHANDRAPUR COMPT KG-3



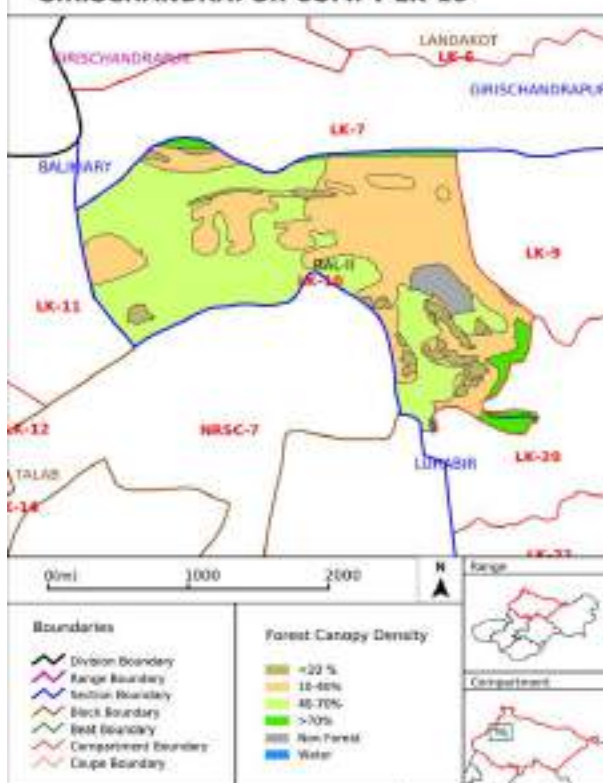
GIRISCHANDRAPUR COMPT NRSC-15



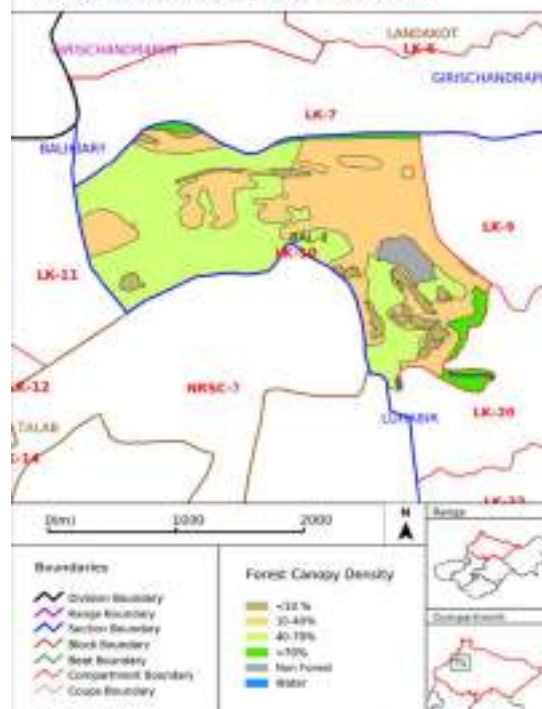


Revised working plan of Rairakhol Division (2021-22 to 2030-31)

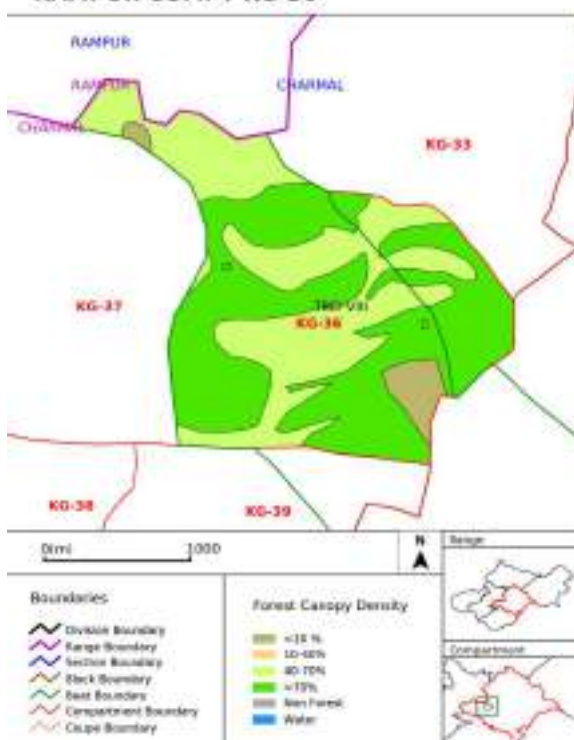
GIRISCHANDRAPUR COMPT LK-10



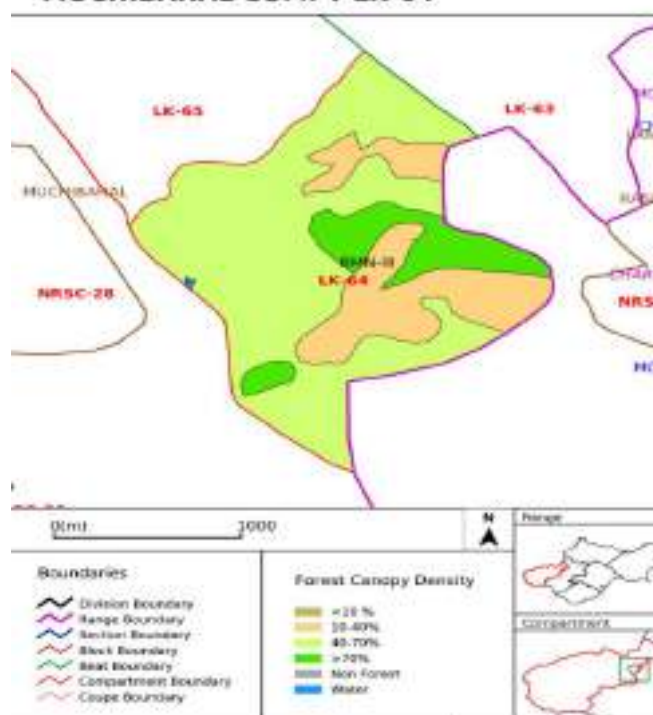
GIRISCHANDRAPUR COMPT LK-10



RAMPUR COMPT KG-36

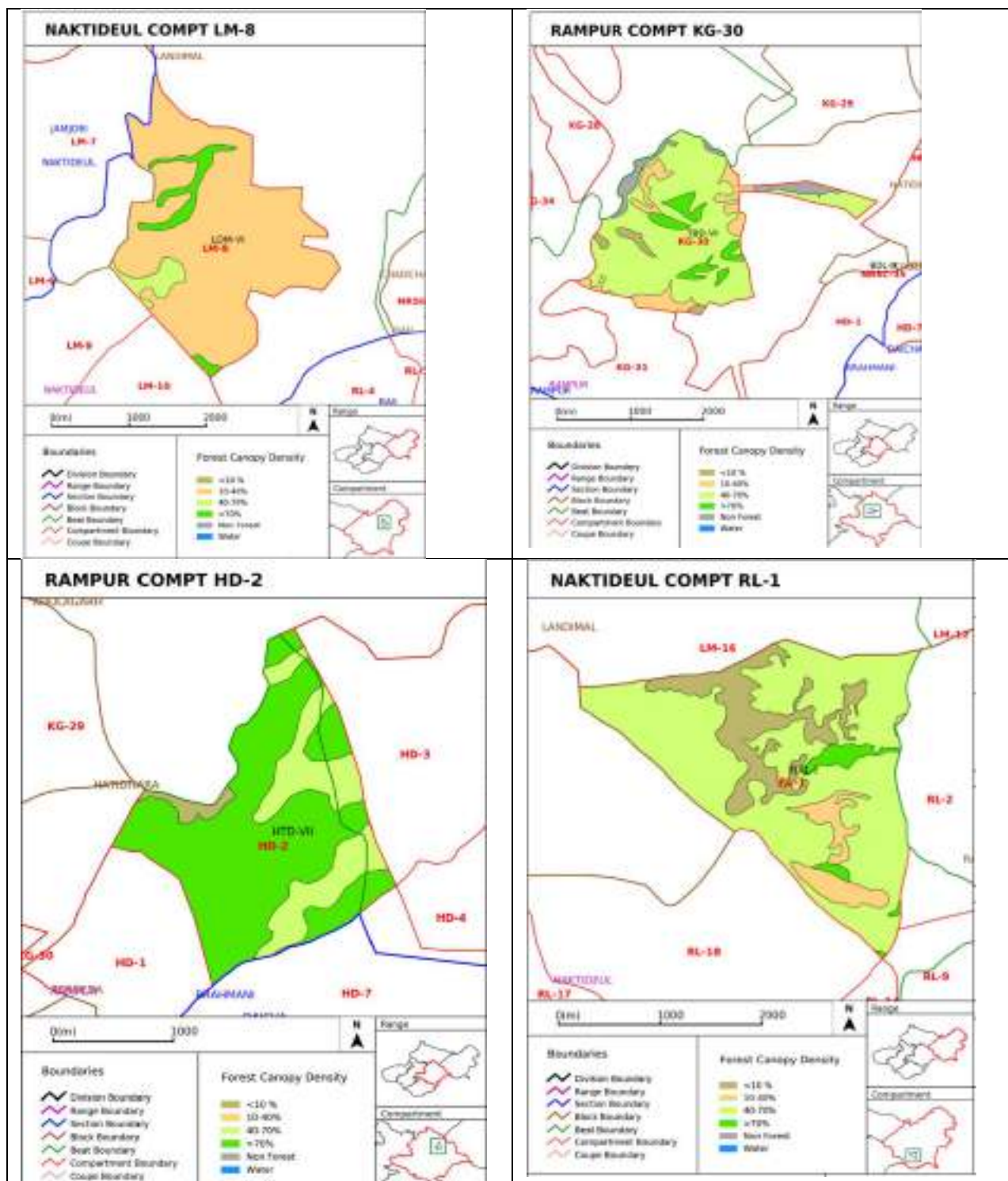


MOCHIBAHAL COMPT LK-64



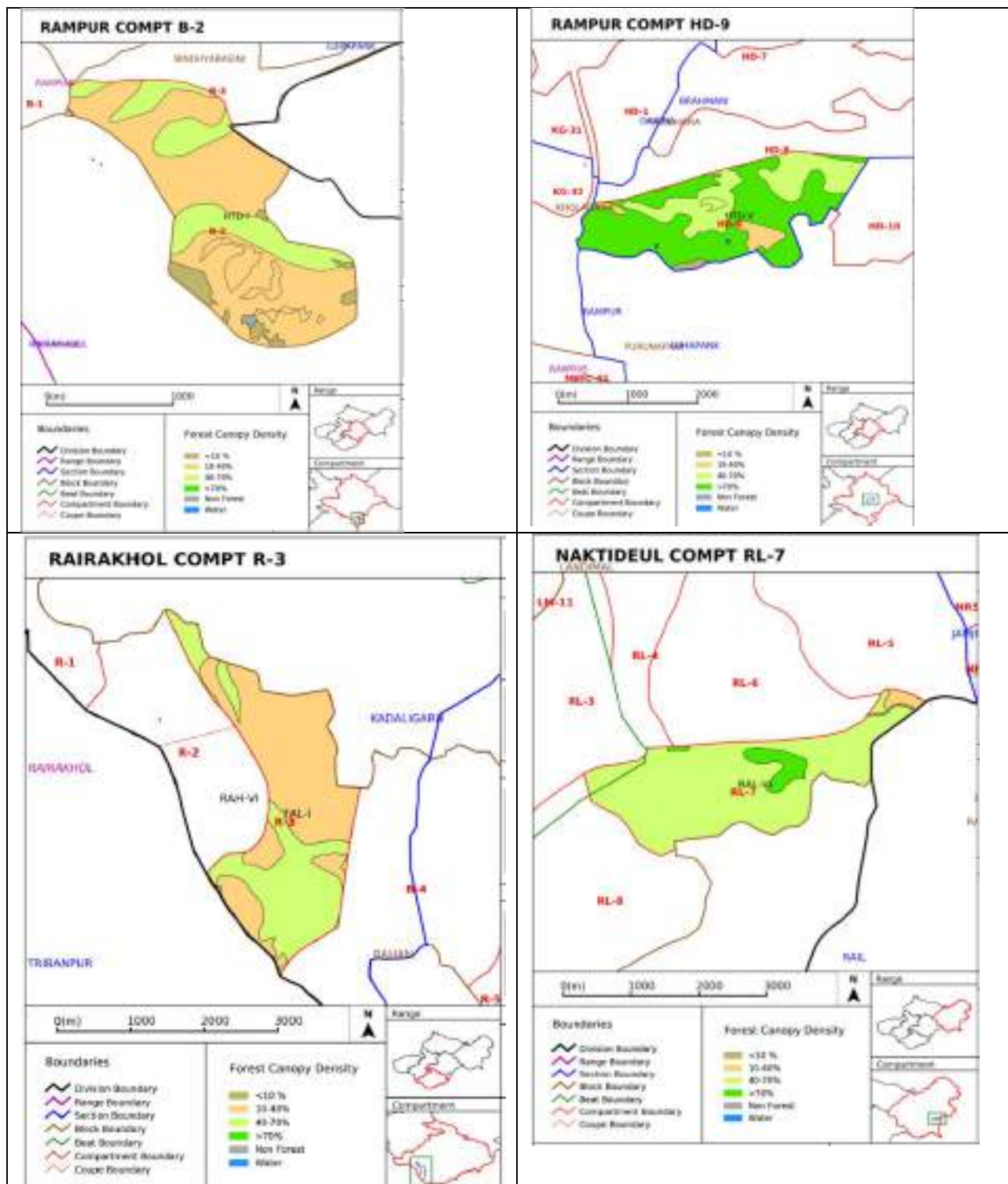


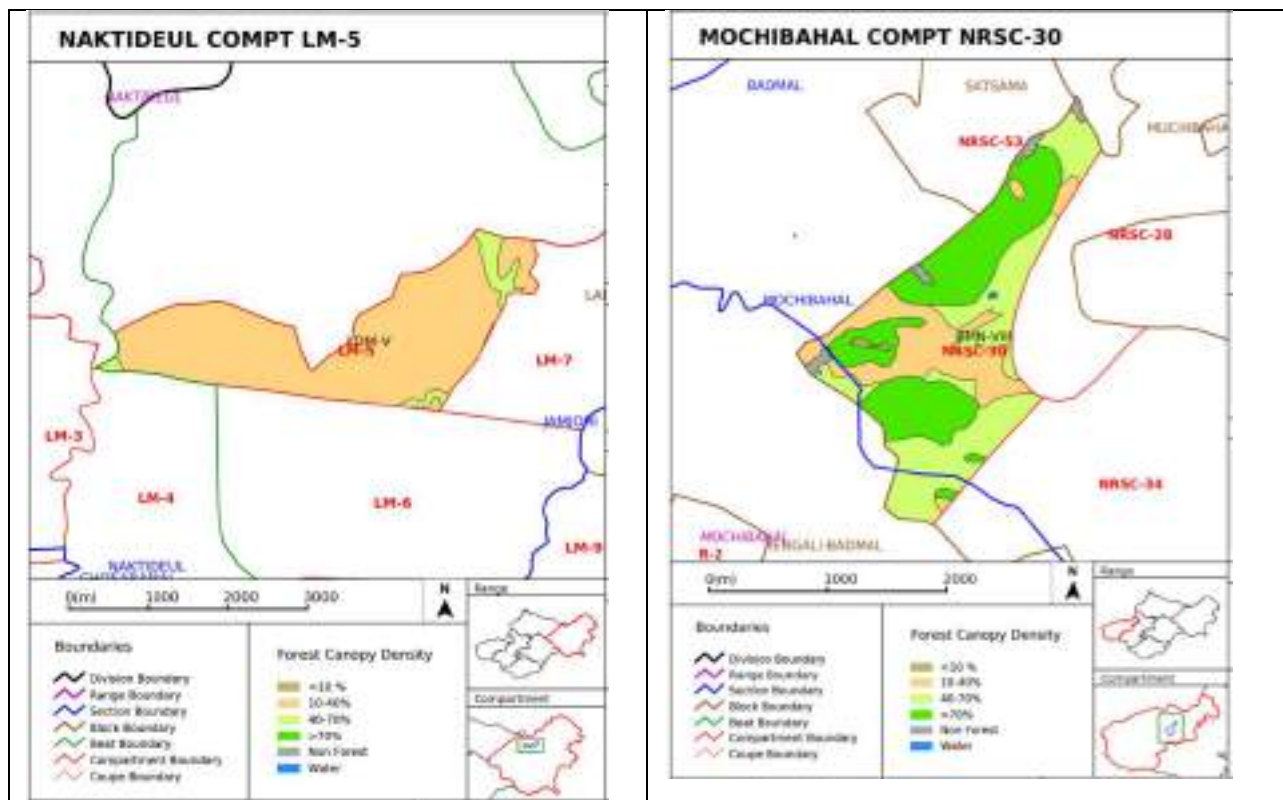
Revised working plan of Rairakhol Division (2021-22 to 2030-31)





Revised working plan of Rairakhol Division (2021-22 to 2030-31)





14.6.2 Silvicultural system:

The Silvicultural System proposed to be adopted is **“Selection System with adequate improvement measures to restock the area in High Forest System”**. Under this adopted system the matured and dead trees will be selectively removed leaving adequate mother trees to have good seed dispersal and natural regeneration. After removal of selected trees, the remaining trees will be treated so as to obtain good established regeneration

14.6.3 Rotation period:

The Rotation Period of 120 years for Sal is prescribed and followed. In the outgoing Plan 120 years of Rotation age was prescribed for all species. During field visit and growth statistics available it is felt that Except Teak for all other species, the Rotation Period of 120 years is accepted and followed. In case of teak which has been introduced in Block Plantation in blank areas under Economic Plantation, the growth is very encouraging. Due to its high timber value it is in much demand in the locality, in the State and outside. Selective removal by illicit



felling is a perceptible threat. Considering all its aspect i.e. Growth Status and Market demand, rotation age of 100 years for teak in this division is suggested.

14.6.4 Harvestable diameters:

Harvestable diameter is being prescribed in different plans for different species from time to time. The criteria considered for recommended “Harvestable Diameter / Girth” are as follows.

- i) The Annual Increment of the Species,
- ii) Development of unsoundness due to climatic and biotic factors,
- iii) Marketability & Demand,
- iv) Site Quality and productivity of Soil

Considering all aspect in the outgoing plan the exploitable Girth (GBH) for Sal was fixed at 150cm and above for all species. Considering the present scenario GBH for exploitation is prescribed as follows.

Name of the Blocks	Name of the trees	Exploitable g.b.h in cm
Hatidhara FS , Kholgarh FS, Daincha FS, Charmal FS, Landakot FS, Badmal FS, Rail FS, Naktideul FS, Landimal FS, GCPur FS, Balikiari FS, Luhabir FS and Jarasingha FS	1. Sal	150
	2. Bija, Haldu and Mundi	135
	3. Bandhan and Sisoo	135
	4. Asan, Dhaura and Semul	150
	5. All other species	135
Other Felling Series	1. Sal	135
	2. Bija, Haldu and Mundi	120
	3. Bandhan and Sisoo	120
	4. Asan, Dhaura and Semul	150
	5. All other species	135

This will be applicable for all Felling Series and all other situation, Plantation under JFM and Non JFM Mode if so required.



14.6.5 Reducing factors and reduced areas:

The yield will be regulated by equi productive area. No reduction factor has been prescribed.

14.6.6 Felling cycle:

The Plan period is 10 years i.e. from 2021-2031. The area assigned to this working circle will be covered within the Plan Period i.e. 10 years. Therefore a felling Cycle of 10 years is prescribed and followed.

14.6.7 Division into Annual Coupes (Cutting Sections):

The area assigned to this Working Circle has been divided to Sixteen five Felling Series. Each felling Series has been sub divided to ten (10) Annual Coupes and numbered as I,II, III --- X prefixed with Felling Series abbreviation. The annual Coupe and area assigned has been outlined at Table No 14.4 (i) , 14.4(II) etc under **Para 14.4.2** above.

14.6.8 Calculation of the yield:

Basing on Sample enumeration data number of trees in different girth class available in the assigned compartments has been furnished at Table No 14.2. For Sal exploitable Class is 150cm and above where as for all other species 120cm to 150cm. The previous girth class is considered as Approach class.

a) Smythies' Safeguarding Formula:

The yield shall be regulated by area with a percentage check on the removal of exploitable trees as per "**Smythies' Safeguarding Formula**". As per this Formula the yield available during the felling Cycle is regulated by the number of trees of the lower girth class that may pass into next Girth Class (Exploitable Girth Class) during the felling cycle. The Increment is expressed by the following formula.

$$X = (F/T) \times (II - Z\% \text{ of II}) \text{ --- equation No 1}$$

Where

F- is the felling Cycle i.e. 10

T - is the time taken by a II Class tree to reach to exploitable class i.e. Class -I (>150cm girth Class)

II – No of Trees in approach Class (120cm- 150cm Girth Class)



Z – Percentage of class-II trees that do not pass in to Class I in T years due to mortality or removal in between

From the growth data observed in Chapter 6 of this Plan the value of T and Z have been taken as 40 years and 50% respectively. Taking in to account the above value of parameters and considering a felling cycle of 10 years the annual yield y percentage of trees available for removal is computed as follows.

$$Y = \{x / (1 + x/2)\} * 100 + A$$

Where x is defined in equation no- 1. Using this formula the availability of trees during the plan period in each compartment assigned to this Working Circle is furnished at table no 14.10

Calculation of value of x

Table No 14.10 (a) number of trees available for removal as per Smithis' Safe guarding Formula
Value of x

Block	Compt no	Area in ha	No of Trees in Class-II (120cm-150 cm)	No of Trees in Class-I (>150cm)	Value of x= (10/40) { Trees in Approach Class (II) - 50% of (II)}
Bindhya-basini	All	755.51	11110	3504	1388.8
Hatidhara	All	7511.55	141493	67941	17686.6
Kholgarh	21-39	7967.224	156209	55122	19526.1
Rahan	3-5	1876.09	11162	4783	1395.3
Landakot	39-59 72-74 &78-80	7911.76	128482	53490	16060.3
Suani	All	352.79	2710	1743	338.8
Sagmalia	All	3004.87	45080	17220	5635.0
Landakot	60-71	2925.355	21403	10107	2675.4
Rail	2,7,911 ,13,-18	6231.110	84399	36838	10549.9
Landimal	1-14	13957.197	193398	77940	24174.8
Landakot	1-38, 75-77 & 81-87	13641.85	210669	97421	26333.6



Table No 14.10 (a) number of trees available for removal as per Smithis' Safe guarding Formula
Value of x

Block	Compt no	Area in ha	No of Trees in Class-II (120cm-150 cm)	No of Trees in Class-I (>150cm)	Value of x= (10/40) { Trees in Approach Class (II) - 50% of (II)}
Kholgarh	1-20	10345.870	181815	78901	22726.9
Podabalanda PRF		273.95	2254	869	281.8
San-Rengali PRF		311.11	2804	1210	350.5
Kalia		318.26	2383	2369	297.9
Mochibahal		1548.13	14755	5688	1844.4
Sagjori		584.41	5501	5199	687.6
Talab		626.70	10900	5615	1362.5
Balikiari		37.6	682	311	85.3
Jarasingha		177.13	1905	974	238.1
Podamal		110.0	1452	684	181.5
Total		80468.466	1230566	527929	

Calculation of y

Table No 14.10 (b) number of trees available for removal as per Smithis' Safe guarding Formula
– value of y

Block	Compt no	Area in ha	No of Trees in Class-II (120cm-150 cm)	No of Trees in Class-I (>150cm)	x	$Y = \{ x / (1 + x/2) \} * 100$
Bindhya-basini	All	755.51	11110	3504	1388.8	33.08
Hatidhara	All	7511.55	141493	67941	17686.6	23.03
Kholgarh	21-39	7967.224	156209	55122	19526.1	30.09
Rahan	3-5	1876.09	11162	4783	1395.3	25.46
Landakot	39-59 72-74 &78-80	7911.76	128482	53490	16060.3	26.11
Suani	All	352.79	2710	1743	338.8	17.71
Sagmalia	All	3004.87	45080	17220	5635.0	28.12
Landakot	60-71	2925.355	21403	10107	2675.4	23.38
Rail	2,7,911 ,13,-18	6231.110	84399	36838	10549.9	25.05



Table No 14.10 (b) number of trees available for removal as per Smith's Safe guarding Formula – value of y

Block	Compt no	Area in ha	No of Trees in Class-II (120cm-150 cm)	No of Trees in Class-I (>150cm)	x	$Y = \{ x / (1 + x/2) \} * 100$
Landimal	1-14	13957.197	193398	77940	24174.8	26.85
Landakot	1-38, 75-77 & 81-87	13641.85	210669	97421	26333.6	23.81
Kholgarh	1-20	10345.870	181815	78901	22726.9	25.18
Podabalanda PRF		273.95	2254	869	281.8	27.90
San-Rengali PRF		311.11	2804	1210	350.5	25.30
Kalia		318.26	2383	2369	297.9	11.83
Mochibahal		1548.13	14755	5688	1844.4	27.90
Sagjori		584.41	5501	5199	687.6	12.41
Talab		626.70	10900	5615	1362.5	21.64
Balikiari		37.6	682	311	85.3	24.11
Jarasingha		177.13	1905	974	238.1	21.79
Podamal		110.0	1452	684	181.5	23.43
Total		80468.466	1230566	527929		



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Table No 14.10 (c) Number of trees available for removal as per Smithis' Safe guarding Formula

Block	Compt no	Area in ha	No of Trees in Class-II (120cm-150 cm)	No of Trees in Class-I (>150cm)	x	y	No of trees Available as per Smithis' Formula y% of Class I Trees	No of trees suggested for marking (35% of Available trees) i.e. 1 out of 3	No of trees /ha
Bindhya-basini	All	755.51	11110	3504	1388.8	33.08	1159	406	0.54
Hatidhara	All	7511.55	141493	67941	17686.6	23.03	15650	5477	0.73
Kholgarh	21-39	7967.224	156209	55122	19526.1	30.09	16588	5806	0.73
Rahan	3-5	1876.09	11162	4783	1395.3	25.46	1218	426	0.23
Landakot	39-59 72-74 &78-80	7911.76	128482	53490	16060.3	26.11	13964	4887	0.62
Suani	All	352.79	2710	1743	338.8	17.71	309	108	0.31
Sagmalia	All	3004.87	45080	17220	5635.0	28.12	4843	1695	0.56
Landakot	60-71	2925.355	21403	10107	2675.4	23.38	2363	827	0.28
Rail	2,7,911 ,13,-18	6231.110	84399	36838	10549.9	25.05	9228	3230	0.52
Landimal	1-14	13957.197	193398	77940	24174.8	26.85	20929	7325	0.52
Landakot	1-38, 75-77 & 81-87	13641.85	210669	97421	26333.6	23.81	23198	8119	0.60
Kholgarh	1-20	10345.870	181815	78901	22726.9	25.18	19866	6953	0.67
Podabalanda PRF		273.95	2254	869	281.8	27.90	242	85	0.31



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Table No 14.10 (c) Number of trees available for removal as per Smithis' Safe guarding Formula

Block	Compt no	Area in ha	No of Trees in Class-II (120cm-150 cm)	No of Trees in Class-I (>150cm)	x	y	No of trees Available as per Smithis' Formula y% of Class I Trees	No of trees suggested for marking (35% of Available trees) i.e. 1 out of 3	No of trees /ha
San-Rengali PRF		311.11	2804	1210	350.5	25.30	306	107	0.34
Kalia		318.26	2383	2369	297.9	11.83	280	98	0.31
Mochibahal		1548.13	14755	5688	1844.4	27.90	1587	555	0.36
Sagjori		584.41	5501	5199	687.6	12.41	645	226	0.39
Talab		626.70	10900	5615	1362.5	21.64	1215	425	0.68
Balikiari		37.6	682	311	85.3	24.11	75	26	0.70
Jarasingha		177.13	1905	974	238.1	21.79	212	74	0.41
Podamal		110.0	1452	684	181.5	23.43	160	56	0.51
Total		80468.466	1230566	527929			134038	46913	0.58



14.6.8.1 Felling Series wise yield calculation

Basing on Smithi's Safe guard formula Felling Series wise / Coupe wise trees that can be removed and suggested is furnished at table No 14.11 below.

Table No 14.11.(I) No of Trees (Mark able) Bidhyabasini Felling Series (BBFS) expected

Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Coupe Area	No of Tree/ ha	Total markable trees expected
Bidhyabasini Felling Series (BBFS)	2021-22	BBFS-I	Hatidhara	8	521.20	0.73	380
	2022-23	BBFS-II	Hatidhara	1	479.66	0.73	350
	2023-24	BBFS-III	Hatidhara	2	256.48	0.73	187
	2024-25	BBFS-IV	Hatidhara	3	398.72	0.73	291
	2025-26	BBFS-V	Hatidhara	4	521.59	0.73	381
	2026-27	BBFS-VI	Hatidhara	5	636.97	0.73	465
	2027-28	BBFS-VII	Hatidhara	6	293.42	0.73	214
	2028-29	BBFS-VIII	Hatidhara	7	518.75	0.73	379
	2029-30	BBFS-IX	Bindhya-basini	1	446.530	0.54	241
			Bindhya-basini	2			
	2030-31	BBFS-X	Bindhya-basini	3	308.98	0.54	167
	Total FS				4382.300		3055

Table No 14.11.(II) No of Trees (Mark able) Hatidhara Felling Series (HFS) expected

Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Coupe Area	No of Tree/ ha	Total markable trees expected
Hatidhara Felling Series (HFS)	2021-22	HFS-I	Hatidhara	9	543.06	0.73	396
	2022-23	HFS-II	Hatidhara	10	280.77	0.73	205
	2023-24	HFS-III	Hatidhara	11	448.25	0.73	327
	2024-25	HFS-IV	Hatidhara	12	494.47	0.73	361
	2025-26	HFS-V	Hatidhara	13	551.81	0.73	403
	2026-27	HFS-VI	Hatidhara	14	482.85	0.73	352
	2027-28	HFS-VII	Hatidhara	15	379.62	0.73	277
	2028-29	HFS-VIII	Hatidhara	16	243.56	0.73	178
	2029-30	HFS-IX	Hatidhara	17 (Part)	230.00	0.73	168
	2030-31	HFS-X	Hatidhara	17 (Bal)	230.37	0.73	168
	Total FS				3885.130		2835



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Table No 14.11.(III) No of Trees (Mark able) Kholgarh Felling Series (KHFS) Expected

Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Coupe Area	No of Tree/ ha	Total markable trees expected
Kholgarh Felling Series (KHFS)	2021-22	KHFS-I	Kholgarh	27	202.51	0.73	148
	2022-23	KHFS-II	Kholgarh	29	315.01	0.73	230
	2023-24	KHFS-III	Kholgarh	30	399.87	0.73	292
	2024-25	KHFS-IV	Kholgarh	21	536.14	0.73	391
	2025-26	KHFS-V	Kholgarh	22	417.45	0.73	305
	2026-27	KHFS-VI	Kholgarh	23	463.72	0.73	339
	2027-28	KHFS-VII	Kholgarh	24	363.21	0.73	265
	2028-29	KHFS-VIII	Kholgarh	26	305.29	0.73	223
	2029-30	KHFS-IX	Kholgarh	25	454.26	0.73	332
	2030-31	KHFS-X	Kholgarh	28	360.68	0.73	263
	Total FS				3818.140		2788

Table No 14.11.(IV) No of Trees (Mark able) Daincha Felling Series: (DFS) –Expected

Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Coupe Area	No of Tree/ ha	Total markable trees expected
Daincha Felling Series: (DFS)	2021-22	DFS-I	Kholgarh	31	363.75	0.73	266
	2022-23	DFS-II	Kholgarh	32	544.71	0.73	398
	2023-24	DFS-III	Kholgarh	33	391.27	0.73	286
	2024-25	DFS-IV	Kholgarh	34 (P)	430.0	0.73	314
	2025-26	DFS-V	Kholgarh	34 (B)	432.85	0.73	316
	2026-27	DFS-VI	Kholgarh	35	428.5	0.73	313
	2027-28	DFS-VII	Kholgarh	36	407.844	0.73	298
	2028-29	DFS-VIII	Kholgarh	37	455.44	0.73	332
	2029-30	DFS-IX	Kholgarh	38	316.81	0.73	231
	2030-31	DFS-X	Kholgarh	39	377.91	0.73	276
	Total FS				4149.084		3030



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Table No 14.11.(V) No of Trees (Mark able)Rahan Felling Series (RFS) – Expected

Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Coupe Area	No of Tree/ ha	Total markable trees expected
Rahan Felling Series (RFS)	2021-22	RFS-I	Podabalanda		273.95	0.31	85
	2022-23	RFS-II	San-Rengali		311.11	0.34	106
	2023-24	RFS-III	Rahan	3 (P)	275.00	0.23	63
	2024-25	RFS-IV	Rahan	3 (B)	273.11	0.23	63
	2025-26	RFSV	Rahan	4	200.00	0.23	46
	2026-27	RFS-VI	Rahan	4	200.00	0.23	46
	2027-28	RFS-VII	Rahan	4	200.00	0.23	46
	2028-29	RFS-VIII	Rahan	4	213.46	0.23	49
	2029-30	RFS-IX	Rahan	5	260.00	0.23	60
	2030-31	RFS-X	Rahan	5	254.52	0.23	59
	Total FS				2461.150		623

Table No 14.11.(VI) No of Trees (Mark able)Charmal Felling Series (CFS) – Expected

Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Coupe Area	No of Tree/ ha	Total markable trees expected
Charmal Felling Series (CFS)	2021-22	CFS-I	Landakot	42	396.89	0.62	246
	2022-23	CFS-II	Landakot	43	308.31	0.62	191
	2023-24	CFS-III	Landakot	44	491.51	0.62	304
			Landakot	45			
	2024-25	CFS-IV	Landakot	46	315.52	0.62	196
	2025-26	CFS-V	Landakot	47	389.640	0.62	242
			Landakot	48			
	2026-27	CFS-VI	Landakot	49	310.96	0.62	193
	2027-28	CFS-VII	Landakot	50	341.54	0.62	212
	2028-29	CFS-VIII	Landakot	51	430.820	0.62	267
			Landakot	52			
	2029-30	CFS-IX	Landakot	40	395.49	0.62	245
	2030-31	CFS-X	Landakot	39	640.690	0.62	397
			Landakot	41			
	Total FS				4021.37		2493



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Table No 14.9.(VII) No of Trees (Mark able) Landakot Felling Series (RFS)-Expected

Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Coupe Area	No of Tree/ ha	Total markable trees expected
Landakot Felling Series (RFS)	2021-22	LFS-I	Landakot	53	324.27	0.62	201
	2022-23	LFS-II	Landakot	54	236.81	0.62	147
	2023-24	LFS-III	Landakot	55	310.42	0.62	192
	2024-25	LFS-IV	Landakot	56	552.55	0.62	343
	2025-26	LFS-V	Landakot	57	651.540	0.62	404
			Landakot	58			
	2026-27	LFS-VI	Landakot	59	469.33	0.62	291
			Landakot	72			
	2027-28	LFS-VII	Landakot	73	166.89	0.62	103
	2028-29	LFS-VIII	Landakot	74	371.85	0.62	231
	2029-30	LFS-IX	Landakot	78	486.790	0.62	302
			Landakot	80			
	2030-31	LFS-X	Landakot	79	319.94	0.62	198
Total FS					3890.390		2412

Table No 14.11.(VIII) No of Trees (Mark able) Sagmalia Felling Series (SFS)- Expected

Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Coupe Area	No of Tree/ ha	Total markable trees expected
Sagmalia Felling Series (SFS)	2021-22	SFS-I	Suani	1	352.79	0.31	109
	2022-23	SFS-II	Sagmalia	1	424.5	0.56	238
	2023-24	SFS-III	Sagmalia	2	440.13	0.56	246
	2024-25	SFS-IV	Sagmalia	3	373.13	0.56	209
	2025-26	SFS-V	Sagmalia	4 (1 st P)	250.0	0.56	140
	2026-27	SFS-VI	Sagmalia	4(2 nd P)	250.0	0.56	140
	2027-28	SFS-VII	Sagmalia	4(Bal)	247.13	0.56	138
	2028-29	SFS-VIII	Sagmalia	5	459.03	0.56	257
	2029-30	SFS-IX	Sagmalia	6 (P)	280.00	0.56	157
	2030-31	SFS-X	Sagmalia	6 (B)	280.95	0.56	157
	Total FS				3357.660		1791



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Table No 14.11.(IX) No of Trees (Mark able) Badmal Felling Series (BFS)- Expected

Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Coupe Area	No of Tree/ ha	Total markable trees expected
Badmal Felling Series (BFS)	2021-22	BFS-I	Mochibahal	(2 nd P)	515.00	0.36	185
	2022-23	BFS-II	Mochibahal	(Bal)	515.00	0.36	185
	2023-24	BFS-III	Landakot	69	483.950	0.28	136
			Landakot	70			
	2024-25	BFS-IV	Landakot	68	493.19	0.28	138
			Landakot	71			
	2025-26	BFS- V	Sagjori		584.41	0.39	228
	2026-27	BFS-VI	Kalia		592.41	0.31	184
			Landakot	60			
	2027-28	BFS-VII	Landakot	61	457.70	0.28	128
			Landakot	62			
	2028-29	BFS-VIII	Landakot	63	606.65	0.28	170
			Landakot	64			
	2029-30	BFS-IX	Landakot	65	609.715	0.28	171
			Landakot	66			
			Landakot	67			
	2030-31	BFS-X	Mochibahal	(1 st P)	518.13	0.36	187
	Total FS				5376.155		1711

Table No 14.11.(X) No of Trees (Mark able) Rail Felling Series (RLFS)- Expected

Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Coupe Area	No of Tree/ ha	Total markable trees expected
Rail Felling Series (RLFS)	2021-22	RLFS-I	Rail	17	745.06	0.52	387
	2022-23	RLFS-II	Rail	11	679.700	0.52	353
			Rail	9 (P)			
	2023-24	RLFS-III	Rail	9	773.33	0.52	402
			Rail	13			
	2024-25	RLFS-IV	Rail	16	771.78	0.52	401
	2025-26	RLFS- V	Rail	18	540.42	0.52	281
	2026-27	RLFS-VI	Rail	1	557.16	0.52	290
	2027-28	RLFS-VII	Rail	2	640.38	0.52	333
	2028-29	RLFS-VIII	Rail	7	512.79	0.52	267
	2029-30	RLFS-IX	Rail	14	454.39	0.52	236
	2030-31	RLFS-X	Rail	15	556.1	0.52	289
	Total FS				6231.110		3239



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Table No 14.11.(XI) No of Trees (Mark able) Naktideul Felling Series (NFS)- Expected

Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	No of Tree/ ha	Total markable trees expected
Naktideul Felling Series (NFS)	2021-22	NFS-I	Landimal	5	678.87	0.52	353
	2022-23	NFS-II	Landimal	6	868.65	0.52	452
	2023-24	NFS-III	Landimal	7	489.16	0.52	254
	2024-25	NFS-IV	Landimal	8	547.39	0.52	285
	2025-26	NFS- V	Landimal	9	736.2	0.52	383
	2026-27	NFS-VI	Landimal	1	898.52	0.52	467
	2027-28	NFS-VII	Landimal	2 (P)	530.00	0.52	276
	2028-29	NFS-VIII	Landimal	2 (B)	532.657	0.52	277
	2029-30	NFS-IX	Landimal	3	921.8	0.52	479
	2030-31	NFS-X	Landimal	4	965.49	0.52	502
	Total FS				7168.737		3728

Table No 14.11.(XII) No of Trees (Mark able) Landimal Felling Series (LMFS)- Expected

Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Coupe Area	No of Tree/ ha	Total markable trees expected
Landimal Felling Series (LMFS)	2021-22	LMFS-I	Landimal	10	778.29	0.52	405
	2022-23	LMFS-II	Landimal	11	637.27	0.52	331
	2023-24	LMFS-III	Landimal	12	724.51	0.52	377
	2024-25	LMFS-IV	Landimal	13	694.86	0.52	361
	2025-26	LMFS- V	Landimal	14	628.23	0.52	327
	2026-27	LMFS-VI	Landimal	15	658.3	0.52	342
	2027-28	LMFS-VII	Landimal	16 (P)	580.0	0.52	302
	2028-29	LMFS-VIII	Landimal	16 (B)	577.28	0.52	300
	2029-30	LMFS-IX	Landimal	17	1007.03	0.52	524
	2030-31	LMFS-X	Landimal	18	502.69	0.52	261
	Total FS				6788.460		3530



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Table No 14.11.(XIII) No of Trees (Mark able) GCPur Felling Series (GCFS)- Expected

Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Coupe Area	No of Tree/ ha	Total markable trees expected
GCPur Felling Series (GCFS)	2021-22	GCFS-I	Landakot	23	517.06	0.60	310
			Landakot	24			
			Landakot	25			
	2022-23	GCFS-II	Landakot	19	651.98	0.60	391
			Landakot	20			
			Landakot	21			
	2023-24	GCFS-III	Landakot	22	680.49	0.60	408
			Landakot	2			
	2024-25	GCFS-IV	Landakot	3	849.40	0.60	510
			Landakot	4			
	2025-26	GCFS- V	Landakot	5	677.44	0.60	406
			Landakot	6			
			Landakot	7			
	2026-27	GCFS-VI	Landakot	8	629.97	0.60	378
			Landakot	9			
	2027-28	GCFS-VII	Landakot	10	614.61	0.60	369
			Landakot	11			
	2028-29	GCFS-VIII	Landakot	12	684.61	0.60	411
			Landakot	13			
			Landakot	14			
	2029-30	GCFS-IX	Landakot	15	736.98	0.60	442
			Landakot	16			
	2030-31	GCFS-X	Landakot	17	669.58	0.60	402
			Landakot	18			
			Landakot	1			
Total FS					6712.120		4027



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Table No 14.11.(XIV) No of Trees (Mark able) Balikiari					Felling Series (BKFS)- Expected		
Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Coupe Area	No of Tree/ ha	Total markable trees expected
Balikiari Felling Series (BKFS)	2021-22	BKFS-I	Landakot	82	805.92	0.6	484
			Landakot	83			
			Landakot	84			
	2022-23	BKFS-II	Landakot	75	766.66	0.6	460
			Landakot	76			
			Landakot	26			
	2023-24	BKFS-III	Landakot	77	764.25	0.6	459
			Landakot	27			
	2024-25	BKFS-IV	Landakot	28	800.71	0.6	480
			Landakot	29			
			Landakot	30			
	2025-26	BKFS- V	Landakot	31	744.21	0.6	447
			Landakot	32			
			Landakot	33			
	2026-27	BKFS-VI	Landakot	34	885.14	0.6	531
			Landakot	35			
			Landakot	36			
	2027-28	BKFS-VII	Landakot	37	547.34	0.6	328
	2028-29	BKFS-VIII	Landakot	38	519.29	0.6	312
	2029-30	BKFS-IX	Landakot	85	528.69	0.6	317
			Landakot	86			
	2030-31	BKFS-X	Landakot	87	567.52	0.6	341
			Landakot	81			
Total FS					6929.730		4159



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Table No 14.11.(XV) No of Trees (Mark able) Luhabir Felling Series (LUFS)

Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Coupe Area	No of Tree/ ha	Total markable trees expected
Luhabir Felling Series (LUFS)	2021-22	LUFS-I	Kholgarh	10	616.22	0.67	413
	2022-23	LUFS-II	Kholgarh	11	692.33	0.67	463
	2023-24	LUFS-III	Kholgarh	12	842.31	0.67	564
	2024-25	LUFS-IV	Kholgarh	1	664.76	0.67	445
			Kholgarh	2			
	2025-26	LUFS- V	Kholgarh	3	654.82	0.67	439
	2026-27	LUFS-VI	Kholgarh	4	401.8	0.67	269
	2027-28	LUFS-VII	Kholgarh	5	405.58	0.67	272
	2028-29	LUFS-VIII	Kholgarh	6	452.42	0.67	303
	2029-30	LUFS-IX	Kholgarh	7	402.89	0.67	270
	2030-31	LUFS-X	Kholgarh	9	623.34	0.67	418
	Total FS				5756.47		3856

Table No 14.11.(XVI) No of Trees (Mark able) Jarasingha Felling Series (JFS)

Name of FS	Year of Working	Coupe No	Forest Block	Comp. No	Coupe Area	No of Tree/ ha	Total markable trees expected
Jarasingha Felling Series (JFS)	2021-22	JFS-I	Kholgarh	13	787.86	0.67	528
	2022-23	JFS-II	Talab PRF		626.7	0.68	426
	2023-24	JFS-III	Kholgarh	14	541.42	0.67	363
	2024-25	JFS-IV	Kholgarh	15	400.66	0.67	268
			Balikiari DPF				
	2025-26	JFS- V	Kholgarh	16	509.95	0.67	342
			Podamal DPF				
	2026-27	JFS-VI	Kholgarh	17	645.85	0.60	388
			Jarasingha DPF				
	2027-28	JFS-VII	Kholgarh	18 (P)	425.00	0.67	285
	2028-29	JFS-VIII	Kholgarh	18 (B)	425.08	0.67	285
	2029-30	JFS-IX	Kholgarh	19	732.44	0.67	491
	2030-31	JFS-X	Kholgarh	20	445.87	0.67	299
	Total FS				5540.830		3675



14.6.8.2 Year wise abstract of Trees to be available for Marking (Expected)

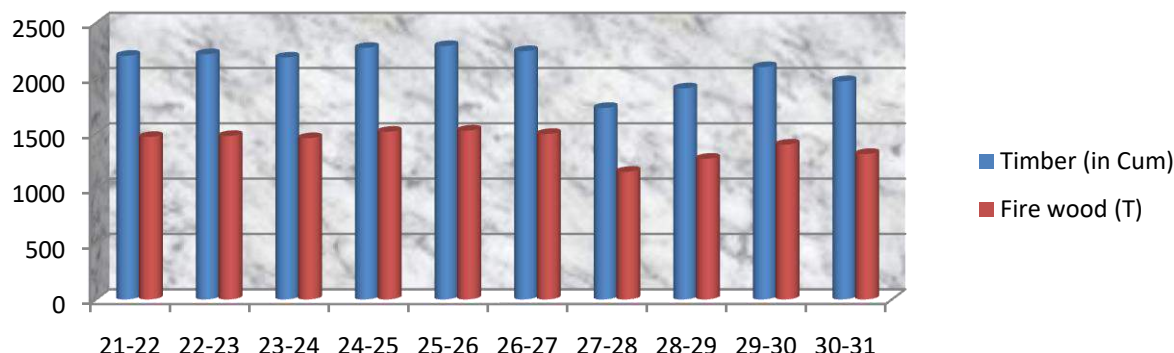
Table No 14.12 Yield calculation table (Timber / Fire wood) – Rairakhol Division.

Felling Series	Year / Coupe No										Total
	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	
	I	II	III	IV	V	VI	VII	VIII	IX	X	
Bidhyabasini	380	350	187	291	381	465	214	379	241	167	3055
Hatidhara	396	205	327	361	403	352	277	178	168	168	2835
Kholgarh	148	230	292	391	305	339	265	223	332	263	2788
Daincha	266	398	286	314	316	313	298	332	231	276	3030
Rahan	85	106	63	63	46	46	46	49	60	59	623
Charmal	246	191	304	196	242	193	212	267	245	397	2493
Landakot	201	147	192	343	404	291	103	231	302	198	2412
Sagmalia	109	238	246	209	140	140	138	257	157	157	1791
Badmal	185	185	136	135	228	184	128	170	171	187	1709
Rail	387	353	402	401	281	290	333	267	236	289	3239
Naktideul	353	452	254	285	383	467	276	277	479	502	3728
Landimal	405	331	377	361	327	342	302	300	524	261	3530
GCPur	310	391	408	510	406	378	369	411	442	402	4027
Balikiari	484	460	459	480	447	531	328	312	317	341	4159
Luhabir	413	463	564	445	439	269	272	303	270	418	3856
Jarasingha	528	426	363	268	342	388	285	285	491	299	3675
Total	4896	4926	4860	5053	5090	4988	3846	4241	4666	4384	46950
Timber (in Cum)	2203	2217	2187	2274	2291	2245	1731	1908	2100	1973	21128
Fire wood (T)	1469	1478	1458	1516	1527	1496	1154	1272	1400	1315	14085

The number of markable trees as indicated may vary within a range of $\pm 2.5\%$ on an average. The marking should be carried out as per actual in the field within this Range of variation as per marking rule prescribed in para 14.6.10 (b). Considering the Crop Composition the Sal / Non Sal ratio may vary from Coupe to coupe but expected to be in 7: 3 Ratios. The yield is calculated @0.45 cum per tree and 5 trees to produce 1 stack of Fire wood equivalent to 1.5 Ton. The yield predicted is 21128 cum of timber and 14085 Ton of Firewood within this plan period. Deviation within $\pm 5\%$ is acceptable. In case of variation more than $\pm 5\%$ is to be analyzed by the Divisional Forest Officer and facts to be recorded in the compartment history.



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14.6.9 Table of felling;

The annual felling program has been furnished at Table No 14.2 under Para 14.4.2 the same is reproduced for ready reference. (Table No 14.13)

Table No 14.13 Table of Felling (2021-22 to 2026-27)						
Name of Felling Series	Year of Operation (Area in ha)					
	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27
Bidhyabasini	521.20	479.66	256.48	398.72	521.59	636.97
Hatidhara	543.06	280.77	448.25	494.47	551.81	482.85
Kholgarh	202.51	315.01	399.87	536.14	417.45	463.72
Daincha	363.75	544.71	391.27	430.0	432.85	428.50
Rahan	273.95	311.11	275.00	273.11	200.00	200.00
Charmal	396.89	308.31	491.51	315.52	389.64	310.96
Landakot	324.27	236.81	310.42	552.55	651.54	469.33
Sagmalia	352.79	424.50	440.13	373.13	250.0	250.0
Badmal	515.00	515.00	483.95	493.19	584.41	592.41
Rail	745.06	679.70	773.33	771.78	540.42	557.16
Naktideul	678.87	868.65	489.16	547.39	736.20	898.52
Landimal	778.29	637.27	724.51	694.86	628.23	658.30
GCPur	517.06	651.98	680.49	849.40	677.44	629.97
Balikiari	805.92	766.66	764.25	800.71	744.21	885.14
Luhabir	616.22	692.33	842.31	664.76	654.82	401.80
Jarasingha	787.86	626.70	541.42	400.66	509.95	645.85
Total	8422.700	8339.170	8312.350	8596.390	8490.560	8511.480



Table No 14.14 Table of Felling (2027-28 to 2030-31)					
Name of Felling Series	Year of Operation (Area in ha)				
	2027-28	2028-29	2029-30	2030-31	Total
Bidhyabasini	293.42	518.75	446.53	308.98	4382.300
Hatidhara	379.62	243.56	230.00	230.37	3884.760
Kholgarh	363.21	305.29	454.26	360.68	3818.140
Daincha	407.844	455.44	316.81	377.91	4149.084
Rahan	200.0	213.46	260.0	254.52	2461.150
Charmal	341.54	430.82	395.49	640.69	4020.561
Landakot	166.89	371.85	486.79	319.94	3890.390
Sagmalia	247.13	459.03	280.0	280.95	3357.660
Badmal	457.70	606.65	609.715	518.13	5376.155
Rail	640.38	512.79	454.39	556.10	6231.110
Naktideul	530.00	532.657	921.80	965.49	7168.737
Landimal	580.0	577.28	1007.03	502.69	6788.460
GCPur	614.61	684.61	736.98	669.58	6712.120
Balikiari	547.34	519.29	528.69	567.52	6929.730
Luhabir	405.58	452.42	402.89	623.34	5755.576
Jarasingha	425.00	425.08	732.44	445.87	5540.830
Total	6600.264	7308.977	8263.815	7622.760	80466.763

14.6.10 Method of executing the Felling:

a) Demarcation of Annual Coupe:

The annual coupes as outlines above shall be demarcated in the preceding year season or working on the ground by clearing 3-meter width. Stone cairns of (75cm +45cm)/2 x 60cm are to be placed at a visible distance and important turning points. The coupe line clearance shall be restricted to clear visibility only without removing the trees (30cm GBH and above) coming within the coupe line. A double coal tar ring shall be put on the breast height or the standing trees on the line at visible distance. In case of line coinciding with that of compartment line, the compartment line will be maintained by marking with double band of white paint at breast height of the trees standing on boundary at visible distance. In case of overlapping with two or more compartments/forests blocks, each compartment shall be treated as separate unit and such unit shall be demarcated with single coal tar ring on the



trees standing on the boundary of compartment/forest blocks. After demarcation of Coupe line a sign board indicating Name of the Range, Felling Series, Coupe No, Area in ha, Year of Working is / are to be placed at entrance of the coupe, Roads adjacent to the coupe line for ease identification.

b) Marking Rules:

The forests to be worked out in this working circle are Sal and Non Sal forests. The crop is of irregular age class and pole crops are generally encountered. Marking should be taken up preferably by Forest Ranger and in no case it shall be below the rank of Forester. It shall be checked by Assistant Conservator of Forests up to 40% of the marking. The Divisional Forest Officer shall also ensure test check of required percentage at least 10% of the marked trees to ensure the application of Marking Rules. The marking should be in a conservative basis not on **“Enhanced Production Approach”**

- i. All trees to be marked for felling shall be blazed at two places, one at breast height and the other at just above ground level.
- ii. The blaze should be of size 15 cm x 15 cm and marked with departmental marking hummer and numbered serially.
- iii. If a tree is forked below the breast height, then it should be treated as separate tree but if forked above breast height, then it should be treated as one tree.
- iv. During marking, the trees shall be classified as sound and unsound basing on the external appearance.
- v. The trees standing on open/blank without established natural regeneration shall be excluded from marking.
- vi. The trees standing on the hilly terrain of 30⁰ slopes or more should not be marked for felling except dead, uprooted trees.
- vii. Trees which cannot be dragged out from the stump site should not be marked.
- viii. Trees standing on nalla banks or eroded areas also should not be marked as this will lead to further soil erosion and gaps.
- ix. Marking also should not be made within 50 meters of public road on both sides, key habitat of wildlife such as game tank, water holes, salt licks and den etc. Area near to spring origin should be left without marking.
- x. The marking of trees shall be restricted to those trees whose removal will not create permanent gap in the canopy and will not affect in the regeneration of the principal



species.

- xi. In case of a tree is marked for felling, no other tree shall be marked within 30 meters Radius of that tree subject to further restriction on removal of trees as per limit stipulated.
- xii. Marking should be done with all the dead, diseased, hollow and even uprooted trees except in case of requirement on the wild life point of view. The tree is reckoned as dead if its crown is completely leafless and the bark is peeled of partly or completely. Similarly, a tree is treated as diseased, if its main trunk is affected with borer and powdery deposit on the stem or base and/or Sambar Akhia or there is visual evidence of affected bole. So also, a tree is considered as hollow, when the hollowness is established through naked eye.
- xiii. Girdling is a common phenomenon in this locality. People girdle the trees one two years prior to marking to make the area suitable for cultivation / encroachment. If such trees are noticed in the coupe such dead trees to be marked at the first instances and such trees to be adjusted against green tree marking. However this practice should be strictly dealt with by the authority.
- xiv. 35% of the available mark able trees are to be marked for removal i.e. out of three available trees one tree to be marked. The overall limit of number of trees in a compartment is to be regulated as per **Table No 14.8**
- xv. The fruit yielding trees like Mango, Kendu, Char, Mahula, Tamarind, Kusum, Bela etc. shall not be marked during its productive age.

c) Improvement marking:

The improvement marking shall be carried out mainly to improve the crop composition and enhance diameter growth without aiming at any yield from it. The following rules are prescribed for the circle.

All dead, diseased and defective trees will be marked for felling. However some dead standing trees as prescribed in the Wildlife Overlapping Working Circle will be retained in the interest of wild life purpose.

The marking and removal shall be subject to the following conditions:

- The marked trees shall form part of congested crop and principle of thinning warrants its removal.



- There shall be established seedlings, sapling or poles to replace the removal. No marking of fruit bearing trees such as Mango, Tamarind, Mahula, Kendu, Bela, Char, Kusum etc shall be done for its removal. The marking of trees shall be always of inferior species interfering or likely to establish growth of principal species. The principle of thinning as described below to be followed.

d) Execution of Marking & Thinning:

The objectives of taking of thinning are

- i) To improve the hygienic condition.
- ii) To create best conditions of growth & obtain diameter growth of remaining trees.
- iii) Salvage the anticipated losses of the merchantable volume.
- iv) To obtain a desirable composition of crops.
- v) Retaining seed bearers.
- vi) Improvement in wood quality.
- vii) To obtain intermediate yield and increase net yield and financial out-turn.
- viii) Decomposition of raw hummus.
- ix) To reduce the risk of diseases and pests.

After thinning, the results expected are

- Reduced competition in root and crown,
- Reduced weed growth,
- Improved quality of wood,
- Regulation of rate of growth,
- Increase seed production,
- Reduction in the net cost of growing,
- Reducing the risk of fire and diseases,
- Encouraging the advanced growth,
- Fulfilling the market demands.

For undertaking thinning the following aspects are to be kept in mind.

- I. Before planning the nature and intensity of thinning preference between the intensity of thinning and quality of thinning should be decided.
- II. The trees remaining after the thinning should be able to compensate for the loss in increment by trees removed in thinning.



- III. There will be an optimum stocking for a given site and species.
- IV. For this individual trees are classified by height and size of crown and thinning is decided on the basis of which classes of trees are fit to be removed for maintaining the desired qualitative and quantitative nature of the thinning.
- V. The main purpose of the thinning is to release more space for future development of trees; the freedom of crown is the guiding factor for thinning purpose.
- VI. The retention of trees per unit should be decided first and then the number of trees to be removed should be marked accordingly.
- VII. The development of crown and stem are the deciding factor for sub-classification of the dominance classes of trees for the given site and species.
- VIII. Tree classification in regular forests are done as under

1. Classification based on height:

i) Dominant trees (D or D1)

It includes the trees that form the uppermost leaf canopy. They are the tallest trees that determine the top level of canopy they are also called pre-dominant trees.

ii) Co-dominant trees (CD or D2)

These are shorter than dominant. About $5/6^{\text{th}}$ of the height of the dominant.

iii) Sub-dominant trees (SD or D3)

They do not form part of the uppermost leaf canopy. Their height is about $3/4^{\text{th}}$ that of the tallest trees. They are also called dominated trees.

iv) Suppressed trees (S)

The height of the suppressed trees is about $1/2$ to $5/8^{\text{th}}$ of the height of the best trees. Suppressed trees grown below the crowns of the other trees in the stand. The leading shoots are over-topped by their neighboring trees or at least shaded on all sides by them.

v) Wolf trees (W)

The wolf trees are large, coarse and misshapen trees.



vi) **Whips (Wh)**

This class comprises bent over and badly leaning trees. Whips have tall, thin stems which are unstable and may cause damage to other trees when they sway.

vii) **Dead, dying and moribund trees (m)**

This category consists of trees that are dead or at the point of death.

viii) **Disease trees (k)**

It includes trees that are infected with parasites and their growth is seriously affected due to infection.

ix) **Reproduction or Regeneration (r)**

It consists of recruits or regeneration.

x) **Over mature or veterans.**

Classification on the Basis of Crown

The crown spread may be taken as better indication than canopy position to understand growth potentialities of a tree. For this tree may be classification on the basis of the crown with average stem spacing as shown below:-

I. **Spaced**

Trees with free crown spreading having less than or equal to $3/4^{\text{th}}$ that of spacing.

II. **Co-spaced**

Trees with a free crown spread having $3/4^{\text{th}}$ to $1/2$ (50-75%) that of the available spacing.

III. **Sub-spaced**

Trees with the spread of free crown less than half but more than one-fourth $1/4^{\text{th}}$ of the spaced.



IV. Mal-spaced

Trees with a very small spread of trees crown which is less than a quarter of the spaced.

V. De-spaced

Trees will no free crown with little vigor.

VI. Dead, dying and low yielding trees

In the present situation, it is recommended to follow an ordinary thinning as described below.

This is known as “THINNING FROM THE BLOW” and consists of the removal of inferior individuals starting from the suppressed class, then taking the dominated class and ultimately some of the dominant class.

It is a very common form of selective thinning in regular crops. It has been devised to be in line with nature because only those trees which have been unsuccessful in the struggle for growth are removed first.

i) Grade of Ordinary Thinning

The thinning grades are defined by the spacing class removed so that a check may be made by comparing yield table numbers for the mean diameter in question. There are various grades of thinning e.g. A, B, C, D, E, grades.

I. A-Grade

Light thinning- removal of dead, dying, diseased and suppressed trees.

II. B-Grade:

Moderate thinning - In addition to trees in A-grade further removal of defective dominated stems and whips. Advance growth which cannot be pruned or lopped may also be removed.



III. C- Grade (Heavy thinning):

This includes trees in grade A and B and all remaining dominated defective, co-dominants that may be removed without making lasting gaps in canopy. The C grade thinning is the standard grade in vogue for yield table compilation.

IV. D-Grade (Very Heavy Thinning):

This includes trees of all above grades and some good dominants so that no lasting or permanent gap develops in canopy. The left over trees are with good boles and crowns, well spaced and evenly distributed over the site for future development.

V. E-Grade (Extremely Heavy Thinning):

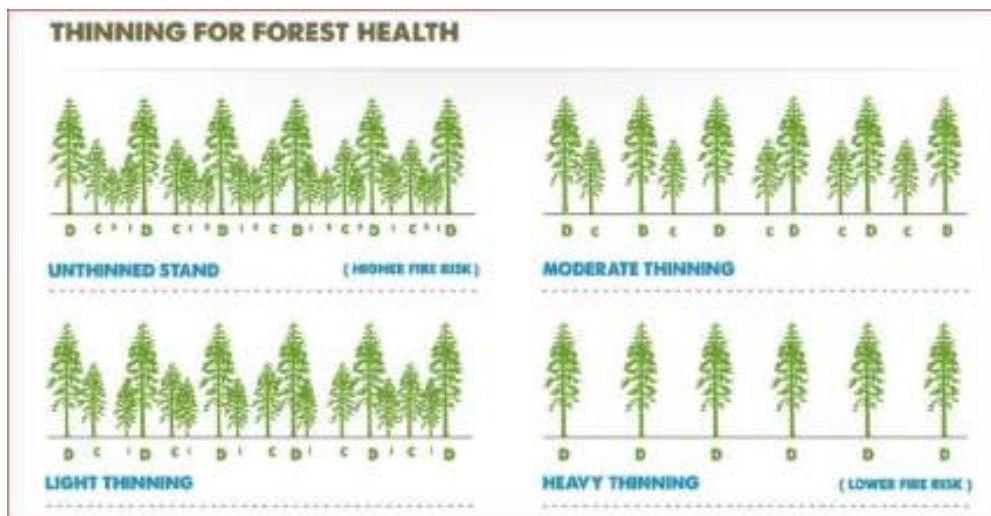
This type of thinning is adopted mainly for research purposes. This is the heaviest thinning that can be made in the crop without creating permanent gaps in the canopy. Many dominant stems are also removed.

It is always better to make C-grade or D-grade thinning in a dense crop in which thinning has been unduly delayed. The removal of trees should be Economic or Hygienic value. In addition to above classes the intermediate grades of thinning such as C/D may be carried out.

Precautions in First Thinning

The first thinning is very important for any crop. The following factors should be considered at the time of first thinning.

- The thinning should take place before adjoining trees check one another's growth.
- The thinning should not be postponed on the ground that the poles obtained will be non-saleable or uneconomic.
- The age of first thinning should be taken on the basis of height or size attained.
- The heavy thinning should not be carried on poorer sites, drier areas and steeper slopes, because the gaps may not fill up due to poor growth of trees.
- All thinning should be done on the silvicultural lines.
- The light demander species may require heavier thinning as compared to the shade bearer species.
- It is best to carry out silvicultural thinning. Some admixture of secondary species may be retained where this is desired on silvicultural or protection grounds.



ii) Thinning In Irregular Crops:

It is difficult to classify tree in an irregular crop. The general classifications which are used for the research purposes are THREE crown positions. It is suggested that in regular crops the degree of crown freedom and their further classification into large, medium and small crown sizes, should be taken in account.

Crown Freedom	Free	Restricted	Confine
Crown development or crown size	Well developed or large	Average or medium	Poor or small

- The crown freedom is judged irrespective of the size of the tree and its position in the stratification.
- The thinning in an irregular crop is done by selection method.
- The trees to be cut are those which restrict the growth of their neighbors on all sides and should be more valuable than their neighbors.
- The aim should be to maintain a crop of all diameter classes in a sufficient number of maximum sustained yield.



- The valuable species are retained whereas inferior trees of all diameter classes are removed.
- The removal of trees is carried out in diameter classes.
- It aims at continuous improvement by repeated removal of inferior stems in all diameter classes so that basal area or standing volume becomes more or less equal to theoretical ideal value.

iii) Factors Affecting Thinning Practice:

The following factors may be considered before the thinning practice:

1. Site Factors
2. Nature of species
3. Age

1. Site Factors

The site quality influence on thinning practice is that a relatively close canopy on the poorer sites should be maintained. On low quality sites heavy openings should not be made. The spacing out widely in earlier stages should not be carried out on hot, dry, slopes, on poor soils and on all sites where grass and other weed invasion is likely to occur. A poor site will usually support less stems per hectare than a good one.

2. Nature of Species

The shade-bearers are more tolerant of crown than the light demanders therefore more frequent thinning is needed for light demander species. Light demanders usually show good response to ordinary thinning where as shade-bearers to crown thinning. Sal, Sisoo, Asan, Teak, being light demanders require heavier grades of ordinary thinning.

3. Age

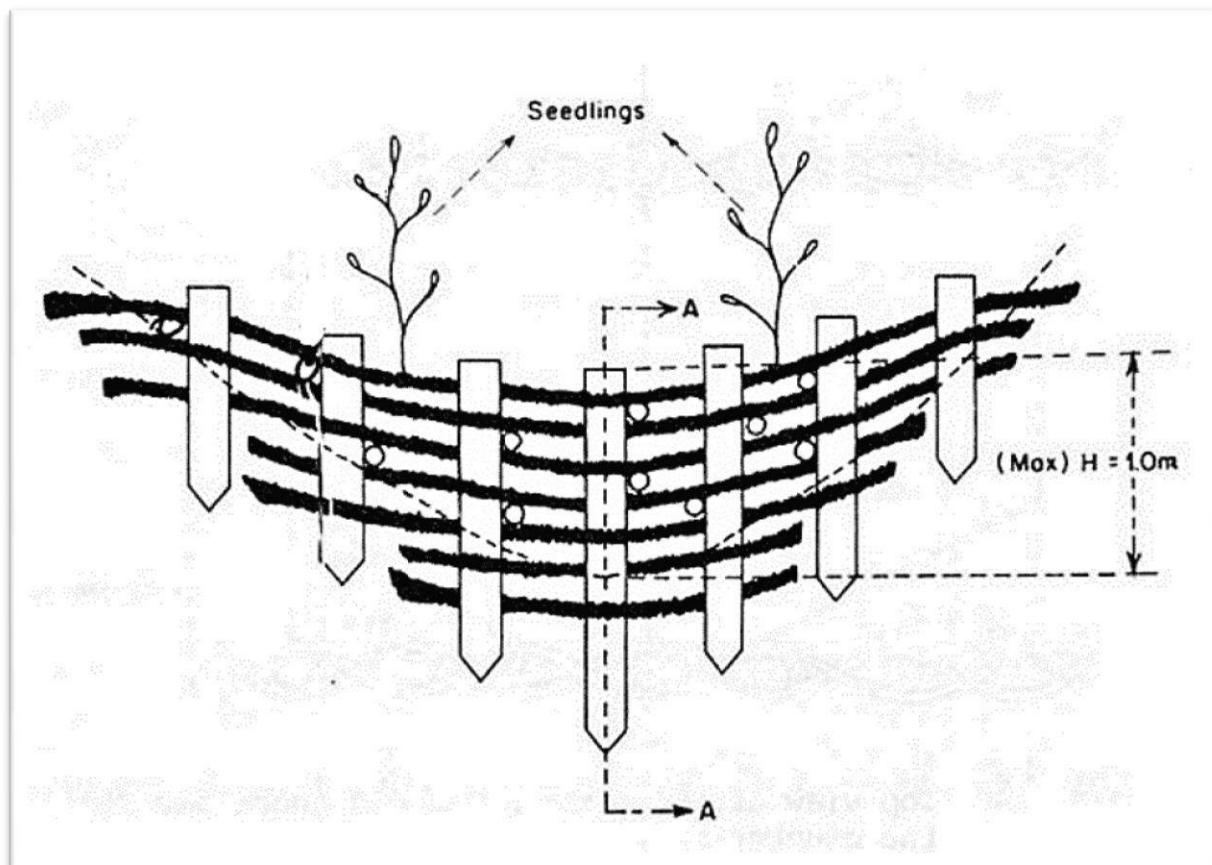
The crown formation depends on age and in young ages when the crown formation is not completed mechanical thinning or sticks thinning may be done with succession. The light demander species require heavier grade of thinning at frequent intervals in younger crops. On the other hand some species in middle age or maturity require crown thinning.



14.6.11 Subsidiary silvicultural operations (cleaning and thinning):

After Coupe working, the coupe area is required to be improved through Subsidiary Silvicultural Operation. The following works are required to be taken up under Subsidiary Silvicultural Operation (SSO)

- (i) All marked trees those have not been removed by the OFDC Ltd during coupe working are required to be removed without considering its economic value.
- (ii) All debris, barks etc are to be removed from the coupe area and may be dumped in pits for natural decay and formation of humus.
- (iii) All diseased tree parts should be removed from the coupe and preferable burnt in order to check it's out break.
- (iv) High stumps of living trees if found, it should be cut back at a height 30-40cm above the ground level.
- (v) Silvicultural Cleaning and thinning are two major subsidiary silvicultural operations being prescribed. Cleaning is being taken up in Sapling crops where as thinning is prescribed in pole crops. If such crop is available within the coupe cleaning / thinning if required to be taken up.
- (vi) Soil & Moisture Conservation work is required to be taken up. The forests assigned to this working circle are mostly in pole stage. Hence thinning as required is prescribed. The details of thinning have been described under Para- 14.6.10.4 above.
- (vii) Soil & Moisture Conservation: Moisture regime of a forest block greatly influences the crop composition, quality class and productivity of the forests. The dryer the tract – poorer is the vegetation. The forests included in this working circle are the best available forest blocks of the division. It is recommended to improve soil moisture regime in forests to improve the vigour of the crop, allow the species towards a climatic climax with increased biodiversity. It is recommended to treat all the available seasonal nallas to enhance period of water flow, check soil erosion in slopes, increase the humus layer in forest floor. The following activities are prescribed.



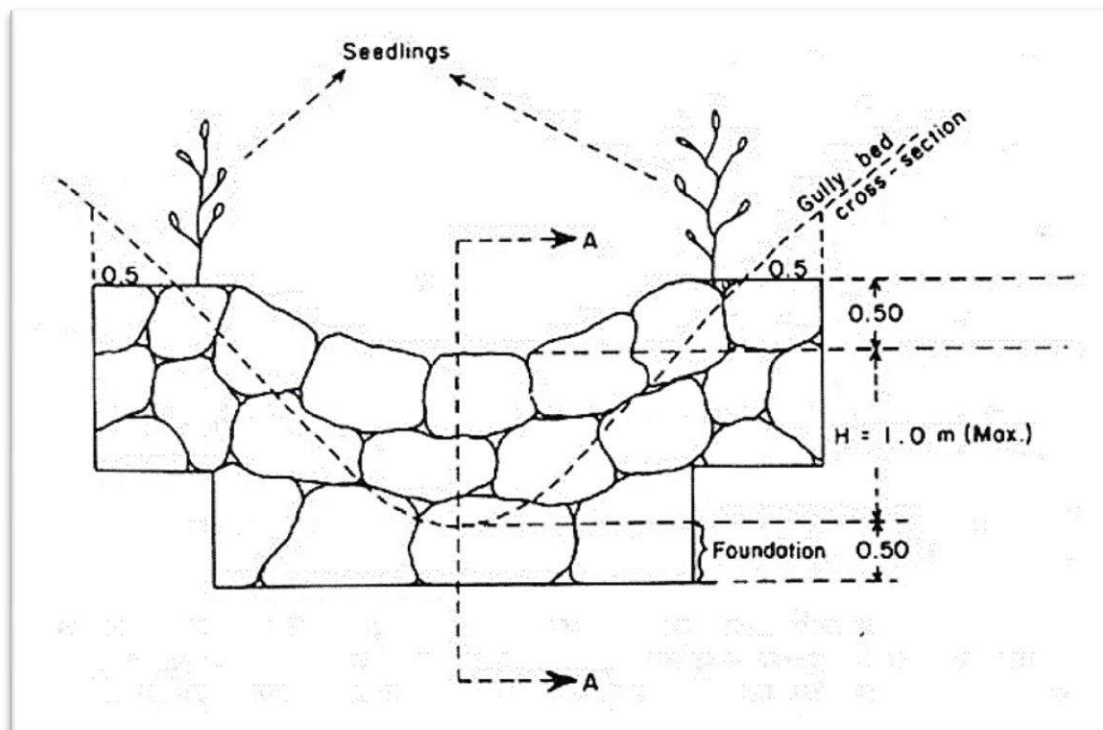
- a) V
vegetative / brushwood Check dams on nalla bed.
- b) Loose boulder Check dams (LBCD)
- c) Percolation Pits.
- d) Create & Maintain Humus layers to reduce run off and enhance time of collection.

(A) Vegetative / Brushwood check dams:

Brushwood check dams made of posts and brush are placed across the gully / Nalla bed. The main objective of brushwood check dams is to hold fine material carried by flowing water in the gully / nalla. Small gully heads, no deeper than one meter, can also be stabilized by brushwood check dams. Brushwood check dams are temporary structures.

They can be employed in connection with land use changes such as improved range management until vegetative and slope treatment measures become effective.

This type of check dams can be constructed by using fallen materials on forest floor.



(B) Loose Boulder Check Dams (LBCD):

Loose stone check dams made of relatively small rocks are placed across the gully. The main objectives for these dams are to control channel erosion along the gully bed and to stop waterfall erosion by stabilizing gully heads. Loose stone check dams are used to stabilize the incipient and small gullies and the branch gullies of a continuous gully or gully network.

(C) Percolation Pits / trench:

A percolation trench, also called an infiltration trench, is a type of Best Management Practice (BMP) that is used to manage storm water runoff, prevent flooding and downstream erosion, and improve water quality in an adjacent river, stream. It is a shallow excavated trench filled with gravel or crushed stone that is designed to infiltrate storm water through permeable soils into the groundwater aquifer.

A percolation trench is similar to a dry well, which is typically an excavated hole filled with gravel.



(D) Create & Maintain Humus layers:

The forest floor, also called detritus, duff and the O horizon, is one of the most distinctive features of a forest ecosystem. It mainly consists of shed vegetative parts, such as leaves, branches, bark, and stems, existing in various stages of decomposition above the soil surface. Although principally composed of non-living organic material, the forest floor also teems with a wide variety of fauna and flora. It is one of the richest components of the ecosystem from the standpoint of biodiversity because of the large number of decomposers and predators present, mostly belonging to invertebrates, fungi, algae, bacteria. Certain (adapted) plants may be more apparent in tropical forests, where rates of metabolism and species diversity are much higher than in colder climates.

The major compartments for the storage of organic matter and nutrients within systems are the living vegetation, forest floor, and soil. The forest floor serves as a bridge between the above ground living vegetation and the soil, and it is a crucial component in nutrient transfer through the biogeochemical cycle. Much of the energy and carbon fixed by forests is periodically added to the forest floor through litter fall, and a substantial portion of the nutrient requirements of forest ecosystems is supplied by decomposition of organic matter in the forest floor and soil surface. The sustained productivity of forests is closely linked with the decomposition of shed plant parts, particularly the nutrient-rich foliage.

The amount of material in the forest floor depends on the balance between inputs from litter production and outputs from decomposition, and amounts also reflect the site's disturbance history. Both litter production and decomposition are functions of the site (e.g., wet versus dry; cold versus warm; nutrient rich versus nutrient poor) and the vegetation that occupies the site (e.g., conifer versus broadleaf). A site's forest floor is determined by its areal weight, depth, and nutrient content. Typically, forest floors are heaviest and deepest in boreal forests and mountain forests where decomposition rates are slow. In contrast, the lightest and thinnest forest floors usually occur in tropical forests where decomposition rates are rapid.

Key soil functions SOM provide for include:

Nutrient Supply.

Upon decomposition, nutrients are released in a plant-available form while maintaining current levels.



Water-Holding Capacity.

Organic matter behaves somewhat like a sponge. It has the ability to absorb and hold up to 90 percent of its weight in water. Another great advantage of organic matter is that it releases nearly all of the water it holds for use by plants. In contrast, clay holds great quantities of water, but much of it is unavailable to plants.

Soil Aggregation.

Organic matter improves soil aggregation, which improves soil structure. With better soil structure, water infiltration through the soil improves, which improves soil's ability to take up and hold water.

Erosion Prevention.

Because of increased water infiltration and stable soil aggregates erosion is reduced with increased organic matter. Estimating Organic Material Needed to Increase Soil Organic Matter.

In Sal forests heavy leaf fall during January / February covers the entire forest floor. Frequent forest fire break the nutrition cycle in forest resulting poor forest growth. In order to enhance decomposition of leaf litters it is recommended to check burning of leaf litters, allow moderate grazing in February/ March for trampling and breaking of curacious leaf.

14.6.12 Regeneration:

a) Sowing of Seeds:

In the assigned forest blocks there are blank areas. It is recommended to cover the blank areas more than 0.50Ac to be covered under sowing of seeds. Seeds of Sal, Piasal, Sisoo, Asan, Arjun, Jamu, Kusum are to be sown on line or thali in June 1st / 2nd week just after few pre-monsoon shower. This arrangement will allow recruits to come up. Subsequently little care in form of weeding may fill up the gaps.

The silvicultural system adopted for this working circle is a "High Forest System". For regeneration, the seed bearers are to be well maintained and covering of blank areas by sowing of seeds with after care is prescribed. Collection of genetically good seeds is to be stressed. The standard guideline for selecting a mother tree is furnished below.



- Collect seed lots from between 15 and 25 individuals that are spaced at least 100 meters distance from any other collection tree of the same species.
- Choose trees in vigorous health and avoid any that are diseased, suppressed, deformed, environmentally stressed, or in otherwise poor health.
- Collect from trees that are well formed and either dominant or co-dominant in the canopy.
- Avoid individuals that are isolated from others of the same species.
- Harvest only mature seed from ripened fruits.
- To ensure genetic variation, collect fruits equally from all parts of the crown--top, sides, and bottom--as these parts may have been pollinated at varying times from different sources.
- Collect throughout a species' normal habitat, noting variations in site.
- Man-made stands, including live fencing, plantations, or windbreaks, should be carefully reviewed as to their establishment before being selected as a seed source.

b) Closing to Grazing:

The area assigned to a particular year is required to be closed to grazing for three to protect the natural regeneration to attain a sapling stage. This should be strictly adhering to. **A formal “Close to Grazing” order is to be issued and circulated to local offices / villages and VSS.**

Table no. 14.15 Closing to Grazing										
Year										
Coupe	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31
I	Closed									
II		Closed								
III			Closed							
IV				Closed						
V					Closed					
VI						Closed				
VII							Closed			
VIII								Closed		
IX									Closed	
X										Closed

c) Fire Protection Measure:

Strict Fire Protection measures are required to be taken up / ensured for 1st three years. All possible measures at hand are required to be utilized to enforce Fire Protection. The following methods may be adopted depending upon extent of fire / time/ resource at hand.



- a) Control burning of debris,
- b) Fire line maintenance,
- c) Counter Firing,
- d) Beating out of Fire and use of blower machines,
- e) Use of Chemical extinguishers to control large in assessable fires.

As many forest blocks / large area have been assigned to VSS for protection etc, their assistance to be availed for fighting against fire. A Standard Operating Procedure (SOP) is required to be drawn up to meet any eventuality on Fire.

14.6.13 Associated regulations and measures:

Fire, grazing though two important site degraders, it can be judiciously use in high forest system to initiate a good regeneration. This aspect is to be seriously thought up and implemented to have a better stand.

Villagers / VSS are to be actively involved in all operations in assigned area. Their contribution will have a better result at a long run.

14.6.13.1 Annual Control Form:

The forest blocks assigned to a particular year for operation shall be taken up in the assigned year. After execution of prescribed work, an annual Report to be furnished in the form prescribed below. In case any deviation, the reason for such deviation is to be recorded. In case of spill over to next year for taking up the assigned operation, necessary approval of deviation is required to be obtained from PCCF, Odisha / CCF (P&SM) before executing the work. A copy of approved deviation shall find place in the Compartment History File.

Working circle- periodic block-		Felling- series cutting section	Localities prescribed localities suggested				Coupe control form		
							Coupe No.		Page
			As carried out				Excess(+) or deficit (-)		
Prescription in brief	W.P. para	Year due	Year	Block/ Compt.	Area	Volum e	Area	Volume	Remarks and Sanction
1	2	3	4	5	6	7	8	9	10



FELLING CONTROL FORM

128. The format of felling control form is as under:

Working circle- periodic block		Felling series- cutting section		Localities prescribed localities suggested (with areas)				Coupe control form	
Range wise	Area	Species	Diameter class	Trees marked	Unit factor	Volume marked	Trees retained	Coupe No.	Page
1	2	3	4	5	6	7	8	9	10

14.6.13.2 Deviation Statement:

Any large and unusual operation from yield and target for plantation/ regeneration/ and or other activities provided in control forms of the working plan constitutes a deviation. These should also be speltout. The check is through control forms and reporting is through deviation statements. Deviation beyond 20% of the target is considered a major deviation.

Statement showing deviations from working plan prescriptions

Year

Division

Serial No. of deviation	Control book name, form no. page	Reference to working plan		Nature of deviation requiring sanction
		Paragraph	Nature of prescription	





CHAPTER-15

REHABILITATION WORKING CIRCLE (RWC)

15.1 Name of working circle:

The Forest Blocks previously managed under Rehabilitation Working Circle and still in open forest category i.e. crop density below 40% are required to be treated further. Many forest blocks could not be treated in the previous plan period. The areas treated under working plan prescriptions but have not yielded desired result. Observing the present crop condition, status of regeneration and over all juvenility of vegetation and soil moisture regime, it is felt to provide adequate silvicultural treatment to bring the crop to Medium Dense Forest. It is recommended to treat the forest blocks under “**Rehabilitation Working Circle**”.

15.2 General constitution of working circle:

The Forest blocks of the Division i.e. Reserved Forests, Proposed Reserved Forests and Demarcated Protected Forests having crop density less than 40% and heavily affected by biotic interference are included in this Working Circle. The total area included in this working circle is 9995.9725 hectare (9.81 %) of the total forest area under management prescriptions of this plan. The Forest Block assigned to this Working Circle and area allotted is furnished in **Table No 15.1**

Table No: 15.1 Forest Area Allotted to RWC – Rairakhol Division (area in ha)

Sl No	Name of Forest Block	Com p no	GIS compt. Area	Area diverted under		Area available for Management	Allotted to	
				FC Act 1980	FRA		RWC	JFM(O) WC
Reserved Forests.								
B. Badbahal Range								
1	Rahan	1	406.77			406.77	371.77	
	Rahan	2	379.95			379.95	329.17	50
		Total	786.72			786.72	700.94	50
	Range Total		786.72	0	0	786.72	700.94	50
C. Charmal Range								
2	Suani	2	327.18	0.0375		327.1425	327.1425	24.4
	Range Total		327.18	0.0375	0	327.1425	327.1425	24.4



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Table No: 15.1 Forest Area Allotted to RWC – Rairakhol Division (area in ha)

Sl No	Name of Forest Block	Com p no	GIS compt. Area	Area diverted under		Area available for Management	Allotted to	
				FC Act 1980	FRA		RWC	JFM(O) WC
D. Badmal Range						0		
3	R. Badmal	1	361.1			361.1	341.1	
	R. Badmal	2	778.03			778.03	778.03	
4	Chargad	1	473.41			473.41	473.41	
	Range Total		1612.54	0	0	1612.54	1592.54	0
E. Naktideul Range						0		
5	Nadia	1	404.82			404.82	404.67	120
	Nadia	2	527.71			527.71	527.71	148
	Range Total		932.53	0	0	932.53	932.38	268
Div Total (RF)			3658.97	0.0375	0	3658.9325	3553.003	342.40
Proposed Reserved Forest								
A. Redhakhol Range								
6	Purunapani		962.39			962.39	950.01	100
	Range Total		962.39	0	0	962.39	950.01	100
B. Badbahal Range								
7	Hemantakhol		214.92			214.92	214.92	
	Range Total		214.92	0	0	214.92	214.92	0
C. Charmal Range								
8	Behrampura		777.38			777.38	777.38	50
9	Rasibeda		93.62			93.62	93.62	60.5
	Siaripani		204.72			204.72	203.72	158.60
	Range Total		1075.72	0	0	1075.72	1074.72	269.10
D. Badmal Range								
10	Koilipadar		227.83	2.49		225.34	217.54	50
11	Satsama		474.95			474.95	464.75	
	Range Total		702.78	2.49	0	700.29	682.29	50
E. Naktideul Range								
12	Rohinigadia		569.43			569.43	569.43	
	Range Total		569.43	0	0	569.43	569.43	0



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 15.1 Forest Area Allotted to RWC – Rairakhol Division (area in ha)

Sl No	Name of Forest Block	Com p no	GIS compt. Area	Area diverted under		Area available for Management	Allotted to	
				FC Act 1980	FRA		RWC	JFM(O) WC
F. Girishchandrapur Range								
13	Goudpali		58.24			58.24	58.24	
	Range Total		58.24	0	0	58.24	58.24	
	Div. Total (PRF)		3583.48	2.49	0	3580.99	3549.61	419.10
DPF (Demarcated Protected Forest)								
A. Redhakhol Range								
14	Bada-Hindol#		581.32			581.32	569.32	193
15	Hinterei		111.55			111.55	106.55	37
16	Terbeda		35.99			35.99	35.99	12
	Range Total		728.86			728.86	711.86	242
C. Charmal Range								
17	Kusumbahali		326.49			326.49	301.49	108
	Range Total		326.49			326.49	301.49	108
E. Naktideul Range								
18	Abmajhari		189.41			189.41	189.41	63
19	Abmajhari-Dhadrokhhol		596.42			596.42	596.42	199
20	Bahaljharan		128.14			128.14	127.54	43
21	Dhadrokhhol		326.84			326.84	326.84	109
22	Lampaphuli		426.58			426.58	426.58	142
23	Penthabahal		28.46			28.46	27.96	9
	Range Total		1695.85			1695.85	1694.75	565
F. Girishchandrapur Range								
24	Budbuda		102.42			102.42	102.42	34
25	Phulkusum		86.05			86.05	82.84	29
	Range Total		188.47	0	0	188.47	185.26	63
	Div. Total (DPF)		2939.67	0	0	2939.67	2893.36	978
	RWC Total		10182.12	2.5275	0	10179.5925	9995.9725	1739.50

Under Charmal Range,



15.3 General characteristics of vegetation:

The Blocks assigned to this working circle are degraded forest with crop density less than 40%. The crop is mostly Sal forest, Mixed Forests and enriched by mixed Plantations. Due to biotic interference and prolonged dry spell, crop composition is changing from Sal to mixed crops in patches. Some mixed plantations and bamboo plantations have been tried. The crop is quite uneven. Trees of all age class are noticed. Due to coppice origin, growth is stunted and in a pole stage. Due to Biotic interference, annual fire, the soil is mostly regressed. The open spaces created due to unplanned felling have been infested with heavy weeds. Now natural regeneration is moderate. There are plantations within RF/ PRF/ DPF during last plan period as enrichment plantations. The growth is not so prominent than the surroundings. It became difficult to prescribe management practices for such plantations. An intensive silvicultural operation with strict fire protection may improve the condition.

15.4 Rehabilitation Series / Rehabilitation Section:

For convenience of treatment and well distributed working the following Treatment Series are constituted. These are as follows. (Table No 15.2)

Table No 15.2 Area assigned to various Rehabilitation Series.

Sl No	Name of Rehabilitation Series	Range	Forest Block	Comp . No	Area in ha	Reh. Series Area in Ha
1	Rairakhol – Badbahal Rehabilitation Series	Rairakhol	Purunapani		950.01	2577.73
		Charmal	Bada-Hindol DPF		569.32	
		Rairakhol	Hinterei DRF		106.55	
		Rairakhol	TerbedaDRF		35.99	
		Badbahal	Rahan	1	371.77	
			Rahan	2	329.17	
			Hemantakhol		214.92	
2	Charmal Rehabilitation Series	Charmal	Suani	2	327.1425	1703.3525
			Behrampura		777.38	
			Rasibeda		93.62	
			Siaripani		203.72	
			Kusumbahali		301.49	
3	Badmal Rehabilitation Series	Badmal	R. Badmal	1	341.1	2274.83
			R. Badmal	2	778.03	
			Chargad		473.41	
			Koilipadar		217.54	
			Satsama		464.75	



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4	Naktideul Rehabilitation Series	Naktideul	Nadia	1	404.67	1501.81
			Nadia	2	527.71	
			Rohinigadia		569.43	
5	Naktideul- GCPur Rehabilitation Series	GC Pur	Goudpali		58.24	1938.25
			Budbuda		102.42	
			Phulkusum		82.84	
		Naktideul	Abmajhari		189.41	
			Abmajhari-Dhadrokhhol		596.42	
			Bahaljharan		127.54	
			Dhadrokhhol		326.84	
			Lampaphuli		426.58	
			Penthabahal		27.96	
5 Reha. Series				9995.973	9995.9725	

15.4.1 Rehabilitation Series Abstract:

Table No 15.3 Abstract of Rehabilitation Series			
Sl No	Name of Rehabilitation Series	Range	Area assigned in Ha
1	Rairakhol – Badbahal Rehabilitation Series	Rairakhol & Badbahal	2577.73
2	Charmal Rehabilitation Series	Charmal	1703.3525
3	Badmal Rehabilitation Series	Badmal	2274.83
4	Naktideul Rehabilitation Series	Naktideul	1501.81
5	Naktideul- GCPur Rehabilitation Series	Naktideul & GCPur	1938.25
Total 5 Reh. Series			9995.9725

15.5 Blocks, compartments and JFM area:

Under Joint Forest management (JFM) Resolution most of the degraded forests have been assigned to VSS for protection and management as per JFM Resolution 2011 and amendment thereof. The area assigned to VSS is furnished at Table No 15.1 above

15.6 Special objectives of Management:

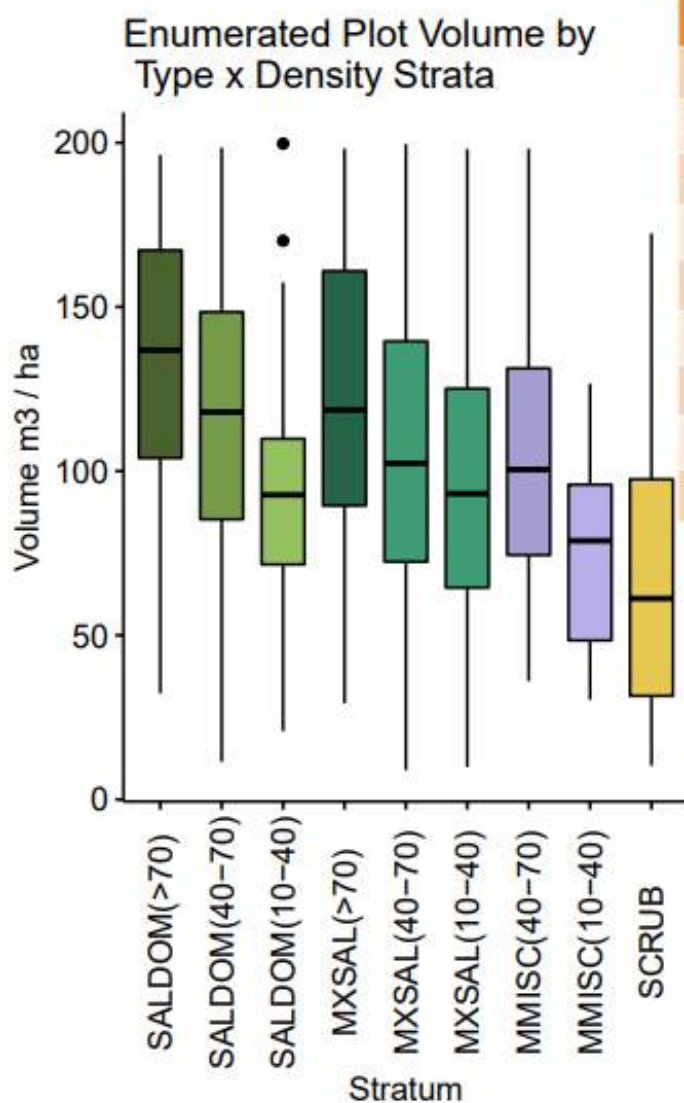
The Special Objectives of Management set out for this Working Circle within the ambit of the general objectives of management are as follows.



- (i) To induce natural regeneration & improve the condition of existing forests through protection against encroachment, grazing, fires and illicit felling.
- (ii) To improve the crop density to more than 50% from the present position through protection, Silvicultural practices.
- (iii) To enhance soil enrichment through Soil & Moisture Conservation measures.
- (iv) To regulate the surface water runoff to enhance percolation and water availability down the streams.
- (v) To protect against the River Bank / Stream Bank erosion through vegetative measures.
- (vi) To restock barren areas through artificial regeneration with most desirable indigenous species.
- (vii) To have partnership with the local community in protection and management of the forests.
- (viii) To increase the water retaining capacity of the soil & bring the crop to climax species composition.
- (ix) To Control / eradicate the weeds and check its invasion.
- (x) To restore and improve the microclimate and micro edaphic condition of forests.
- (xi) To increase the biodiversity and heterogeneity in the forest crop by encouraging natural regeneration.

15.6.1 Analysis of the crop:

Basing on Sample Point enumeration data, the NRSC Report indicates most of the forest blocks as degraded and the overall report on crop density, Strata as found out is furnished below.



Stratum	Numpt	MeanPerHa
SALDOM(>70)	98	129.87
SALDOM(40-70)	109	116.79
SALDOM(10-40)	20	97.72
MXSAL(>70)	68	120.93
MXSAL(40-70)	403	106.73
MXSAL(10-40)	200	97.33
MMISC(40-70)	19	102.60
MMISC(10-40)	16	75.51
SCRUB	37	72.59

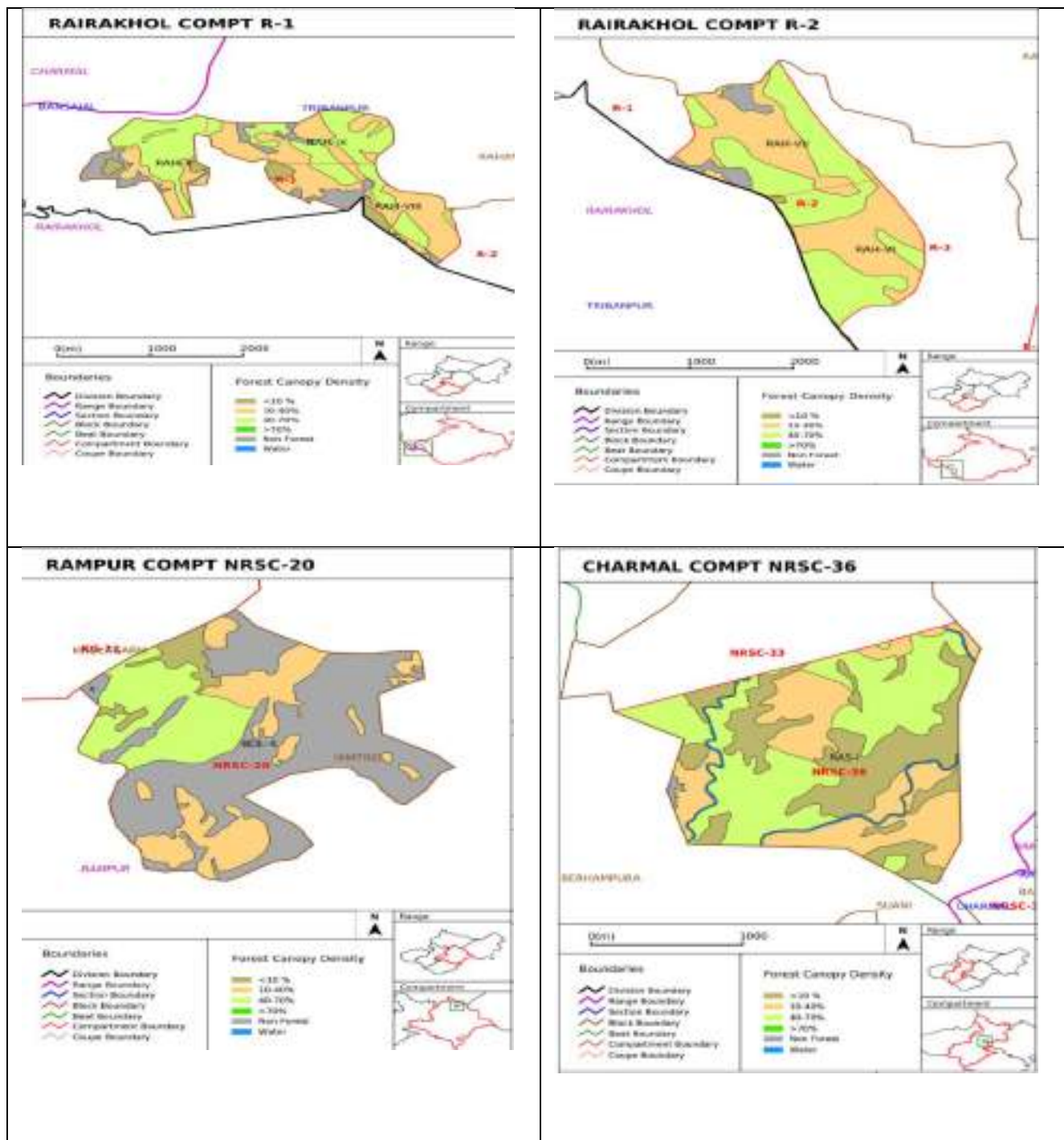
TreesPerHa	BAPerHa	VolPerHa
310.85	14.21	107.17

MeanVol	SE	LB	UB
107.02	0.02	103.64	110.39

The crop distribution pattern of some forest blocks are analysed in details for overall concept about the crop.

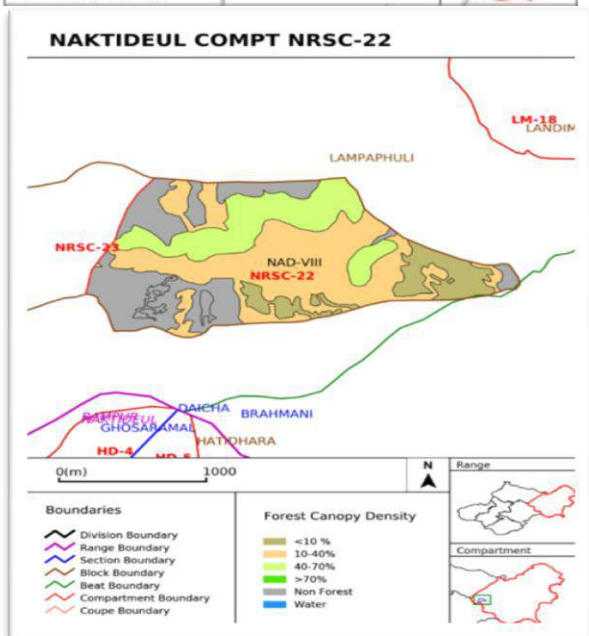
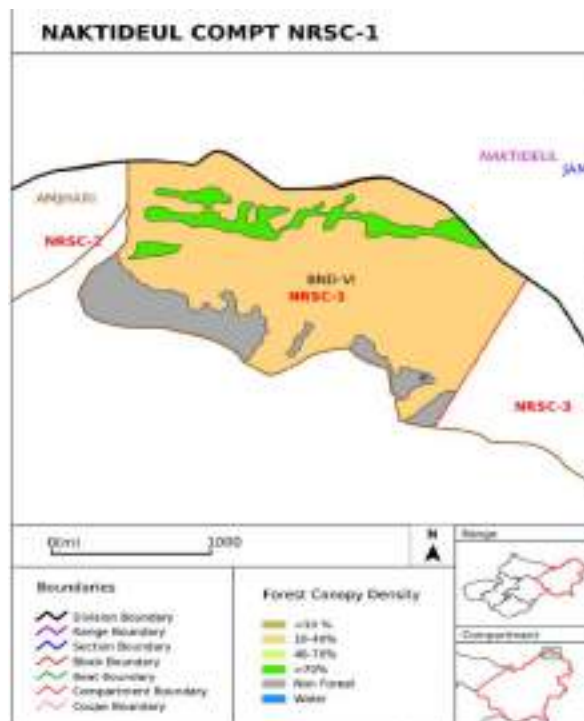
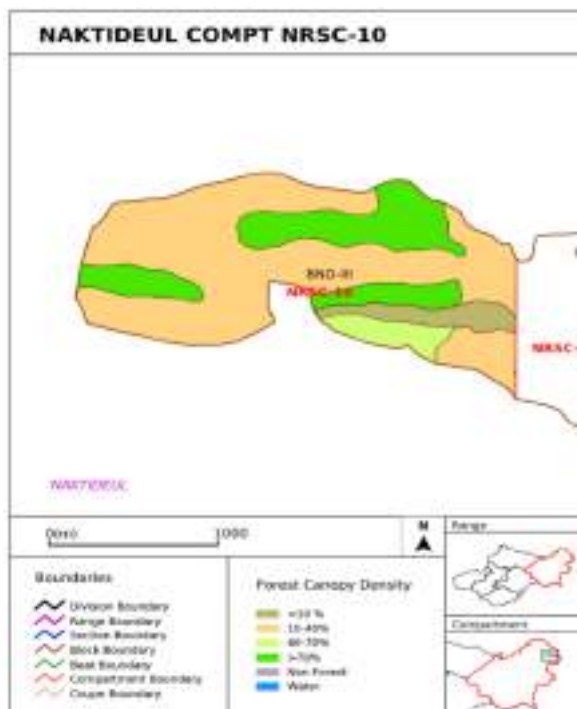


15.6.1 Rahan Comp.1





Revised working plan of Rairakhol Division (2021-22 to 2030-31)

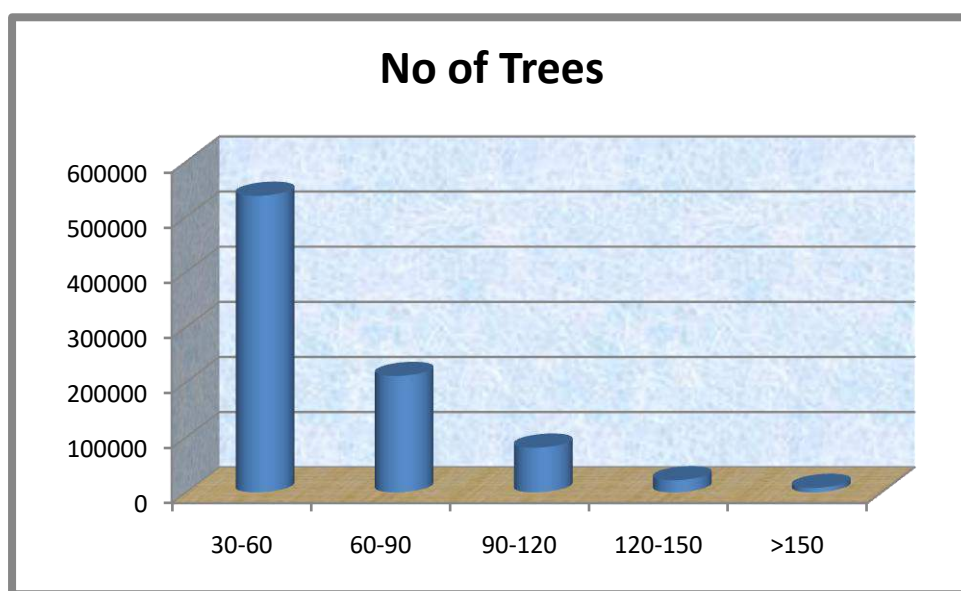


This is subjected to biotic pressure. The tree distribution in the block is as follows.



Table No 15.4 Girth Class wise tree distribution in various blocks

Forest block	Comp. No	Girth class wise tree distribution					Total
		30-60	60-90	90-120	120-150	>150	
Rahana	1	2966	1194	175	38	34	4407
Rahana	2	395522	109614	30579	4735	1526	541976
Hinterei		16816	9055	4965	1776	623	33235
Rasibeda		38573	32944	12418	3807	1630	89372
Rohinigadia		26403	19340	11497	4195	1596	63031
Ambajhari		32459	21792	11917	4319	1364	71851
Lampaphuli		25108	17039	9351	3043	1157	55698
Total		537847	210978	80902	21913	7930	859570
Percentage		62.57	24.54	9.41	2.55	0.92	100.00



Analysis of Data from stand table at random indicates lack of adequate trees above 120cm GBH. This may be due to various factors mainly indicated towards illicit felling / Biotic pressure. Selective removal of trees by people for their own use or otherwise is the main reason for skewed distribution of trees and why trees slowly moves to higher girth class.

The forest blocks having this type of skewed tree distribution has been included in this Working Circle and an attempt is being made Silviculturally / mechanically to improve the condition.



15.6.2 Silvicultural system

The Silvicultural System to be adopted for this working Circle is ***“Silvicultural Cleaning, Tending followed by Aided Natural Regeneration supplemented with enrichment Plantation”***

a) Silvicultural Cleaning:

Silvicultural Cleaning operation includes

- Removal of Soft stem Weeds (Annual in nature).
- Singling of Shoots.
- The species / plant if considered to be a good coppicer and in malformed, it may be cut flush to ground. This will induce a good promising shoot with high probability of **“Established Regeneration”**.
- Cut back the living high stumps to produce good coppice shoot.
- The annual climbers which hinders with the establishment of regeneration to be removed.
- Woody Climbers interlinking the trees above 10 m height may not be removed as it will help to sustain wind pressure during Cyclone.
- Eradication of weeds as a priority.

b) Silvicultural Tending:

Silvicultural Tending involves

- Thinning of natural growth in a congested patch (Above Sapling Stage i.e. in a pole crop to enhance diameter growth.)
- Advance growth / Natural growth are to be retained.
- Pruning in heavily branched individuals to allow faster height growth. Pruning should be restricted to one third height of the individual plant. ($\frac{1}{3}^{\text{rd}}$ of the Plant height)
- Woody climbers affecting poles below 5m height required to be cut down.
- List disturbance to Ground Flora.

c) Aided Natural Regeneration:

Besides Silvicultural Cleaning the following activities are prescribed for the Aided Natural Regeneration (ANR)



- Regeneration from Seed Origin (Recruits, Seedlings and Saplings) to be aided with weeding, Soil Working and application of fertilizer to enhance growth & speedy establishment.
- Extensive Soil & Moisture Conservation measures to be taken up. Besides Contour trenches, contour bonding, gully plugging, Vegetative check dams, percolation pits are required to be taken up to improve soil moisture regime. Individual plants of **Natural Origin** need to be provided with **Half Moon Trench**, Soil Mulching etc.

d) Enrichment Plantation

- In Blanks seedlings of indigenous species matching with the natural seedlings / saplings / vegetation available to be planted. Planting of teak inside natural forest to be avoided.
- Prepare the soil in blanks, around the existing seeding trees (Mother Trees) to receive seeds and allow the seeds to germinate and grow.

15.6.3 Rotation period:

The present crop is not to be harvested during this plan period. No rotation period is prescribed at present. The entire area will be treated in a **Ten Year Cycle**.

15.6.4 Harvestable diameters:

From enumeration / sampling data, it is observed that only 2.55 % of trees are above 120 cm and below 150 cm and 0.92 % above 150cm girth class. Under this condition no removal of trees is prescribed from the forests assigned to this Working Circle. Hence the harvestable diameter for any species has not been fixed in this plan for this Working Circle. Harvestable Diameter (Girth) has been prescribed for Selection Working circle (Para 14.6.4). The same is applicable for the entire division for other purpose.

15.6.5 Reducing factors and reduced areas:

As no yield is expected from the annual treatment area, there is no yield regulation hence no reducing factor assessed.

15.6.6 Rehabilitation Cycle:

A Rehabilitation Cycle of 10 years i.e. co terminated with Plan period is prescribed.



15.6.7 Division into Rehabilitation Sections:

Under Para 15.4 the assigned area has been allotted to different Rehabilitation series. All total five (5) Rehabilitation series have been constituted. Each series is now subdivided to 10 sections with year of allotment as below. [Table No 15.5(1) to 15.5 (5)].

15.6.7.1 Rairakhol – Badbahal Rehabilitation Series (RRS)

Table No 15.5(1) Sections of Rairakhol – Badbahal Rehabilitation Series (RRS)						
Name of Reh. S	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
Rairakhol – Badbahal Rehabilitation Series(RRS)	2021-22	RRS-I	Purunapani	1 st P	240.0	240.0
	2022-23	RRS-II	Purunapani	2 nd P	240.0	240.0
	2023-24	RRS-III	Purunapani	3 rd P	240.0	240.0
	2024-25	RRS-IV	Purunapani	Bal	230.01	230.01
	2025-26	RRS- V	Rahan	1	371.77	371.77
	2026-27	RRS-VI	Rahan	2	329.17	329.17
	2027-28	RRS-VII	Bada-Hindol DPF	1 st P	280.0	280.0
	2028-29	RRS-VIII	Bada-Hindol DPF	Bal	289.32	289.32
	2029-30	RRS-IX	Hinterei DRF		106.55	142.54
			TerbedaDRF		35.99	
	2030-31	RRS-X	Hemantakhola		214.92	214.92
	Total RS				2577.73	2577.73

15.6.7.2 Charnal Rehabilitation Series (CRS)

Table No 15.5(2) Sections of Charnal Rehabilitation Series (CRS)						
Name of Reh. S	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
Charnal Rehabilitation Series (CRS)	2021-22	CRS-I	Behrampura	1 st P	195.0	195.0
	2022-23	CRS-II	Behrampura	2 nd P	195.0	195.0
	2023-24	CRS-III	Behrampura	3 rd P	195.0	195.0
	2024-25	CRS-IV	Behrampura	Bal	192.38	192.38
	2025-26	CRS- V	Suani	2 (P)	165.0	165.0
	2026-27	CRS-VI	Suani	2 (B)	162.1425	162.1425
	2027-28	CRS-VII	Rasibeda		93.62	93.62
	2028-29	CRS-VIII	Siaripani		203.72	203.72
	2029-30	CRS-IX	Kusumbahali	Part	150.0	150.0
	2030-31	CRS-X	Kusumbahali	Bal	151.49	151.49
	Total RS				1703.3525	1703.3525



15.6.7.3 Badmal Rehabilitation Series (BRS)

Table No 15.5(3) Sections of Badmal Rehabilitation Series (BRS)						
Name of Reh.S	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
Badmal Rehabilitation Series (BRS)	2021-22	BRS-I	Koilipadar		217.54	217.54
	2022-23	BRS-II	R. Badmal	2(1 st P)	260.0	260.0
	2023-24	BRS-III	R. Badmal	2(2 nd P)	260.0	260.0
	2024-25	BRS-IV	R. Badmal	Bal	258.03	258.03
	2025-26	BRS- V	R. Badmal	1 (P)	170.0	170.0
	2026-27	BRS-VI	R. Badmal	1 (B)	171.1	171.1
	2027-28	BRS-VII	Chargad	Part	240.0	240.0
	2028-29	BRS-VIII	Chargad	Bal	233.41	233.41
	2029-30	BRS-IX	Satsama	1 st P	230.0	230.0
	2030-31	BRS-X	Satsama	Bal	234.75	234.75
	Total RS				2274.83	2274.83

15.6.7.4 Naktideul Rehabilitation Series (NRS)

Table No 15.5(4) Sections of Naktideul Rehabilitation Series (NRS)						
Name of Reh.S	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
Naktideul Rehabilitation Series (NRS)	2021-22	NRS-I	Nadia	1	200.00	200.00
	2022-23	NRS-II	Nadia	1	204.67	204.67
	2023-24	NRS-III	Nadia	2(1 st P)	130.0	130.0
	2024-25	NRS-IV	Nadia	2(2 nd P)	130.0	130.0
	2025-26	NRS- V	Nadia	2(3 rd P)	130.0	130.0
	2026-27	NRS-VI	Nadia	2 (Bal)	137.71	137.71
	2027-28	NRS-VII	Rohinigadia	1 st P	145.0	145.0
	2028-29	NRS-VIII	Rohinigadia	2 nd P	145.0	145.0
	2029-30	NRS-IX	Rohinigadia	3 rd P	145.0	145.0
	2030-31	NRS-X	Rohinigadia	Bal	134.43	134.43
	Total RS				1501.81	1501.81



15.6.7.5 Naktideul- GCPur Rehabilitation Series

Table No 15.5(5) Sections of Naktideul- GCPur Rehabilitation Series (NGRS)

Name of Reh.S	Year of Working	Coupe No	Forest Block	Comp. No	Area in ha	Coupe Area
Naktideul- GCPur Rehabilitation Series (NGRS)	2021-22	NGRS-I	Goudpali		58.24	160.66
			Budbuda		102.42	
	2022-23	NGRS-II	Phulkusum		82.84	110.80
			Penthabahal		27.96	
	2023-24	NGRS-III	Abmajhari		189.41	189.41
	2024-25	NGRS-IV	Abmajhari-Dhadrokhoh		200.0	200.0
	2025-26	NGRS- V	Abmajhari-Dhadrokhoh		200.0	200.0
	2026-27	NGRS-VI	Abmajhari-Dhadrokhoh		196.42	196.42
	2027-28	NGRS-VII	Bahaljharan		127.54	127.54
	2028-29	NGRS-VIII	Dhadrokhoh		326.84	326.84
	2029-30	NGRS-IX	Lampaphuli	Part	210.0	210.0
	2030-31	NGRS-X	Lampaphuli	Bal	216.58	216.58
Total RS					1938.25	1938.25

15.6.7.6 Abstract of Rehabilitation Series / Section (Year wise)

Year wise area allotted under different Rehabilitation series is furnished at Table No 15.6 for ready reference.

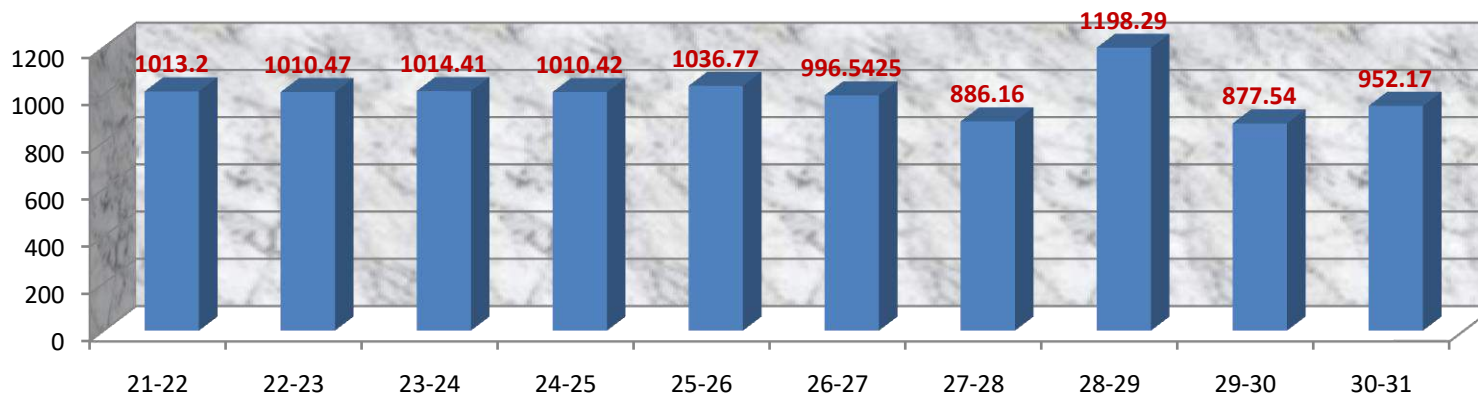


Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 15.6 Year wise area allotted under different Rehabilitation series

Name	Year										Total
	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	
Rairakhol-Badbahal	240.0	240.0	240.0	230.01	371.77	329.17	280.0	289.32	142.54	214.92	2577.7300
Charmal	195.0	195.0	195.0	192.38	165.0	162.1425	93.62	203.72	150.0	151.49	1703.3525
Badmal	217.54	260.0	260.0	258.03	170.0	171.10	240.0	233.41	230.0	234.75	2274.8300
Naktideul	200.00	204.67	130.0	130.0	130.0	137.71	145.0	145.0	145.0	134.43	1501.8100
Naktideul-GCPur	160.66	110.80	189.41	200.0	200.0	196.42	127.54	326.84	210.0	216.58	1938.2500
Total	1013.200	1010.470	1014.410	1010.420	1036.770	996.5425	886.160	1198.290	877.540	952.170	9995.9725

Area assigned for Working in Ha





15.6.8 Calculation of the yield:

As there is no prescription to harvest forest produce, no yield has been calculated. However during silvicultural cleaning and thinning, brush wood, Fire wood and poles may be obtained. In order to maintain hygiene of the forest, dead trees may be removed leaving some dead trees / fallen trees at least 4-5 trees per hectare for wildlife management point of view.

In case of VSS assigned area, the removed forest produce may be given to the Villagers as per JFM Resolution after maintaining necessary records of removal and sharing mechanism as per VSS Resolution.

15.6.9 Table of Treatment:

The forest Blocks assigned to this working circle has been divided to five (5) Rehabilitation series. For convenience of working each Rehabilitation Series has been sub divided in to 10 sections. Each year the assigned area is required to be treated strictly. The Rehabilitation Series and corresponding Sections and year of operation have been described under Para 15.6.7 above.

15.6.10 Method of executing the Treatment:

15.6.10.1 Demarcation of Annual Rehabilitation Area:

The Annual Rehabilitation Area (Treatment Area) has been depicted on Topo map (1: 50000 Scale) with marking like TS-I, TS-II. The area assigned for the year is to be surveyed, Pillars Posted well marked on the Ground. This will be done in following manner.

- i. For identifying and locating the annual rehabilitation areas for respective rehabilitation series a preliminary reconnaissance survey will be carried out in the month of October.
- ii. As the area is very susceptible to land encroachment / heavy Biotic Pressure, the Boundary of the Forest Block is to be clearly demarcated/ concrete pillars posted as per the guidelines of PCCF, Odisha.
- iii. In the situation when the Treatment Section line is not coinciding with the block or Compartment lines, it is to be demarcated by cleaning a strip of 1.50 meter width and stone cairns of size 90 cmX60 cm are to be erected at the corners at visible intervals along the line. While clearing 1.50 meter strip, all trees below 20 cm GBH are to be felled .Trees of larger girth occurring along coupe line at visible distances are to be given with two Black Paint rings at breast height.



- iv. When Treatment Section Line is co-terminus with block or compartment line then the latter will be maintained as per prevailing practice.
- v. When the Treatment Section line is coterminous with compartment line and the same has not been demarcated earlier, then two white paint rings at breast height are to be given in the trees standing along the Compartment line.
- vi. The sign boards exhibiting the serial number of the Treatment Section and extent of rehabilitation area, name of rehabilitation series and year of working etc. shall be posted at prominent places preferably at the points where Treatment Section line meets the road.

15.6.10.2 Preparation of Treatment Map & Treatment Plan.

(a) Treatment Map:

Once the annual rehabilitation areas has been identified, delineated and demarcated in the field then an officer not below the rank of Range Officer, shall inspect and examine such area and prepare a treatment map. The treatment map so prepared should exhibit measures to be taken for different patches within the annual rehabilitation area. The areas included under this Working Circle are in different stage of degradation and require different type of site-specific treatment. While preparing treatment map following five types of areas will be distinguished.

Type “A”

Area to be taken for Silvicultural Cleaning which includes singling out of coppice shoot, pruning, climber cutting removal of high stumps and other tending operations. Area for eradication of weeds is to be marked on the map. Area with congested advance growth, if required thinning is also to be marked.

Type “B”

Seedlings / Recruits of seed origin available in the area are to be specifically noted & its approximate number / species to be mentioned. An available Blank Area which needs to be planted up is to be marked. The suitable species are also to be mentioned in the Treatment Plan.



Type “C”

Plantations raised under different Schemes (AR Only) are also to be specifically marked on the Map. The growth pattern and required treatment to plantations like thinning etc to be specifically indicated.

Type “D”.

The area assigned to VSS is also to be marked on treatment map. It may be cross checked with the VSS assigned map / MoU with the VSS to check the veracity.

Type “E”.

There are stony out crop of varied extent of sizable area. This type of area is also to be marked / noted on the Treatment Plan.

(b) Treatment Plan:

The treatment Plan shall include

- I. Site identification i.e. Forest Block/ Compartment No. / Treatment series No
- II. Area and Treatment map.
- III. Site characteristics (terrain, slope, drainage, soil type and depth).
- IV. Vegetation and extent of regeneration.
- V. Extent of degradation.
- VI. Year of operations (including maintenance if any).
- VII. Major operation to be undertaken.
- VIII. Cost norms and calendar of operations.
- IX. Involvement of VSS and works that can be executed through VSS.
- X. In case of Plantation / Gap filling required, the species required to be planted are need to be mentioned.
- XI. In case of availability of Dead / fallen trees required to be removed during the operation, it will be marked and a marking list is to be prepared as per standard format.

The treatment Plan is to be prepared by the Range Officer, checked by the Asst. Conservator of Forests and to be approved by the DFO, Rairakhol Division for execution. The Treatment Plan may be drawn up within October – December of the previous year of assigned year. This will help in planning and arrangement of funds through budgetary provisions.



After receipt of the Treatment Plan, it is to be examined and execution plan to be decided by the Divisional Forest Officer well in advance.

(c) Execution of Rehabilitation Method.

After approval of the Treatment Map & Plan, the same is to be executed in the assigned year. The sequences of Operations are

- i) Fencing of the Area:
- ii) Removal of marked trees, if any.
- iii) Silvicultural Cleaning.
- iv) Silvicultural thinning,
- v) Eradication of weeds,
- vi) Treatment of bamboo clumps including Harvest / De-congestion)
- vii) Soil & Moisture Conservation.
- viii) Treatment of Natural seedlings available,
- ix) Restocking of Area by Planting (Artificial Regeneration) & Post-care operation.
- x) Subsidiary Silvicultural Operation for bamboo.
- xi) Control of Grazing,
- xii) Fire Protection Measures.

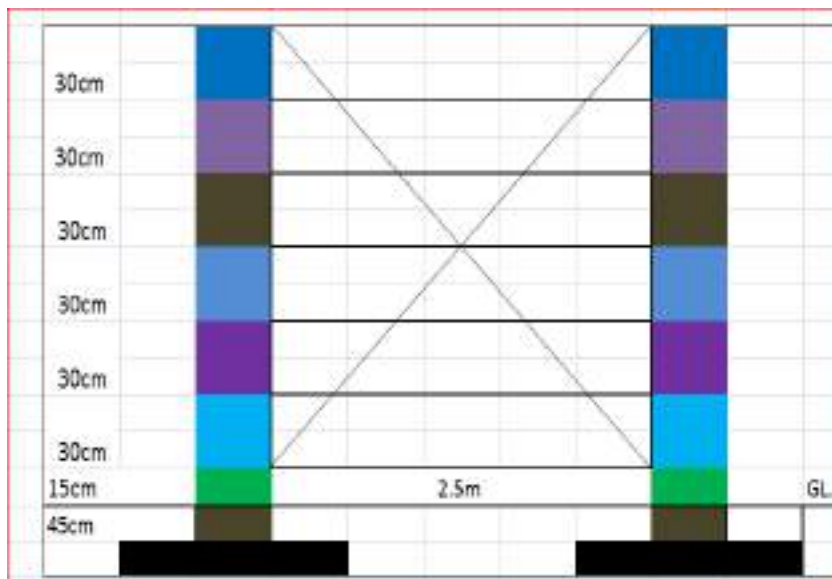
15.6.11 Description of Operations:

i) Fencing of the Area:

The area which are susceptible to encroachment and other biotic interferences are required to be fenced either with Vegetative fencing as per cost norm provided in Block Plantation or Barbed wire fencing if budgetary provisions support. In wildlife abundance areas, vegetative fencing is strongly recommended. To have a successful regeneration it is strongly required to fence the area with barbed wire.

Description of Barbed Wire Fencing:

It is suggested to put T shaped pillars at an interval of 2.5m. The length of such pillar is 2.40 m. (1.95 m above the ground & 0.45m below the ground.) Size: 15cmx15cm at bottom and 10cm x10cm at top. The Lower bar of inverted "T" is of 30cm including the width of the pillar. There will be 7 strands of two ply barbed wires and to be placed at a height of 15cm, 45cm, 75cm, 105cm, 135cm, 165cm and 195cm from the ground level. Two strands will be put diagonally (connecting 15cm point to 195 cm point & 195cm point to 15cm point of adjacent pillar).



The approved Cost norm for barbed wire fencing based on wage rate of Rs280/- per Persondays is at **Annexure-XVII**.

ii) Silvicultural Cleaning.

The silvicultural cleaning is intended to achieve healthy growth of existing seedlings / saplings / coppice shoots of favoured species. The operation includes

- Cutting back of high stumps with preference to living stumps and having a good coppicing power.
- Cutting of climbers those are of annual nature and uprooting them wherever possible. The woody climbers those are interlocking the existing trees should not be cutback as it gives enforcement to trees during Cyclone / heavy wind.
- Singling out of multiple coppice shoots and retaining most promising ones.

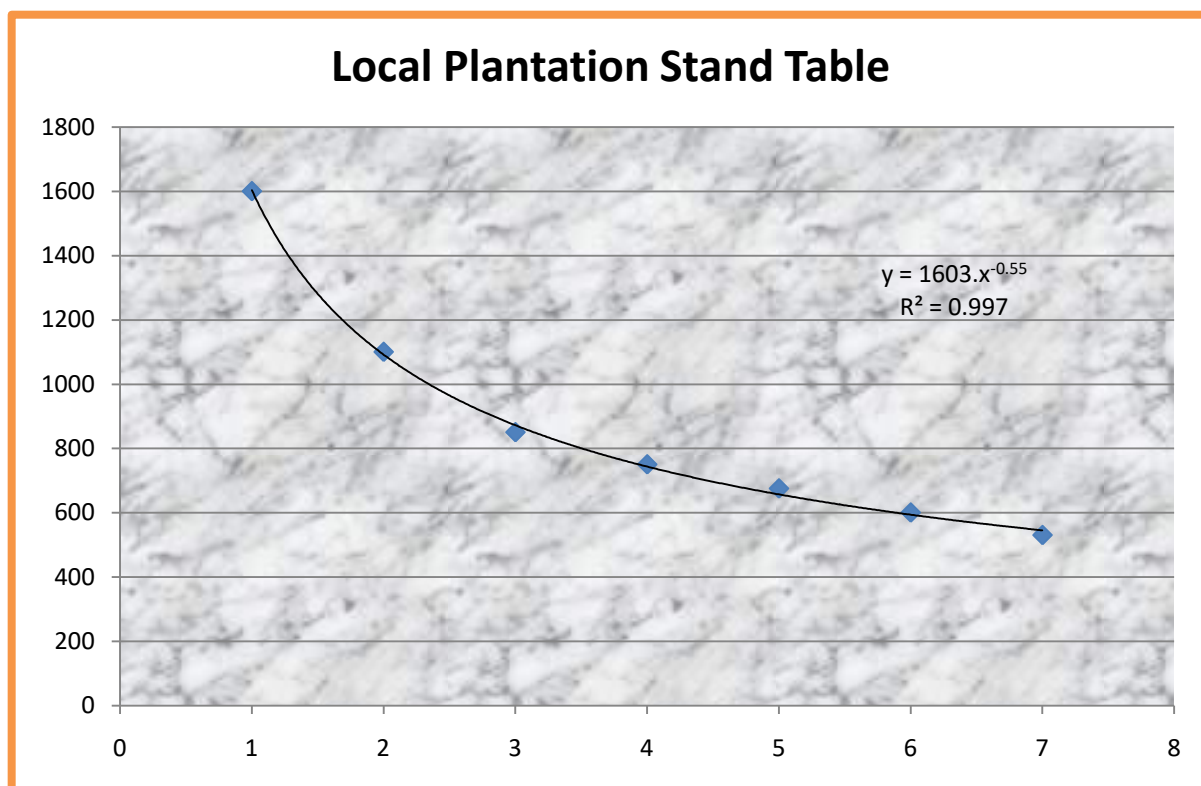
iii) Silvicultural thinning.

In cases of having congested advance growth at a pole stage, it is required to take up light thinning of “**C grade intensity**”. It is required to undertake removal of dead, moribund, diseased, suppressed, dominated and defective trees without creating a permanent gap in canopy. Some defective trees around five trees per hectare having cankers / holes should be retained for wildlife habitation. As the crop is mostly of coppice origin, heavy thinning is not preferred. The details of thinning procedure have been described under Para-14.6.10.4 which may be referred.



In case of Planted areas (AR Plantations / Teak Plantations) for which specific prescription not provided in this plan are to be thinned. The local stand table for miscellaneous plantations / Teak Plantations is required to be followed. From field observation, it is expected to have at least the number of stems per hectare as furnished below at Table No 15.9 in a miscellaneous plantation / B. Economic Plantation ideally. The equation / graph are given below. From the equation, the number of stems for any interim year can also be derived

Table No 15.7 Number of stems expected in different years from plantations.	
Year	Number of stems per ha (Approximately)
1st year	1600
5th Year	1100
10th year	850
15th year	750
20th year	675
25th year	600
30th year	530





iv) Eradication of weeds:

The present Blank area included in this Working Circle is heavily infested with Eupatorium, Lantana, Bana Tulasi and other thorny weeds. These weeds are hindering with the growth of natural seed origin seedlings and planted seedlings. Before taking up plantation in these areas its eradication is essential. The details of eradication process have been described in Part-I of this plan. Methods like repeated cutting at tender stage, uprooting of weeds by tractors and immediate covering the area with plantations / grass land creation may be followed. About 7% to 10% of the area assigned to this Working Circle is observed to be infested with weed. This indicates the quantum of task ahead.

v) Soil & Moisture Conservation.

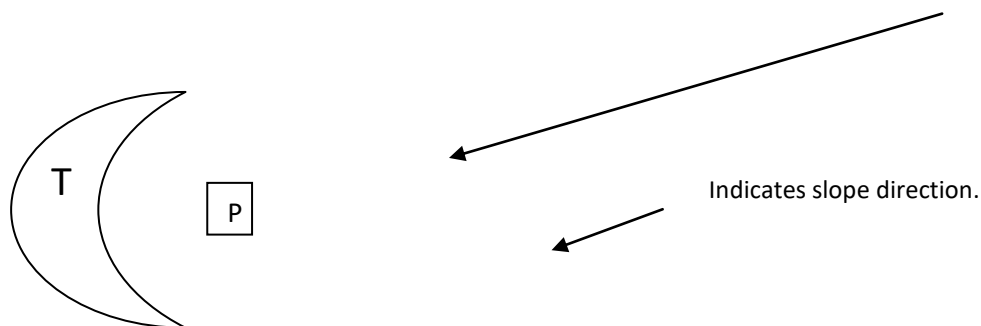
The area included in this working circle is mostly hilly terrain to moderate slope. Percolation pits of 2mx 1mx1m with gentle side slopes, Contour bonding within 200meters from water body/ River bank, Treatment of nalla / Rills / gullies are prescribed. Maintaining thick leaf litters in humus form coupled with fire protection measures will also help in moisture conservation.

vi) Treatment of Natural seedlings available,

The natural seedlings available in the treatment area are to be given appropriate attention to ensure its establishment.

The following measures are prescribed.

- Deep Soil Working around the seedlings at a width of 0.50 m with application of fertilizer.
- Weeds to be removed / uprooted at a radius of 1 meter.
- In case of sloppy location Half Moon trench to be provided.



- T : Half Moon Trench
- P: Plant position.



vii) Restocking of Area by Planting (Artificial Regeneration) & Post-care operation.

Plantation of indigenous species matching with the local species is required to be planted following the cost norm of Plantations approved by Forest department. The species suggested are Pahadi sisoo (*Dalbergia latifolia*), Khaira (*Senegalia catechu / Acacia catechu*), Bela (*Aegle marmelos*), Phasi (*Anogeissus acuminata*), Dhaura (*Anogeissus latifolia*), Asan (*Terminalia tomentosa*), Arjun (*T. arjuna*), Bahada (*T. belerica*), Bandhan (*Ougeinia oojeinensis*), Kuruma (*Adina cardifolia*), Jamu (*Syzygium cumini*) etc. Government has issued instruction for not planting Teak in Sal and Natural Forests. Teak should not be planted in erosion prone areas, in Rehabilitation Area less than 10 ha or intermixed with other species.

viii) Control of Grazing.

The assigned area for a particular year is required to be closed to grazing at least for three years. During that period, VSS members, villagers may be allowed to collect grasses by cutting only. After three years controlled grazing may be allowed considering the quantum of grass growth in the protected area.

ix) Fire Protection Measures.

The area is to be protected against fire. Fire line is required to be maintained along the periphery and internal lines. Controlled burning of weeds / fallen leafs may be taken up under strict supervision of section forester.

x) Disposal of Forest Produce:

During Cleaning / thinning operation if any utilizable forest produce is obtained, it will be disposed up as per the guidelines of Forest Department. Delivery to OFDC Ltd is the favored practice. In case of VSS assigned area, it may be distributed to the VSS as per JFM resolution treating the produce as an interim harvest.

15.6.12 Subsidiary silvicultural operations (Cleaning & Thinning):

The process of thinning and Silvicultural cleaning has been described above.

15.6.13 Regeneration:

The area assigned to Rehabilitation Working Circle is found to be having moderate to poor regeneration. The basic objectives are to restock the area by

- Checking Degradation, Encourage High Forest System,



- Allow establishment of Saplings / regenerated seedlings within the time limit.
- Supplement the regeneration through planting.

15.6.13.1 Checking of Degradation:

The Forests assigned to this working Circle are subjected to illegal removal of selected species of higher girth class. Girdling is a common sight. Degradation may also be due to constant biotic interference, Heavy Grazing, Loss of Soil fertility, Soil erosion, reduced moisture regime and most important is Fire invasion and illegal removal of forest produce i.e. timber, poles and brush woods. Dedicated efforts are required to check the drivers of forest degradation.

15.6.13.2 Encourage High Forest System:

Most of the forest crops are observed to be of coppice origin than of seed origin. It should be our endeavour to create favourable ground situation to have seedlings / recruits more in number. The following suggestions are made to follow to have a better High Forest system to develop than artificially supplementing the regeneration.

- a) Identification of Mother trees in all forest blocks @5 trees per hectare irrespective of species. List of such trees may be prepared either prior to assigned year or in the assigned year. List of such mother trees may also be available in compartment history for the block.
- b) Most of the matured seeds fall to forest floor during winter and some species of low viability period before rains. Seeds those matured during winter / spring should be collected from mother trees only.
- c) The ground / soil may be manipulated by loosening and kept ready to receive seeds for germination.
- d) In pre-monsoon shower seeds to be dibbled / broadcasted as convenient and the area may be protected against trampling / grazing.
- e) After germination, if required organic fertilizer, FYM or Chemical fertilizer may be applied to have a better growth.
- f) This patch to be under constant supervision of Range Officers for three years. The location of such patch (Latitude / Longitude) may be recorded in the compartment history / Register or Journal for reference by succeeding officials.
- g) Naturally available seedlings to be treated as described under Para 14.6.11. (vi) above.



15.6.13.3 Establishment of Saplings / regenerated seedlings within the time limit:

It is mostly observed that villagers are removing the small saplings / poles for fencing and house hold use. Whatever regenerated / established saplings achieved are going in vain due to removal of poles etc in disguise of brush wood. Hence public awareness is required to be created for not removing any materials from forest in name of brush wood to have desired effect in a time limit.

15.6.13.4: Supplement the regeneration through planting.

Supplementing the regeneration by artificial method i.e. planting of seedlings is a favoured practice since long. The choice of seedlings in most cases mismatch with the local flora available and seedlings selected for planting is not compatible with the soil status / succession stage of plant community. In practice choice of species is guided by “Ease to raise nursery attitude and seeds availability” than site requirement. These aspects may be addressed in the Treatment Plan prepared in advance. It will lead to a better forest at par with neutrality and keep bio diversity of the area unaffected.

15.6.14 Associated regulations and measures:

Besides the above prescriptions, the following associated regulations are prescribed to be followed. These are

- Grazing in forests required to be regulated as more damaged is caused to regeneration through trampling.
- Fire protection in the forest blocks especially on treated area should be strictly enforced.
- No lopping is allowed within 5 years of treatment.
- Boundary maintenance in a cycle of 3 years is to be ensured.
- VSS is to be strengthened and regular interaction with villagers / VSS members to be maintained.

15.6.14.1 Degraded Forest Area Suitable for Compensatory Afforestation:

Compensatory Afforestation is an important component for Diversion of Forest land for various projects. The Central Govt. Protects, PSU of Central Govt. Transmission Line projects used to provide Degraded Forest Land for Compensatory Afforestation Purpose. The forest area under administrative control of suitable for taking under Compensatory Afforestation purpose has been tentatively identified.



15.6.14.2 Coupe Control Form.

The activities are to be closely monitored to have the desired result. A set of Coupe control form is prescribed below to be filled up and submitted to DFO by the Range officer at the end of the year.

Table No 15.8 Coupe Control Form (Form No-2)

Name of Treatment Series	Coupe No	Year of Assigned	Area in ha	Areas treated Under (in Ha)					Deviation
				Cleaning	Thinning	Planting	Seed sowing	SMC	





CHAPTER-16

PLANTATION WORKING CIRCLE (PLWC)

16.1 Name of working circle:

Rairakhol Forest Division is basically a Sal Dominated Forest Tract having a good crop Density. Most of the Forests are under “High Forest System” of management. There is limited scope of Artificial Regeneration through Planting. On different circumstances, plantations have been raised during last Plan Period. These plantations are mostly miscellaneous / Economic plantations. These plantations are required to be managed.

During Social Forestry Project (SFP) Plantations have been raised and declared as Village Forest under Section 30 of the Odisha Forest Act, 1972. The Village Forest Committee looking after these plantations are in a dormant stage after abolished & amalgamation of Social Forestry Project Divisions. The boundaries of such forests have not been properly dealt with and it is important to bring all such plantations raised and declared as “**Village Forest**” to management fold. In Rairakhol Division one only one such village forest is available.

There is Protected Forests declared u/s 33 of the Odisha Forest Act, 1972. These lands are mostly area selected for “Compensatory Afforestation” purpose against diversion of Forest Land under provisions of Forest (Conservation) Act, 1972. In Rairakhol Division one Protected Forest is available for management. This block is also included in this Working Circle.

There are encroachments in various Forest blocks of the division. It is expected to evict encroachment and covered the area under Plantation. These areas under encroachment are also included in this Working Circle in anticipation of eviction.

There is no blank space more than 4 ha in a patch within RF/ PRF/DPF under this working plan purview. No blank space has been included in this working circle.

In order to have a precise management practices for all plantations as described above, “Plantation Working Circle” has been constituted. An area of **455.0830 ha** has been assigned to this Working Circle.

16.2 General constitution of working circle:

All Plantations raised during last Plan period either under B Economic Plantations, Miscellaneous Plantations, Village Woodlots of Social Forestry Project Plantations, All



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Protected Forests declared under Odisha Forest Act,1972 and Area under encroachment are included in this Working Circle. The details of area is at Table no 16.1 below.

The area included in this Working Circle (Table No 16.1) is broadly comprises area i.e.

Table No: 16.1 Forest Area Allotted to various Working Circle. (area in ha)						
Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Allotted to	
					Pl. WC	JFM(O) WC
Reserved Forests.						
A. Badbahal Range						
1	Rahan	1	406.77	406.77	35.0	
	Rahan	2	379.95	379.95	50.78	50
	Rahan	5	534.52	534.52	20.0	
2	Tal	1	840.18	839.88	0.37	
	Range Total		2161.42	2161.120	106.150	50.00
B. Badmal Range						
3	R. Badmal	1	361.1	361.1	20.00	
	Range Total		361.1	361.1000	20.00	0.00
C. Naktideul Range						
4	Rail	1	575.48	574.78	17.62	
5	Landimal	2	1123.24	1122.657	60.00	
6	Nadia	1	404.82	404.82	0.15	0.15
	Range Total		2103.54	2102.2570	77.77	0.15
D.GCpur Range						
7	Landakot	6	199.56	199.56	6.07	6.07
	Landakot	20	252.63	252.63	10.0	10.00
8	Kholgarh	1	290.01	290.01	21.8	
	Kholgarh	5	408.33	408.33	2.75	2.75
	Range Total		1150.53	1150.5300	40.62	0
	Div Total		5776.59	5775.01	244.54	18.82
Proposed Reserved Forest						
A. Redhakhol Range						
9	Purunapani		962.39	962.39	12.38	12.38
	Range Total		962.39	962.39	12.38	12.38
B. Badbahal Range						
10	San-Rengali		311.61	311.61	0.5	
	Range Total		311.61	311.61	0.5	



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Table No: 16.1 Forest Area Allotted to various Working Circle. (area in ha)

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Allotted to	
					Pl. WC	JFM(O) WC
C. Charmal Range						
11	Siaripani		204.72	204.72	1.0	
	Range Total		204.72	204.72	1	
D. Badmal Range						
12	Koilipadar		227.83	225.34	7.8	
13	Mochibahal		1553.13	1553.13	5.0	
14	Sagjori		610.66	610.66	26.25	
15	Satsama		474.95	474.95	10.2	
	Range Total		2866.57	2864.08	49.25	
F. Girishchandrapur Range						
16	Talab		629.55	629.55	2.85	
	Range Total		629.55	629.55	2.85	
	Div. Total		4974.84	4972.35	65.98	
DPF (Demarcated Protected Forest)						
A. Redhakhol Range						
17	Bada-Hindol		581.32	581.32	12.0	
18	Hinterei		111.55	111.55	5.0	
	Range Total		692.87	692.87	17	
C. Charmal Range						
	Kusumbahali		326.49	326.49	25.0	
	Range Total		326.49	326.49	25	
E. Naktideul Range						
19	Bahaljharan		128.14	128.14	0.6	
20	Penthabahal		28.46	28.46	0.5	
	Range Total		156.6	156.6	1.1	
F. GCpur Range						
21	Jarasingha		179.13	179.13	2.0	
22	Phulkusum		86.05	86.05	3.21	
	Range Total		265.18	265.18	5.21	
	Div. Total		1441.14	1441.14	48.31	
Div. RF, PRF & DPF			12192.57	12246.74	358.83	
Village Forest						
A. Naktideul Range						



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Table No: 16.1 Forest Area Allotted to various Working Circle. (area in ha)

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Allotted to	
					Pl. WC	JFM(O) WC
23	Bindpur		57.86	57.86	57.86	
B Redhakhol				0		
24	Khajurijharan PF		38.393	38.393	38.393	
	Div VF+PF		96.253	96.253	96.253	
	G. Total		12288.82	12342.99	455.0830	

- Economic Plantation & Miscellaneous raised from 2007-08 to 2020-21.(237.00 ha)
- Area under encroachment (121.83 ha)
- Village forest of Social Forestry Project, (57.86 ha)
- Compensatory Afforestation land declared as “Protected Forest” (38.393ha)
- There is no blank area of appreciable extent (> 4.00 ha) for future plantation purpose

16.3 General characteristics of vegetation:

During Working Plan Exercise the plantations have been visited and it is observed that the miscellaneous Plantations have been merged with the existing forest growth and not in a position to differentiate from natural vegetation. These plantations have been identified by Species composition available and availability of natural growth within the plantation sites.

16.3.1 Miscellaneous Plantation (2007-08 to 2020-21)

The plantations raised during last plan period till 2020-21 are furnished at Table No 16.2 below.



Table No 16.2 List of Old Plantations Raised during Out going Plan in RF/ PRF / DPF

Sl No	Name of Forest Block	Comp no	Area available for Management	Old Plantations
Reserved Forests.				
A. Badbahal Range				
1	Rahan	1	406.77	35.00
	Rahan	2	379.95	50.00
	Rahan	5	534.52	20.00
B. Badmal Range				
2	R. Badmal	1	361.1	20.00
C. Naktideul Range				
3	Landimal	2	1122.657	60.00
D. Girishchandrapur Range				
4	Landakot	20	252.63	10.0
	Div Total (RF)		3057.63	195.00
Proposed Reserved Forest				
A. Badmal Range				
5	Mochibahal		1553.13	5.0
DPF (Demarcated Protected Forest)				
A. Redhakhhol Range				
6	Bada-Hindol		581.32	12.0
B. Charmal Range				
7	Kusumbahali		326.49	25.0
	G Total		5518.57	237.00

16.3.2 Land under Encroachment

Land has been encroached by local people and also from Bihar & Jharkhand since a long time. The list of such encroachment is at Table No 16.3



Table No 16.3 Land under encroachment- Rairakhol Division.

Sl No	Name of forest Block	Comp. No	GIS Comp. area	Area under management	Area under encroachment
Reserve Forest					
B. Badbahal Range					
1	Rahan	2	379.95	379.95	0.78
2	Tal	1	840.18	839.88	0.37
B. Naktideul Range					
3	Rail	1	575.48	574.78	17.62
4	Nadia	1	404.82	404.82	0.15
C. Girishchandrapur Range					
5	Landakot	6	199.56	199.56	6.07
6	Kholgarh	1	290.01	290.01	21.8
	Kholgarh	5	408.33	408.33	2.75
	Div Total (RF)		3098.33	3097.33	49.54
Proposed Reserved Forest					
A. Redhakhhol Range					
7	Purunapani		962.39	962.39	12.38
B. Badbahal Range					
8	San-Rengali		311.61	311.61	0.5
C. Charnal Range					
9	Siaripani		204.72	204.72	1.0
D. Badmal Range					
10	Koilipadar		227.83	225.34	7.8
11	Sagjori		610.66	610.66	26.25
12	Satsama		474.95	474.95	10.2
E. Girishchandrapur Range					
13	Talab		629.55	629.55	2.85
	Div. Total (PRF)		3421.71	3419.22	60.98
DPF (Demarcated Protected Forest)					
A. Redhakhhol Range					
14.	Hinterei		111.55	111.55	5.0
B. Naktideul Range					
15.	Bahaljharan		128.14	128.14	0.6
16.	Penthabahal		28.46	28.46	0.5



Table No 16.3 Land under encroachment- Rairakhol Division.

Sl No	Name of forest Block	Comp. No	GIS Comp. area	Area under management	Area under encroachment
C. Girishchandrapur Range					
17	Jarasingha		179.13	179.13	2.0
18	Phulkusum		86.05	86.05	3.21
	Div. Total (DPF)		533.33	533.33	11.31
	G. Total		7053.37	7049.88	121.830

16.3.3 Abstract of area assigned to Plantation Working Circle:

Table No 16. 4 Abstract of area considered under PI WC

Sl No	Description	Area in ha	Percentage
1	Economic & Misc. Plantation	237.00	52.08
2	Encroachments Area	121.830	26.77
3	Village Forest	57.86	12.71
4	Protected Forest	38.393	8.44
	Total	455.083	100.00

16.4 Planting series, sections and JFM areas:

16.4.1 Thinning Series:

The plantations raised since 2007-08 are in the age class 1-14 year as on 2021. It will enter to next age class up to 15-25 during the plan period. One mechanical thinning at the age of 8 and another thinning during 16th year are required under Silvicultural Principle. In order to take up systematic thinning it is proposed to constitute one thinning series i.e. Rairakhol Thinning Series (RTS) comprising all blocks under table no 16.2 covering 237 ha only. In Some plantations thinning may not be required as the growth status is fair to moderate. However it is proposed to make provision for thinning for plantations as it involves mostly timber species of high rotation age i.e. about 100 years and natural growth has been developed along with the planted seedlings and competition in growth has set in.

The Protected Forest is 38.393 ha which has been planted during 2015 and most of the species are teak, sisoo and other timber species matching with plantations raised during last plan period. Hence this is also included in this series for future treatment. Total area allotted to this series (Rairakhol Thinning series) is 275.393 ha(237.00+38.393 ha).



16.4.2 Encroachment Eviction Series.

The total area under encroachment i.e. 121.83 ha is allotted to this Encroachment Eviction Series. It has not been sub divided to sections. It is suggested to start eviction process both legal, social (By Motivation) and in case of agricultural encroachment through Agro forestry model. Steps to be taken to evict at least 12-15 ha of encroachment.

16.4.3 Village Forest & Protected Forest Planting Series:

The total area under Village forest is 57.86 ha and under. (All planted up). These plantations have been allotted to one planting series i.e. Rairakhol Planting Series.

16.4.4 Abstract of Planting Series:

Table no 16.5 Abstract of Planting Series – Rairakhol Division		
Sl No	Name of Series	Area assigned (in Ha)
1	Rairakhol Thinning Series (RTS)	275.393
2	Encroachment Eviction Series (EES)	121.83
3	Rairakhol Planting Series	57.86
	Total	455.083

16.5 Blocks, compartments and JFM area:

The area assigned to Plantation Working Circle has been allotted to Various VSS. The area assigned to VSS has been indicated in Table No 13. 3 and Table No 16.1 above.

16.6 Special objectives of Management:

The objectives of management of this working circle are in tandem with the general objectives of this Plan. The Special Objectives are as follows.

- To manage the economic / mixed Plantations in a scattered manner and improve growth status through Silvicultural practices.
- To bring the plantations raised here and there to a single management fold and scientifically manage to optimize the yield.
- To encourage participatory management of erstwhile Social Forestry Plantations and activate the VFC.
- To manage the plantations raised under Compensatory Afforestation Scheme and declared as Protected Forest thereafter.
- To Increase availability of Firewood and timbers in the locality and reduce pressure on forests for fuel wood and furniture wood.
- To increase the crop density of forests and improve the Carbon Sequestration.



- vii) To develop a healthy usufruct benefit sharing mechanism in the villages and encourage natural resource management with a community approach method.
- viii) To take suitable measures to prevent soil erosion and conserve soil and moisture in barren hilly tracts.

16.6.1 Analysis of the crop:

The crops included in this working circle are of two types i.e.

i) Economic / Mixed Plantation:

Plantations raised during outgoing plan period consists of various timber species like Sisoo, Ghamhar, Bahada, Jamu, Sirisa and teak.

ii) Social Forestry Project Plantation:

Plantations Raised in Social Forestry project consists of Small Timber / Fuel Wood, Fodder/ Fruit Bearing and NTFP Species. Teak, Eucalyptus, Acacia, Sisoo, Bamboo, Mango, Karanja are the most preferred species planted. Trees are of varied growth pattern and planted to meet various objectives. At present Teak, Eucalyptus Acacia, Sisoo are available. The crop height varies from 10m to 15m in average. The Girth also varies from 75 cm to 120 cm depending upon species planted. The survival percentage is near 50%. These plantations were raised in between 1986 to 1995. Hence the trees available are 25 year to 35 year. Fuel wood species have been harvested by Villagers without following any silvicultural practices **“Jyoutha Parichalana Yojana”**. No systematic survey for crop condition has been taken up. During field visit, the present situation has been studied at random.

iii) Encroachment:

Encroachment is a great problem in this tract. There are encroachments indicated in last outgoing plan. No land could be reclaimed / evicted. To give stress on eviction these lands have been included in this working circle. The land is mostly used for Agricultural purpose and homestead land. Outsiders from Bihar / Jharkhand have settled in some parts of Badmal Range. Sometimes Social / cultural problems come up in the locality.

16.6.2 Silvicultural system:

The village woodlots of erstwhile Social Forestry Plantation / Protected Forest will be managed with Silvicultural System **“Clear felling with standard followed by Artificial Regeneration”** by planting. Where ever promising coppice shoots will be developed / come up, the same will also be retained to reduce the replanting cost. The number of standards per



hectare will depend upon biotic interference, possibility of dispersal of seeds for a high forest system, fruit bearing species, having timber value at a higher girth class. The minimum number of trees prescribed for retention is 25 number and maximum 75 numbers per hectare.

In case of Other Plantation raised in outgoing Plans / Compensatory Afforestation it will be Silviculturally tendered to have a good stand. The silvicultural system adopted is **“Silvicultural Tending with Improvement”** Thinning along with Soil & Moisture conservation measures will be implemented to enhance growth rate with removal of **“Stems having Utility value”**.

16.6.3 Rotation period:

Rotation period for Sal, Teak and other species for the Division has been discussed at Para14.6.3. The Rotation Period of 120 years for Sal is prescribed and followed. In the outgoing Plan 120 years of Rotation age was prescribed for all species. During field visit and growth statistics available it is felt that except Teak, Sisoo, Ghambhari for all other species, the Rotation Period of 120 years is accepted and followed. In case of teak which has been introduced as gap planting in rehabilitation Working Circle or in Block Plantation in blank areas under Economic Plantation, the growth is very encouraging. Due to its high timber value it is in much demand in the locality, in the State and outside. Selective removal by illicit felling is a perceptible threat. Considering all its aspect i.e. Growth Status and Market demand, rotation age of 100 years for teak in this division is suggested. For other species usually planted is as follows.

Table No 16.6 Rotation Period for various species in Plantation			
Sl No	Species	Rotation Period in Year	Remark
1	Teak	100	In case of SFP Plantations Clear felling with Standard is being followed. Rotation period is applicable for Standards only.
2	Sisoo, Gambhari and other natural timber species	100	
3	Eucalyptus, Other Soft wood, Acacia, Cassia etc	25	
4	Fruit bearing	As long as fruiting continues	



16.6.4 Harvestable diameters:

Harvestable diameter is being prescribed in different plans for different species from time to time. The criteria considered for recommended “Harvestable Diameter / Girth” are as follows.

- The Annual Increment of the Species,
- Development of unsoundness due to climatic and biotic factors,
- Marketability & Demand,
- Site Quality and productivity of Soil

Considering the present scenario GBH for exploitation is prescribed as follows.

Table No 16. 7 Harvestable Girth / Diameter of other planted species.

Sl no	Species	Girth in cm	Diameter in cm	Remark
1	<i>Acacia auriculiformis</i> (Sunajhari)	90	29	
2	<i>Anacardium occidentale</i> (Cashew)			As long as Fruiting continues.
3	<i>Anogeissus acuminata</i> (Phashi)	150	48	
4	<i>Anthocephalus cadamba</i> (Kadamba)	150	48	
5	<i>Azadirachta indica</i> (Neem)	180	57	
6	<i>Bomax ceiba</i> (Simili)	150	48	
7	<i>Erythrina variegata</i> (Paladhua)	120	38	
8	<i>Gmelina arborea</i> (gambhari)	120	38	
9	<i>Melia azedarach</i> (Mahaneema)	120	38	
10	Fruit bearing species			As long as Fruiting continues.
11	Teak, Sisoo	120	38	

This will be applicable for all Felling Series and all other situation, Plantation under JFM and Non JFM Mode if so required.

16.6.5 Reducing factors and reduced areas:

The yield from plantations will be small quantum and irregular. It will be regulated “by area only”. Hence no reduced factor is prescribed in this plan.



16.6.6 Felling cycle:

The area assigned to each Planting series will be covered within the plan period i.e. in 10 years. Hence a planting cycle / Treatment Cycle of ten years will be followed.

16.6.7 Division into Planting Section / Treatment Section:

For convenience in execution and distributed work load each Planting Series / Treatment Series is divided in to ten sections normally termed as **Coupe**. The Sections are constituted as in following table.

16.6.7.1 For Rairakhol Thinning Series (RTS)

Table No 16.8 Sections of Rairakhol Thinning Series. (RTS)

Name of Series	Range	Year of working	Coupe No	Block	Compt. no	Area in Ha	Total area
Rairakhol Thinning Series (RTS)	Badbahal	2021-22	RTS-I	Rahan	1	35.00	35.00
		2022-23	RTS-II	Rahan	2	50.00	50.00
		2023-24	RTS-III	Rahan	5	20.00	20.00
	Badmal	2024-25	RTS-IV	R. Badmal	1	20.00	20.00
	Naktideuol	2025-26	RTS-V	Landimal	2	30.0	30.0
		2026-27	RTS-VI	Landimal	2	30.0	30.0
	Rairakhol	2027-28	RTS-VII	Khajurijharan PF		38.393	38.393
	GCPur	2028-29	RTS-VIII	Landakot	20	10.0	15.0
	Badmal			Mochibahal		5.00	
	Rairakhol	2029-30	RTS-IX	Bada-Hindol		12.00	12.0
	Charmal	2030-31	RTS-X	Kusumbahali		25.00	25.0
	Total					275.393	275.393



16.6.7.2 Rairakhhol Planting Series:

Table No 16.9 Planting Section Rairakhhol Planting Series.						
Name of Planting series	Range	Year of Working	Section number	Name of Village Forest	Area in ha	Coupe area in ha
Rairakhhol Planting Series	Naktideul	2021-22		NIL		
		2022-23		NIL		
		2023-24		NIL		
		2024-25	RPS-I	Bindpur	57.86	57.86
		2025-26		NIL		
		2026-27		NIL		
		2027-28		NIL		
		2028-29		NIL		
		2029-30		NIL		
		2030-31		NIL		
		Total			57.86	57.86

a) Year Wise area abstract for Planting Series.

Table No 16.10 Abstract of Planting Series / Section											
Planting Series	Year (area assigned in ha)										Total
	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	
Rairakhhol				57.86							57.86
Total				57.86							57.86

16.6.7.3 Encroachment Series:

The total area under encroachment i.e. 121.83 ha is allotted to this Encroachment Eviction Series. It has not been sub divided to sections. It is suggested to start eviction process both legal, social (By Motivation) and in case of agricultural encroachment through Agro forestry model. Steps to be taken to evict at least 12-15 ha of encroachment.

16.6.8 Calculation of the yield:

1) From Thinning.

The thinning prescribed for plantations of young stage. No yield is expected. Whatever thinning materials will be available.



The projected yield is expected to be available during thinning within the Plan Period. Whatever materials will be obtained is of brushwood nature and distributed to the villagers if required by them.

2) SFP Plantations:

In case of SFP Planting Series, There is harvest provision. It is expected to obtain about 08 Tons of Fire wood and 10.0 cum of timber or poles per ha. Hence the expected yield is calculated to be 8146.648 Tons of Fire wood and 10183.31 Cum of timber within the plan period. The year wise yield is as follows.

Table No 16.11 Projected Yield from Village Woodlots of SFP.

Name of P.S.	Year of assignment										Total
	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	
P Series	0	0	0	57.86	0	0	0	0	0	0	57.86
Timber (cum)	0	0	0	578.6	0	0	0	0	0	0	578.60
F. Wood (Ton)	0	0	0	462.88	0	0	0	0	0	0	462.88

Total Yield expected is Timber /pole 578.6 Cum, Fire wood -462.88 MT During the plan period.

16.6.9 Table of felling:

The felling / Planting / Thinning and other operations suggested under Para 16.6.10 below will be executed as per sequence / year assigned to each block in constituted Section Para 16.6.7 and subpara 16.6.7.1,, 16.6.7.2 given above.

16.6.10 Method of executing the Felling / Planting & tending:

16.6.10.1 for Plantations (RTS)

i) Demarcation of Area:

The plantation area for treatment is required to be re demarcated in the assigned year of operation. Simple Coal tar ring on trees standing on boundary is suggested.

ii) Inspection & Report:

The plantation area is to be thoroughly inspected by the Section Forest and Forest Guard. After inspection required Silvicultural operation is to be suggested Operations are cleaning in Sapling Stage (Plantation within 5 years of age). In case of plantations more than 5 years



thinning can be suggested. Thinning regime for all plantations raised during outgoing plan is on 8th Year, 16th Year, 32nd Year, 48th Year, 64th Year, 80th Year and final harvest on 100th Year.

iii) Thinning Grade to be suggested:

On 8th Year first thinning is suggested which a Mechanical is thinning. Observing the Ground reality a modified Mechanical thinning is suggested. In this thinning Mechanical thinning will be carried out with a bend to retain promising stems both planted or natural. 2nd and 3rd thinning will be of C grade to D grade thinning i.e. light to moderate thinning. From 4th and onward thinning consideration of putting diameter growth, removal of utilizable trees / poles without lasting gap. Mostly Elite thinning principle to be adopted. Trees attending exploitable Girth i.e. 120cm are to be removed and it will be of Heavy to very heavy thinning. Marking for thinning is strictly to be done by Range Officers and to be checked by Asst. Conservator of Forests.

iv) Retention of Natural Vegetation:

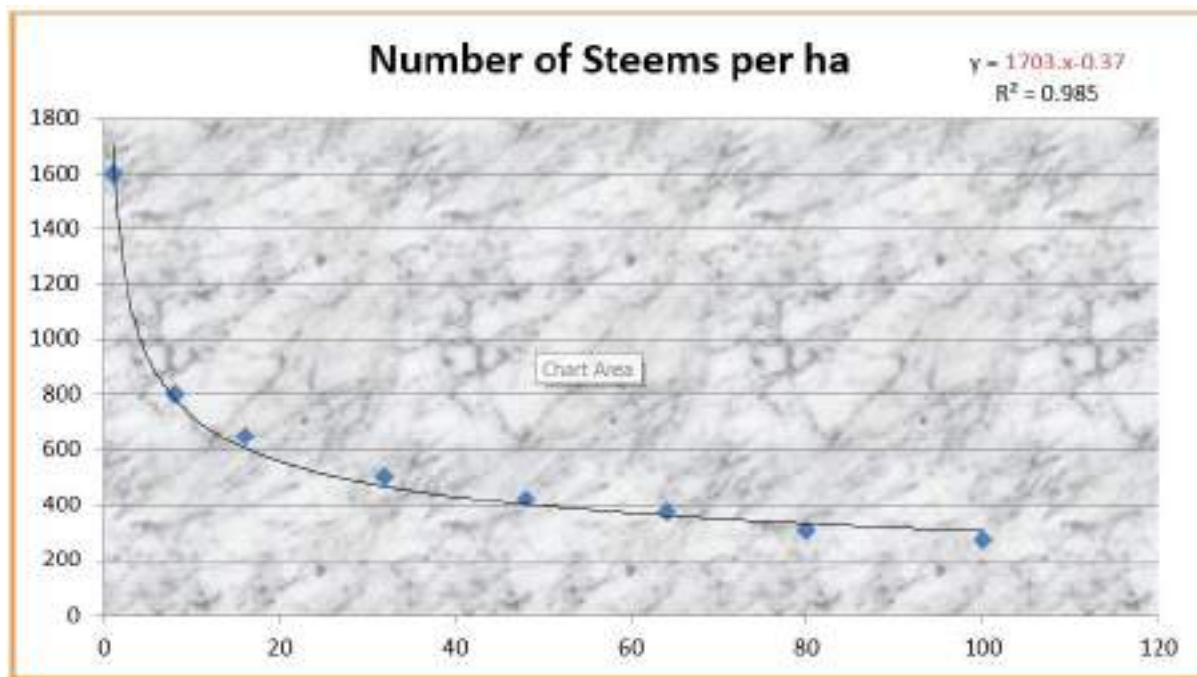
In some Plantations, Natural vegetation has come up. Sal, Asan and other prominent associates like Kendu, Bahada, Chara etc are coming up due to protection of the area. During Thinning these species are to be considered and retained as practicable.

v) Stems to be Retained:

The number of stems that can be sustained by the land depends on its quality on Soil and moisture regime. The number of stems that is to be retained is as prescribed below.

Table No 16.12 Stand Table for Plantation – Rairakhol Division

Age	Number of Planted trees	Age	Number of Planted trees	Remark
01	1600	48	420	Rotation age = 100 year
08	800	64	375	
16	650	80	310	
32	500	100	275	



16.6.10.2 For Social Forestry Plantation (Plantation Series):

a) Consultation with VSS / VFC:

Prior to taking of Operation like demarcation, marking etc, the VSS / VFC is required to be consulted, if the area is assigned to VSS/ VFC. The process of harvesting and restocking is to be explained. The mechanism of Usufruct Sharing is to be decided and resolution to be passed to that effect. Sharing of produce either in monetary term or in kind to be specifically discussed & decided. In case of Village Forest the working cost is required to be adjusted against sale value / royalty of the produce so obtained. Voluntary contribution of labour by villagers for operations may also be examined to reduce the cost of operation. After harvesting, the planting modality is also to be discussed at length.

b) Demarcation of Area:

In case of Village Forests, the area / boundary is not demarcated on ground. It is required to demarcate the Village Forest as notified with the help of Revenue personal in presence of VFC Members. RCC pillars of 20cm x20cm x 120cm may be posted to keep the boundary line visible permanently. In all cases, the entire block is assigned for working in a single year; in that case only boundary line is of importance. This demarcation process is to start at least from April- May of previous year. For keeping the boundary line naturally demarcated, it is



proposed to put Palm Seeds on the boundary at an interval of 5 meters which will grow to a tree within 5 years.

c) Selection of Standard Trees:

As the system to be followed is “**Clear Felling with Standard**”, it is required to mark the standards initially. The criteria for selection of standards in general are furnished below.

- Timber species of greater importance,
- Fruit bearing trees like Mango, Jack Fruit, Barkoli (Zyziphus), Palm, Cashew,
- Any Plus tree suitable for seed collection for raising plantations,
- Any trees associated with sentiments of local villagers are to be retained as standard.

The number of Standard trees per hectare shall not be less than 25 and more than 75. A list of Standard Trees to be prepared and will be a part of Compartment History File. The information may be recorded in a standard format.

Suggested format:

1. Name of Range:
2. Name of Forest Block / Coupe:
3. Area under marking in Ha:
4. Year of Marking:
5. Name of Marking Officer & Designation.

List of Standard Trees selected for retention					
Sl No	Name of Species	GBH in cm	Latitude / Longitude	Crown width in meter	Remark
				Signature of Marking Officer.	

d) Marking of trees for felling:

After selection of Standard trees, all remaining trees above 30cm GBH are marked for felling. However marking on sensitive areas, the following marking rules are to be followed.



- i) Trees near to perennial nala / river banks to a width of 40m measured from High Flood level are not to be marked.
- ii) Tree on which bird's nests is observed is to be retained.
- iii) Trees having cavity, suitable for nocturnal birds habitation up to five numbers per hectares is to be retained.
- iv) Trees on rocky surface / above 30° slope / high erosion prone area are not to be marked for felling.

Marking should be taken up by the section forester and to be checked by the Range Officer minimum up to 20% of marked trees. The marking list is to be prepared in quadruplicate in standard format with a standard estimate of timber and fire wood production. Marking is to be done in February / March of previous year to year of working.

e) Delivery of Coupes for Harvesting:

The Coupe are to be delivered to OFDC Ltd for harvesting and marketing thereof. In case the VSS is willing to participate in harvesting operation, they may be engaged by OFDC Ltd for felling / logging & conversion operation. The Coupe working may be allowed normally for nine months. Any extension of working period may be allowed as per administrative instruction / Odisha Forest Contract Rules, 1966.

The VSS / VFC may take up the harvesting operation as the yield expected will not be economical to OFDC Ltd. In that case, the removal of trees and sharing will be under supervision of Range Officer / Forest Department.

f) Felling of trees & Removal thereof:

The marked trees may be felled, converted and removed as per modern logging practices and the Odisha Timber and Other forest produce transit Rules, 1980 and up to date amendments thereof. The trees felled by axe and saw do not produce coppice shoots. As most of the species are good coppice, it is suggested to fell the trees with axe only. Subsequent logging may be taken up by saw or as convenient to OFDC Ltd / VFC as per modern logging practices.

g) Sharing of Produce in case of VSS / VFC area:

Sharing of forest produce, in case of VSS area will be regulated as per **Para 11 of Joint Forest Management Resolution, 2011**. In case of village Forests, the sharing of forest produce will be regulated as per **Rule 9 of the Odisha Village Forest Rules, 1985**.



h) Surrender of Coupe Area:

After harvesting the marked trees and removal thereof, the Coup area shall be surrendered by OFDC Ltd as soon as possible so as to take subsidiary silvicultural operation / planting activities on the same area. In case of harvesting by VFC, preliminary operation for planting may be taken up simultaneously.

16.6.11(a) Cleaning:

As the silvicultural system adopted is clear felling, the cleaning operation involves

- Removal of debris from the coupe and either buried under ground with a purpose to allow left over materials decompose and enrich soil organic content.
- Fell & Remove the marked trees, if not removed by the OFDC Ltd.
- Remove all weeds by cutting mechanically.
- Make the coupe area suitable for taking up plantation.

16.6.11(b) Thinning:

In the coupe area, if any advance growth is left unmarked / not removed for any consideration and the advance growth is at pole stage, it is required to take up thinning. In this case no thinning will be required as the felling cycle is ten year and clear felling with standard system is adopted.

16.6.12 Regeneration:

The area assigned for fresh plantation is to be covered up through artificial Regeneration i.e. Block Planting. The standard procedure for planting is to be followed as per Approved Cost Norm. The standard procedure is described below for general reference.

The assigned area is to be restocked through Artificial Regeneration i.e. by planting of seedlings with adequate Soil & Moisture Conservation measures.

16.6.12.1 Survey, demarcation, site preparation, alignment & stacking:

The assigned area has been well demarcated and pillars posted during coupe marking and described under **Para 16.6.10.1(b)**. In case of Block plantation @1600 trees per hectare spacing of 2.5mx2.5m is to be adopted. The approved cost norm is to be followed.



16.6.12.2 Pitting:

The areas under consideration are mostly stony /alluvial soil. A pit size of 30cmx30cmx30cm is recommended. Though pitting is generally carried out during January- March, there is possibility of refilling of pits during pre-monsoon due to rain water. It is normally recommended to carryout pitting in March- May and allows weathering at least for one month before planting.

16.6.12.3 Choice of Species & Nursery:

It is recommended to plant species matching to the vegetation of the forest. Government has also suggested not planting Acacia, Eucalyptus, Sana Chakunda, Teak in natural forests. As this zone is intermixed with Sal Zone of North & Teak Zone of South, the most successful species is Teak. It is strongly recommended. The other species recommended are

- i) *Acacia catechu* (Khair),
- ii) *Anogeissus latifolia* (Dhaura),
- iii) *Bahunia purpuria* (Kanchan),
- iv) *Bahunia Vahilii* (Siali),
- v) *Bombax ceiba* (Simili),
- vi) *Dalbergia Sisoo* (Bali Sisoo),
- vii) *Dalbergia latifolia* (Pahadi Sisoo),
- viii) *Embllica occicinalis* (Anla),
- ix) *Erithrina indica / suberosa* (Paladhua),
- x) *Gmelina arborea* (Gamhar),
- xi) *Melia azadirachta* (maha neem),
- xii) *Samania saman* (Bada chakunda,
- xiii) *Syzygium cumini* (Jamu),
- xiv) *Tectona grandish* (Teak)
- xv) *Terminalia belerica* (Bahada),
- xvi) *Terminalia chebula* (Harida,
- xvii) *Terminalia tomentosa* (Asan)

Nursery for required species and number may be raised in permanent nursery or in a temporary nursery as convenient. The standard nursery technique found in any silviculture text or standard practices may be followed. The recommended height of seedling before planting is 60cm to 75cm in case of six month old seedlings and 100 cm in case of one year old seedlings. For seed collection & use, plus trees available in the locality or brought from



known source of origin may only be utilized. Unknown source should be strictly avoided to have a better plantation.

16.6.12.4 Planting:

Planting of seedlings shall be taken up during last week of June / 1st week of July. During planting, application of Chemical fertilizer is recommended at sites away from water sources. Near water source application of FYM / Organic fertilizer is recommended. In no case chemical insecticides should be applied.

After planting following Post care is recommended.

a) Causality Replacement.

After planting, some planted seedlings may get damaged. These dead / defective seedlings are required to be replaced within 15 days of planting or as soon as possible with better seedlings.

b) Weeding & Soil Working:

After 30 days of planting, the planted seedlings start bearing new leaf. From 30 days to 45 days soil working around the plant along with application of fertilizer is recommended. Weeding around the plant i.e. patch weeding is to be taken up. In case of area with heavy weeds or grasses strip weeding proves beneficial. Number of weeding in a year may be decided as per cost norm provisions. Two weeding in 1st year is always prescribed.

c) Mulching:

In sandy / refractory soil mulching by grasses from February to June helps in retaining soil moisture. Hence it is recommended in case of sand or refractory soil with complete open areas.

d) Fire Protection / watch & ward:

Fire protection measures and watch & ward against grazing are strictly to be implemented.

16.6.12.5 Soil & Moisture Conservation:

To improve the vegetation and ensure a good plantation role of Soil & Moisture Conservation is crucial. As the selected site is mostly of degraded soil, it is recommended to have contour



bonding, percolation pits, contour trenches and half-moon trench in all plantations within cost norm provided. In case of eroded soil, gully plugging is also to be executed on priority.

16.6.13 Associated Regulations and Measures:

In case of plantations the plantation journal, Nursery journal is to be maintained. The details of operation, yield, year of working etc along with the photographs are to be recorded / placed in the Compartment history. Each plantation site may be given a Identification number to be maintained at Division level for ease identification.

16.6.13.1 Grazing:

The area planted is to be closed to Grazing for at least for 3 years. The VFC / VSS may be allowed to cut and take grasses from plantations to encourage stall feeding.

16.6.13.2 Map on Topo Sheet:

The planted up area is required to be marked / depicted on Survey of India topo map either 1:50000 scale of 1:25000 scale for future management and next plan preparation. The plantation layer in GIS Doman is to be developed to identify the plantation immediately and growth can be noticed through KML Files.

16.6.13.3 Plantation Control Form:

After completion of planting, a plantation control form is required to be submitted by the Range Officer to regulate activities as per Working Plan prescription.

Table No 16.13 Plantation Control Form No-3

Name of Planting Series	Year of Working	Area assigned in ha	No of Standard Trees marked	Quantum of Timber / F.W obtained	Area actually planted up	Reason of Deviation if any.





CHAPTER- 17

PROTECTION WORKING CIRCLE (PR.WC)

17.1 Name of working circle:

There are forest blocks previously worked under Selection working circle but during this decade, there is rapid change in wildlife management concept. Due to various developmental activities near Rairakhol Township, the Tal – Kholgarh elephant corridor has been disturbed. It is felt the forest blocks coming within Tal- Kholgarh Elephant corridor is protected and developed in line of wildlife management. Hence these blocks are proposed to be managed under Protection working circle rather than selection working circle as in previous plan.

Similarly some forest blocks / compartments are continuous to Satkosia Tiger Reserve through Northern Reserved Forests of Athmallik Division to Rail Reserved Forests of Naktideul Range of Rairakhol Division. These blocks are identified as Tiger Land Scape. It is felt necessary to keep these forest blocks under protection working circle instead of Selection Working Circle in order to provide a safer and a long Tiger land scape from Stkosia Tiger Reserve to Naktideul with a **“Wider Tiger Territory”**. Hence it is proposed to constitute **“Protection Working Circle”** which was conceived as overlapping working circle in outgoing plan. The Total area allotted to this working circle is 10937.91 ha

17.2 General constitution of working circle:

The protection Working Circle has been constituted with the following Blocks / compartments having importance from wildlife management consideration. The blocks included in this working circle are at **Table No 17.1**



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No: 17.1 Forest Area Allotted to various Working Circle. (area in ha)

SI No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Pro.WC	JFM(O) WC
Reserved Forests.						
A. Badbahal Range						
1	Rahan	6	462.33	462.33	462.33	220.0
2	Tal	1	840.18	839.88	839.51	
	Tal	2	619.10	619.10	619.10	
	Tal	3	601.38	601.38	601.38	
	Range Total		2522.99	2522.690	2522.32	220.0
B. Naktideul Range						
3	Rail	3	660.57	660.57	660.57	
	Rail	4	767.32	767.32	767.32	
	Rail	5	1049.04	1049.04	1049.04	
	Rail	6	623.89	623.89	623.89	
	Rail	8	903.36	903.36	903.36	55.00
	Rail	10	368.42	368.42	368.42	
	Rail	12	667.51	667.51	667.51	
	Total		5040.11	5040.1100	5040.11	55.00
C. Girishchandrapur Range						
4	Kholgarh	8	543.35	543.35	543.35	
	Div Total		8106.45	8106.15	8105.78	275.00
Proposed Reserved Forest						
A. Naktideul Range						
5	Chadchadi		2832.13	2832.13	2832.13	94.00
Div. RF, PRF & DPF			10938.58	10938.28	10937.91	369.00

The forest blocks included in this working circle are considered from the following angle.



1. Blocks coming under Tal- Kholgarh Elephant Corridor.

Blocks are Rahan comp. no-6, Tal – comp.no 1, 2,3 and Kholgarh comp. no -8 (Area 3065.670 ha)

2. Tiger Land Scape maintaining continuity with Satkosia Tiger Reserve.

Rail RF Comp. No 3,4,5,6,8,10, 12 and Chadchadi PRF (Area 7872.240 ha)

The area mentioned under 1 is dedicated to Elephant where as area mentioned under 2 is dedicated to Tiger / Leopard.

17.3 General characteristics of vegetation:

The forest blocks included in this working circle are mostly Sal Forest with varied crop density 50-75% and important from wildlife point of view. The associates are those of Moist Peninsular Sal (Low level Sal and Valley Sal)

17.4 Treatment series / sections and JFM areas:

The area assigned to this working circle is sub divided to two Series namely **Tal- Kholgarh Protection Series** and **Rail – Chadchadi Protection Series**. Area assigned to each series is as follows (Table No-17.2).

Table No 17.2 Constitution of Protection Series						
Sl No	Name of Protection Series	Range	Forest Block	Comp. No	Area in ha	Remark
1	Tal- Kholgarh Protection Series	Badbahal	Rahan	6	462.33	3065.67
			Tal	1	839.51	
			Tal	2	619.10	
			Tal	3	601.38	
		GCPur	Kholgarh	8	543.35	
2	Rail – Chadchadi Protection Series	Naktideul	Rail	3	660.57	7872.24
			Rail	4	767.32	
			Rail	5	1049.04	
			Rail	6	623.89	
			Rail	8	903.36	
			Rail	10	368.42	
			Rail	12	667.51	
			Chadchadi		2832.13	
	Total					10937.91



These series are not further sub divided into sections as no work except improvement of habitat from wildlife point of view will be prescribed which will be implemented as a whole in the series as and when required.

17.5 Blocks, compartments and JFM area:

The Forest blocks assigned to this Working Circle has been assigned to VSS for Protection & Management. The same has been indicated in Table No 17.1 above. Out of total 10937.91 ha allotted to this working circle 644.00 ha has been assigned to VSS which constitutes about 5.89% of the working circle area.

17.6 Special objectives of Management:

The objectives of Management of this working Circle is as follows.

- (i) To provide an undisturbed tree cover and improve the ecological condition of the forest assigned.
- (ii) To maintain the elephant corridor and Tiger Landscape so as to have an undisturbed movement of animal in the corridor / landscape.
- (iii) To induce natural vegetation through appropriate seeding.

17.6.1 Analysis of the crop:

The crop consists of Sal along with its associates. The crop density is about 50-70%. In Tal Reserved Forests miscellaneous crop constitutes about 40% where as in other blocks Sal is the main constituent about 75% and above.

The area is coming under Sambalpur Elephant Reserve. The fodder species constituents as recorded by Asian Nature Conservation Foundation, Bangalore for Elephant are reproduced below for reference.

17.6.1 Vegetation of Sambalpur Elephant Reserve

A total of 7019 individuals were enumerated belonging to 102 species of angiosperms spread over 45 different families of flowering plants. There were 110 sample plots in dry deciduous over forests and 36 sample plots in moist deciduous forests. Dry deciduous forests accounted for 76.47% of total individuals while moist deciduous forests accounted for 23.52% of the individuals. Most abundant species was *Shorea robusta* (1896 individuals, 27.01% of total abundance) followed by *Cleistanthus collinus* (713 individuals, 10.16% of total abundance) and *Diospyros melanoxylon* (459 individuals, 6.59% of total abundance). Top ten species account for 72.19% of total abundance. Large proportion of the IVI is by *Shorea robusta* (64.22), other species which contribute to IVI are *Cleistanthus collinus* (14.43) and



Terminalia alata(14.26). Table17.3 summarizes the dominance of top ten species at the community level for Sambalpur Elephant Reserve.

Dominant species in the Sambalpur Elephant Reserve (Data from field sampling)

Table No 17.3 Species abundance in Sambalpur Elephant Reserve

Species	Abundance	Relative abundance (%)	Cumulative abundance(%)	Importance value index
<i>Shorea robusta</i>	1896	27.01	27.01	64.22
<i>Cleistanthus collinus</i>	713	10.16	37.17	14.43
<i>Diospyros melanoxylon</i>	459	6.54	43.71	10.85
<i>Terminalia alata</i>	433	6.17	49.88	14.26
<i>Lagerstroemia parviflora</i>	358	5.10	54.98	8.41
<i>Buchanania lanzan</i>	347	4.94	59.92	6.98
<i>Anogeissus latifolia</i>	294	4.19	64.11	7.89
<i>Diospyros montana</i>	232	3.31	67.42	5.44
<i>Madhuca indica</i>	176	2.51	69.92	6.32
<i>Syzygium cumini</i>	159	2.27	72.19	6.03

Dry deciduous forests of Sambalpur ER has 5368 individuals belonging to 93 species and 42 angiosperm families in the sampled plots. *Shorea robusta* is the most dominant species(1410 individuals , 26.26% of total abundance) followed by *Cleistanthus collinus* (560 individuals, 10.43% of total abundance) and *Diospyros melanoxylon*(367 individuals , 6.83% of total abundance). Table-No 17.4 summarizes the dominance of top ten species in dry deciduous forests of Sambalpur ER.

Dominant species in the Dry deciduous forests of Sambalpur Elephant Reserve (Data from field sampling)

Table No 17.4 Dominant species in the Dry deciduous forests of Sambalpur Elephant Reserve

Species	Abundance	Relative abundance (%)	Cumulative abundance(%)	Importance value index
<i>Shorea robusta</i>	1410	26.27	26.27	64.85
<i>Cleistanthus collinus</i>	560	10.43	36.70	14.93
<i>Diospyros melanoxylon</i>	367	6.84	43.54	11.00
<i>Terminalia alata</i>	358	6.67	50.20	15.65
<i>Lagerstroemia parviflora</i>	289	5.38	55.59	8.89



Table No 17.4 Dominant species in the Dry deciduous forests of Sambalpur Elephant Reserve

Species	Abundance	Relative abundance (%)	Cumulative abundance(%)	Importance value index
<i>Anogeissus latifolia</i>	262	4.88	60.47	8.70
<i>Buchanania lanzan</i>	243	4.53	65.00	6.59
<i>Diospyros montana</i>	171	3.19	68.18	5.07
<i>Madhuca indica</i>	120	2.24	70.42	5.75
<i>Chloroxylon swietenia</i>	119	2.22	72.63	3.46

Moist deciduous forests of Sambalpur ER had 1651 individuals belonging to 63 species and 35 families of flowering plants in the samples plots. Top ten species accounted for 73% of the total abundance. Most abundant species was *Shorea robusta* (486 individuals , 29.4% of total abundance) followed by *Cleistanthus collinus*(153 individuals , 9.27% of total abundance) and *Buchanania lanzan*(104 individuals , 6.3% of total abundance). *Shorea robusta* also had highest IVI value (62.49) followed by *Cleistanthus collinus*(12.85) and *Buchanania lanzan* (10.31). Table17.5 summarizes the dominance of top ten species in moist deciduous forest of Sambalpur ER.

Dominant species in the moist deciduous forests of Sambalpur Elephant Reserve (Data from field sampling)

Table No 17.5 Dominant species in the moist deciduous forests of Sambalpur Elephant Reserve

Species	Abundance	Relative abundance (%)	Cumulative abundance(%)	Importance value index
<i>Shorea robusta</i>	486	29.44	29.44	62.49
<i>Cleistanthus collinus</i>	153	9.27	38.70	12.85
<i>Buchanania lanzan</i>	104	6.30	45.00	8.24
<i>Diospyros melanoxylon</i>	92	5.57	50.58	10.31
<i>Terminalia alata</i>	75	4.54	55.12	9.96
<i>Lagerstroemia parviflora</i>	69	4.18	59.30	6.91
<i>Syzygium cumini</i>	64	3.88	63.17	8.19
<i>Diospyros montana</i>	61	3.69	66.87	6.57
<i>Madhuca indica</i>	56	3.39	70.26	8.09
<i>Haldina cordifolia</i>	45	2.73	72.99	6.60



Vegetation diversity patterns in the Elephant Reserves

Community wise diversity parameters of each Elephant Reserve are given in the Table No 17.6). Sambalpur Elephant Reserve is reported to have more species than either Mayurbhanj ER or Mahanadi ER. This may be attributed to larger number of sample plots. Mahanadi ER has more heterogeneity compared to the rest. However, Mayurbhanj ER is more diverse at a given unit area compared to the rest as indicated by Fisher's Alpha.

Community level diversity parameters of Sambalpur Elephant Reserves (Data from field sampling)

Table No 17.6 Community level diversity parameters of Sambalpur Elephant Reserves					
Parameters(N)	Number of species recorded in sample plots	Dominance	Simpson's index	Shannon's index	Fisher's Alpha
Sambalpur Elephant Reserve(146)	102	0.103	0.89	3.051	16.91

N indicate the number of sample plots laid (in Sambalpur ER 2 plots are without marked vegetation)

Shannon-Weiner's diversity of Mahanadi Elephant Reserve is significantly different from both Mayurbhanj and Sambalpur Elephant Reserves (Diversity 't'test). Though Sambalpur ER has much more species recorded compared with other ERS, this pattern could be attributed to larger sample size of plots. Other factors such as anthropogenic disturbances and developmental activities could also be factors contributing to such patterns.

Among the dry deciduous forest patches of different Elephant Reserves, the Mahanadai Forest was the most diverse followed by Sambalpur and Mayurbhanj . in Mayurbhanj there was a noticeable dominance of Shorea robusta and hence this could have resulted in low diversity.

Diversity parameters of dry deciduous forests of Sambalpur Elephant Reserves(Data from field sampling)

Table No 17.7 Diversity parameters of dry deciduous forests of different Elephant Reserves				
Parameters(N)	Dominance	Simpson's index	Shannon's index	Fisher's Alpha
Sambalpur Elephant Reserve(110)	0.10	0.89	3.042	15.98



N indicate the number of sample plots in dry deciduous patches.

The diversity of moist deciduous forests

Among the three Elephant Reserves, moist deciduous Sambalpur Elephant reserve had the lowest index of 2.937. The diversity estimates for Sambalpur Elephant Reserves are tabulates in table-No 17.8

Diversity parameters of moist deciduous forests of different Elephant Reserves (Data from field sampling)

Table No 17.8 Diversity parameters of moist deciduous forests of different Elephant Reserves

Parameters(N)	Dominance	Simpson's index	Shannon's index	Fisher's Alpha
Sambalpur Elephant Reserve(36)	0.113	0.88	2.937	12.98

N indicate the number of sample plots in moist deciduous patches.

17.6.2 Silvicultural system:

As the assigned forest area is to be maintained as **"Protected Area"** for flora & Fauna no silvicultural system is prescribed.

17.6.3 Rotation period:

There is no harvesting provision in this working circle. Hence no rotation period is prescribed for this working Circle.

17.6.4 Harvestable diameters:

There is no Provision for any harvesting of crop. Hence no harvestable diameter / Girth are prescribed.

17.6.5 Reducing factors and reduced areas:

There is no provision for yield from the blocks allotted to this Working Circle. There is no reducing factors / area under this Working Circle.

17.6.6 Treatment Cycle:

There is prescription for **"Treatment in General"**. Hence no treatment Cycle is prescribed. Any urgent measures if required are to be taken basing on situation, it will be addressed **"As and When basis"**. The prescriptions are to be remaining valid for the Plan Period i.e. for 10 years.



17.6.7 Division into Treatment Section:

The forest block assigned to this working Circle / Protection Series is to be treated as one Section. No further sub division is prescribed.

17.6.8 Calculation of the yield:

No yield is expected from the forests assigned to this working circle. Hence no yield is calculated.

17.6.9 Table of Treatment.

The forests included in this working Circle needs special treatment. The following treatment is suggested in general.

- The forests will be protected from all angles i.e. against illicit felling, Fire and Poaching.
- Except the area assigned to VSS, no collection of NTFP is allowed from this area.
- Available water sources are to be developed / maintained to retain / enhance water holding capacity.
- Streams / nallas are to be protected against diversion of water for any other purpose.
- Existing grass lands are to be maintained / enriched with palatable grasses of the locality.
- No removal of Timber / other forest produce from the assigned area. In case of large scale uprooting of trees / windfall or any natural calamity, the damaged trees can be removed after due marking of trees. Some wind fallen trees (5 numbers per ha)may be retained as such for improvement of habitat for rodents, Snakes, birds etc.
- Soil & Moisture Conservation measures will be taken up where ever required.
- Animal sighting resister is to be maintained at Section / Beat level so as to assess the animal concentration in the forests under this working circle.
- Observed data for the year 2021-22 will be considered as base data and comparison will be made thereafter.

17.6.10 Method of executing:

For management purpose the entire block has been taken as one unit. The treatment plan has been outlined under Para 17.6.9 above. In case of any exigency additional treatment plan to address the situation is to be prepared and approved by the Divisional Forest Officer and to be implemented. The matter of such execution is to be brought to the notice of Regional Chief Conservator of Forests and included in the **Annual Deviation Statement**.



17.6.11 Associated regulations and measures:

The forest blocks included are basically important from wildlife point of view. Steps required to be taken as far as practicable not to disturb the habitat on normal ground. Basing on DGPS map being prepared now, a set of KML File containing entire forest blocks of this working Circle (one for Elephant Corridor and one for Tiger landscape) may be prepared and periodically monitored using advance technology.





CHAPTER-18

BAMBOO OVERLAPPING WORKING CIRCLE (BAMBOO (O) WC)

18.1 Name of working circle:

There are bamboo Forests in Rairakhhol Division. About 12% of the forest area bears bamboo. It is an important NTFP of the Division. These Bamboo Forests are in a degraded path. No harvesting was taken up partly due to poor crop and partly for no demand after closer of Bamboo based industries during the outgoing plan period. In order to improve the bamboo forest this working circle is constituted taking all bamboo forests available. These forests are proposed to be managed under **Bamboo (Overlapping) Working Circle**. The area allotted to this Working Circle is **13821.014 ha**.

18.2 General constitution of working circle:

Bamboo is normally available in moist deciduous forests mostly in a sporadic manner. All the forest blocks having bamboo has been included in this Working Circle. The Range / blocks assigned to this working circle are at table no 18.1 below.

Table No 18.1 Range /Blocks assigned to this working circles

Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Bamboo (O) WC	JFM(O) WC
Reserved Forests.						
A. Rairakhhol Range						
1	Bindhya-basini	1	181.990	181.990	181.990	
	Bindhya-basini	2	264.940	264.540	264.540	
	Bindhya-basini	3	308.980	308.980	308.980	
		Total	755.910	755.510	755.510	
2	Hatidhara	1	482.660	479.660	479.660	
	Hatidhara	2	259.480	256.480	256.480	
	Hatidhara	3	401.720	398.720	398.720	
	Hatidhara	4	524.590	521.590	521.590	50.000
	Hatidhara	6	296.420	293.420	293.420	
	Hatidhara	7	518.750	518.750	518.750	56.000
	Hatidhara	8	521.200	521.200	521.200	51.700
	Hatidhara	9	543.280	543.060	543.060	
	Hatidhara	10	280.770	280.770	280.770	50.000



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Table No 18.1 Range /Blocks assinged to this working circles

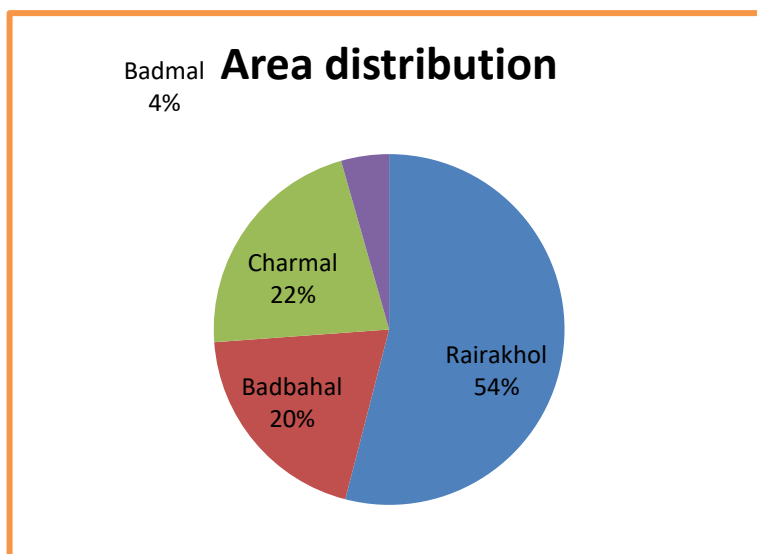
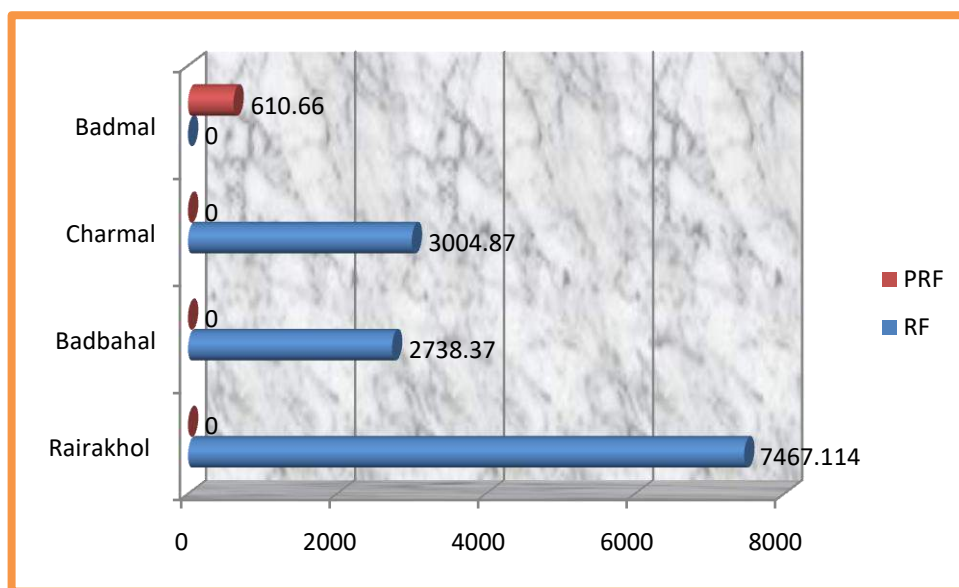
Sl No	Name of Forest Block	Comp no	GIS compt. Area	Area available for Management	Bamboo (O) WC	JFM(O) WC
	Hatidhara	13	551.810	551.810	551.810	
	Hatidhara	14	482.850	482.850	482.850	
		Total	4863.530	4848.310	4848.310	207.700
3	Kholgarh	26	305.29	305.29	305.29	
	Kholgarh	36	408.35	407.844	407.844	
	Kholgarh	37	455.44	455.44	455.44	
	Kholgarh	38	316.81	316.81	316.81	
	Kholgarh	39	378.62	377.91	377.91	
		S. Total	1864.51	1863.294	1863.294	0
	Range Total		7483.95	7467.114	7467.114	207.70
B. Badbahal Range						
4	Rahan	2	379.950	379.950	379.950	50.000
	Rahan	3	548.110	548.110	548.110	150.000
	Rahan	4	813.460	813.460	813.460	170.000
	Rahan	5	534.520	534.520	534.520	
	Rahan	6	462.330	462.330	462.330	220.000
	Range Total		2738.370	2738.370	2738.370	590.000
C. Charmal Range						
5	Sagmalia	1	424.500	424.500	424.500	56.300
	Sagmalia	2	440.130	440.130	440.130	
	Sagmalia	3	373.130	373.130	373.130	100.000
	Sagmalia	4	747.130	747.130	747.130	
	Sagmalia	5	459.030	459.030	459.030	
	Sagmalia	6	560.950	560.950	560.950	
		Total	3004.870	3004.870	3004.870	156.300
	Div Total		13227.190	13210.354	13210.354	954.000
Proposed Reserved Forest						
Badmal Range						
1	Sagjori		610.660	610.660	610.660	
	Range Total		610.660	610.660	610.660	
	Div. Total		610.660	610.660	610.660	
	Total(RF+PRF)		13837.850	13821.014	13821.014	954.000



18.2.1 Abstract of Area allotted to Working Circle:

Table No 18.2 Abstract of Area assigned to Bamboo (O) WC

Sl No	Range	Area assigned from		
		Reserved Forests (RF)	Proposed RF (PRF)	Total
1	Rairakhol	7467.114	0	7467.1140
2	Badbahal	2738.37	0	2738.3700
3	Charmal	3004.87	0	3004.8700
4	Badmal	0	610.66	610.6600
	Total	13210.354	610.66	13821.0140





18.3 General characteristics of vegetation:

Bamboo is available in Five Reserved Forests and One PRF of the division. During assessment of Regeneration of bamboo, it is observed that all bamboo forests can be classified as Good . The average height of culms is 7-8 meter i.e. Type-II. The clump size is 2 to 2.5 m dia with 20-35 culms per clump. Number of Clumps per hectare varies from 80to 125 numbers per hectare.

18.4 Cutting Series, Cutting Sections and JFM areas:

The area assigned to this Working Circle has been divided to Cutting Series and cutting Sections for distributed work load and better management in the field. The following Cutting Series has been constituted.

Table No 18.3 Constitution of Bamboo Cutting Series

SI No	Name of Cutting Series	Range	Forest Block	Comp. No	Area in Ha	Cutting Series Total area
1	Kholgarh Bamboo Cutting Series	Rairakhol	Bindhya-basini	1	181.990	2618.804
			Bindhya-basini	2	264.540	
			Bindhya-basini	3	308.980	
			Kholgarh	26	305.29	
			Kholgarh	36	407.844	
			Kholgarh	37	455.44	
			Kholgarh	38	316.81	
			Kholgarh	39	377.91	
2	Hatidhara Cutting Series	Rairakhol	Hatidhara	1	479.660	4848.310
			Hatidhara	2	256.480	
			Hatidhara	3	398.720	
			Hatidhara	4	521.590	
			Hatidhara	6	293.420	
			Hatidhara	7	518.750	
			Hatidhara	8	521.200	
			Hatidhara	9	543.060	
			Hatidhara	10	280.770	
			Hatidhara	13	551.810	
			Hatidhara	14	482.850	
3	Rahana Cutting Series	Badbahal	Rahan	2	379.950	2738.37
			Rahan	3	548.110	
			Rahan	4	813.460	
			Rahan	5	534.520	



Table No 18.3 Constitution of Bamboo Cutting Series

Sl No	Name of Cutting Series	Range	Forest Block	Comp. No	Area in Ha	Cutting Series Total area
			Rahan	6	462.330	
4	Sagmalia Cutting Series	Charmal	Sagmalia	1	424.500	3615.53
			Sagmalia	2	440.130	
			Sagmalia	3	373.130	
			Sagmalia	4	747.130	
			Sagmalia	5	459.030	
			Sagmalia	6	560.950	
		Badmal	Sagjori		610.660	
	Total				13821.014	13821.014

18.4.1 Abstract of Cutting series Constituted:

Table No 18.4 Abstract of Bamboo Cutting Series

Sl No	Name of Cutting series	Range	Area in ha
1	Kholgarh Bamboo Cutting Series	Rairakhol	2618.804
2	Hatidhara Cutting Series	Rairakhol	4848.310
3	Rahana Cutting Series	Badbahal	2738.37
4	Sagmalia Cutting Series	Charmal & Badmal	3615.53
	Total Bamboo (O) WC		13821.014

18.4.2 Cutting Sections:

For convenience in bamboo working a four year cycle is accepted and followed. This will optimize the yield and also allowed sufficient gestation period to restock the Bamboo Forest. Each Cutting Series is divided in to four Segments i.e. A,B,C and D to be worked each year in cyclic manner. The area allotted to each Section is as follows.



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Table No 18.5 Sections of Kholgarh Cutting Series (KCS)

Name of Cutting Series	Year of Operation	Coupe No	Forest Block	Comp. No	Area	Section Area total
Kholgarh Bamboo Cutting Series (KCS)	2021-22 , 2025-26 & 2029-30	A	Bindhya-basini	1	181.990	755.510
			Bindhya-basini	2	264.540	
			Bindhya-basini	3	308.980	
	2022-23, 2026-27 & 2030-31	B	Kholgarh	26	305.29	713.1340
			Kholgarh	36	407.844	
	2023-24 & 2027-28	C	Kholgarh	37	455.44	455.44
	2024-25 & 2028-29	D	Kholgarh	38	316.81	694.720
			Kholgarh	39	377.91	
	Total				2618.804	2618.804

Table No 18.6 Sections of Hatidhara Cutting Series (HCS)

Name of Cutting Series	Year of Operation	Coupe No	Forest Block	Comp. No	Area	Section Area total
Hatidhara Cutting Series(HCS)	2021-22 , 2025-26 & 2029-30	A	Hatidhara	1	479.660	1134.860
			Hatidhara	2	256.480	
			Hatidhara	3	398.720	
	2022-23, 2026-27 & 2030-31	B	Hatidhara	4	521.590	1333.760
			Hatidhara	6	293.420	
			Hatidhara	7	518.750	
	2023-24 & 2027-28	C	Hatidhara	8	521.200	1345.03
			Hatidhara	9	543.060	
			Hatidhara	10	280.770	
	2024-25 & 2028-29	D	Hatidhara	13	551.810	1034.66
			Hatidhara	14	482.850	
	Total				4848.310	4848.310



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Table No 18.7 Sections of Rahan Cutting Series (RCS)

Name of Cutting Series	Year of Operation	Coupe No	Forest Block	Comp. No	Area	Section Area total
Rahana Cutting Series (RCS)	2021-22 , 2025-26 & 2029-30	A	Rahan	2	379.950	842.28
			Rahan	6	462.330	
	2022-23, 2026-27 & 2030-31	B	Rahan	3	548.110	548.110
	2023-24 & 2027-28	C	Rahan	4	813.460	813.460
	2024-25 & 2028-29	D	Rahan	5	534.520	534.520
	Total				2738.370	2738.370

Table No 18.8 Sections of Sagmalia Cutting Series (SCS)

Name of Cutting Series	Year of Operation	Coupe No	Forest Block	Comp. No	Area	Section Area total
Sagmalia Cutting Series	2021-22 , 2025-26 & 2029-30	A	Sagmalia	1	424.500	864.63
			Sagmalia	2	440.130	
	2022-23, 2026-27 & 2030-31	B	Sagmalia	3	373.130	832.16
			Sagmalia	5	459.030	
	2023-24 & 2027-28	C	Sagmalia	4	747.130	747.13
	2024-25 & 2028-29	D	Sagmalia	6	560.950	1171.61
			Sagjori		610.660	
	Total				3615.53	3615.53

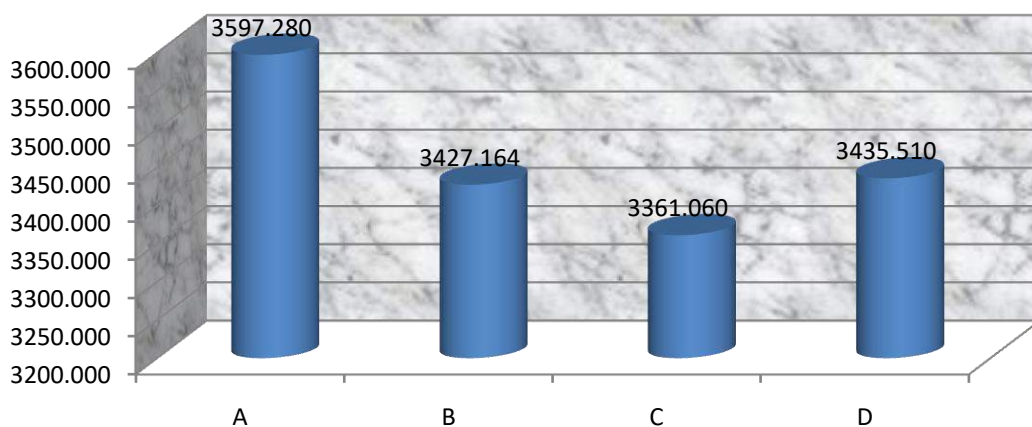


18.4.3 Abstract of Sections constituted:

Table No 18.9 Abstract of Cutting Sections –Rairakhol Division.

Sl No	Name of Cutting series	Cutting Section				
		A	B	C	D	Total
1	Kholgarh	755.510	713.134	455.44	694.720	2618.804
2	Hatidhara	1134.860	1333.76	1345.03	1034.66	4848.310
3	Rahana	842.28	548.110	813.460	534.520	2738.37
4	Sagmalia	864.63	832.16	747.13	1171.61	3615.53
Total Bamboo (O) WC		3597.28	3427.164	3361.06	3435.51	13821.014

Area in Ha



18.5 Blocks, Compartments and JFM area:

Blocks / Compartment allotted to VSS have been indicated in Table No 13.3 and 17.1 above.

18.6 Special objectives of Management:

The special objectives of management in respect of this Over Lapping Working Circle are within the scope of general objectives of management of forest. These are as follows:

- To enforce scientific harvesting of Bamboo and provide bamboo to local artisans and industrial purpose basically to paper mills for raw materials on sustainable basis.
- To restore the bamboo forests through intense silvicultural practices and checking fire & soil erosion.
- To enhance fodder availability to wild animals from bamboo crops.



iv) To improve the bamboo growing stock through plantations.

v) To improve bamboo forests through JFM and provide employment to bamboo artisans

18.6.1 Analysis of the crop:

Bamboo Crop is moderate to fair in most of the forest blocks allotted to this working circle. Due to non working of Bamboo coupes congested clumps are noticed in many forest blocks. Raised Clumps are also a common sight. The crop is considered as degraded and needs constant harvesting and Silvicultural operation.

18.6.2 Silvicultural system:

For Bamboo forests proposed for commercial harvesting will be worked under “**Culm Selection Cum Improvement System**”. Under this system, Bamboo culms are selectively removed depending upon number of culms available under different age i.e. 1st yr to 4th year and above. After cutting of bamboo as per rules, Simultaneous Silvicultural Operation (SSO) is to be taken up to improve the clump and induce good regeneration.

18.6.3 Cutting Cycle:

A four year cutting cycle and treatment Cycle is prescribed in this plan. During the Plan period 2 & ½ Cycle will be completed.

18.6.4 Harvestable Bamboo Clumps:

Bamboo will be removed from a clump selectively. Bamboo of four year old and above can only be removed after leaving minimum required number of culms in a clump according to its quality class i.e. Class-I /II /III.

Table No 18.10: Number of Clums required to be retained

Quality Class of Clump	Criteria for assigning Quality class to clumps	Number of Culms required to be retained.
Clump Quality I	Culm height of Bamboos from 9 meters and up.	20
Clump Quality II	Culm height of Bamboos between 6 meters to 9 meters.	15
Clump Quality III	Culm height of Bamboos below 6 meters.	10

18.6.5 Reduced Factors and reduced areas:

The yield will be regulated on area basis. No reduced factor / area have been assessed.



18.6.6 Calculation of the yield:

The annual yield has been estimated on cutting series wise. It has been based on number of clumps per ha and number of harvestable bamboo available per clump.

Table No 18.11 Calculation of Yield from Bamboo Coupes

Name of Cutting Series	Description	Section Area				
		A	B	C	D	Total
All Series	Area	3597.28	3427.164	3361.06	3435.51	13821.014
	Clumps/ ha	85	80	85	90	
	Harvestable culms / Clump	15	15	15	20	
	Yield No of bamboo	3669225.6	3290077.44	3428281.2	4637938.5	15025523
	SU =350 no CB	10484	9400	9795	13251	42930

The yield per year is estimated to be around 10500 SU on an average if entire assigned area is worked out.

18.6.7 Table of Cutting:

The Forest Blocks assigned for felling along with year of felling has been furnished in Para 18.4.3 in each cutting Section. Each Section & Year of Operation is reproduced below.

Cutting section	Year of Operation
A	2021-22, 2025-26 & 2029-30
B	2022-23, 2026-27 & 2030-31
C	2023-24 & 2027-28
D	2024-25 & 2028-29

18.6.8 Method of executing the Felling:

18.6.8.1 Demarcation of Coupe:

Bamboo Coupes (Section A, B, C & D) in each Cutting Series has been indicated on the Topo Sheet i.e. management Map (1:50000 Scale). Coupe demarcation shall be taken up in April-June every year assigned for working. It shall be demarcated by giving double coal-tar rings at the breast height of the trees standing on the coupe lines (Coupe and Section are Synonym), which will distinctly visible from each other. Signboards shall be displayed on compartment lines, road crossings, nalla crossings and other strategic points mentioning the



details such as sequence of the coupe, its area, year of working and compartment number. After Coupe / section demarcation is completed, it shall be reported to Division Office along with a map of the area.

18.6.8.2 Preparation of Treatment Map:

After demarcation is complete, the OFDC Ltd may be asked to jointly visit the area of the assigned coupe and prepare a treatment map with sequence of felling and yield estimation. The Coupe area may be indicated in to different treatment types. Following guidelines may be kept in mind while preparing the treatment map.

- Treatment map shall be prepared on available Management Map with Distinct Contour Lines.
- Treatment types to be distinguished shall be based on the assessment of the standard Salia bamboo quality classes and actual clump condition.
- Areas less than 4 Hectare in extent will not be separated out as distinct Treatment Types.
- An abstract of area under different treatment class / Blank Area / area available for Bamboo Plantation etc to be furnished with the report.

Treatment Types:

Treatment types (A, B& C) have been prescribed for Salia Bamboo area and described below:

Treatment Type-A:

Areas with healthy and well-stocked Bamboo Clumps having harvestable bamboo have been classified to Treatment Type –A. This type is further classified to Quality Class depending upon average Culm height in a clump.

Table No 18.12 Bamboo Clump Classifications – Quality Class.	
Quality Class- I	Average Culm height of Bamboos from 9 meters and up
Quality Class-II	Average Culm height of Bamboos between 6 meters to 9 meters
Quality Class-III	Average Culm height of Bamboos below 6 meters

Treatment Type-B:

Areas with well-stocked but degraded, damaged, congested and / or fire burnt Bamboo Clumps are considered for Treatment Type- B.



Treatment Type-C:

Areas where bamboo clumps are sparse and scattered. If necessary, the treatment types A & B may further be classified into the above mentioned three clumps quality classes.

18.6.8.3 Execution of Cutting:

The cutting of Salia Bamboo is regulated through a set of Bamboo Cutting Rules. The Rule is reproduced below.

Rules, which are uniformly applicable to all the treatment types:

- i. Karadi (culm up to one year of age) and the bamboo Culm over one year but under two years of age will not be cut under any circumstances. Such more than one-year-old culms and the culms, which are older than 2 years but less than 3 years of age, shall be retained in the clump and their number, should not be less than number of Karadis.

ii. Distinguishing Morphological characters of the Culms of different age:

Culm age	Morphological Character
Karadi (the first year clum)	Culm sheath present on lower half of Culm. Branches present throughout the length of Culm. Green uniformly, bloom is abundantly present and comes off easily on finger. A fresh cut just under the node shows the same fresh coloration even after one or two minutes
Kasi (the second year clum)	Culm sheath mostly absent except some remnants. Culm dark in colour. Branches present practically at all nodes. Bloom is patchy, grayish-white in colour and comes off less easily on finger. A fresh cut just under the node shows the same fresh coloration even after one or two minutes
Pakala (the 3rd & 4th year clum)	Culm sheath absent. White bloom absent. Blackish gray or dark blotches appear which come off on finger slightly on rubbing. A fresh cut under the node shows reddish-brown coloration after one or two minutes.

- iii. The Minimum number of culms to be retained in a clump is fixed on the basis of quality of the clump and it is as follows: -

1. Clump Quality I – 20 culms.
2. Clump Quality II – 15 culms.
3. Clump Quality III – 10 culms.



- iv. Clumps having the minimum or less than minimum prescribed number of culms shall not be commercially exploited. Only broken, dead, dry, badly damaged and mal-formed bamboos will be felled.
- v. A clump will be distinguished, as an independent clump where its periphery is easily discernible from others. Only where such a distinction is not possible, two clumps within one-meter distance will be regarded as one.
- vi. The retained culms in a clump should be well spaced, preferably at the periphery in the following order of preference.
 - 1. Karadi bamboos.
 - 2. Kasi bamboos (older than one year but less than 2 years).
 - 3. Pakala bamboos (Young green bamboos).
 - 4. Older live bamboos.
 - 5. Other as may be available.
- vii. Rhizomes will not be dug.
- viii. The height above which culms are cut shall not be less than 15 cm. or more than 45 cm. from the ground level and in no case below the first prominent node from the ground.
- ix. The cut shall be made with a sharp instrument to ensure that the stump remains intact without splitting.
- x. Lops and tops of bamboos will be simultaneously cleared to a distance of at least one meter away from the periphery of the worked out clumps to avoid fire hazard.
- xi. Climbers shall be cut from all the bamboo clumps during working of the coupes.
- xii. Bamboo strips will not be used in tying bamboo bundles.
- xiii. Bamboo cutting will not be done from 1st July to 30th September.
- xiv. In case of sporadic flowering of bamboo, the flowered clumps will be clear-felled, once the seeds from such clumps have fallen.
- xv. In case of gregarious flowering, the clumps will be clear-felled and extracted early just after the shedding of ripe seeds, so that the bamboo do not dry or deteriorate or become prone to fire damage. Disposal of such bamboos should be expeditiously arranged to prevent deterioration in quality and the prescribed treatment as mentioned below shall be adopted in the gregariously flowered areas.
- xvi. Lopping of bamboos either for feeding livestock or otherwise is strictly prohibited.
- xvii. As far as possible, bamboo cutting should be completed by the end of May.



- xviii. Bamboo forests should be rigidly protected from fire. In any case, forest fire should not occur during the year of working and the year following it.
- xix. No grazing shall be permitted during rains in bamboo forests, which have been worked in the previous season.

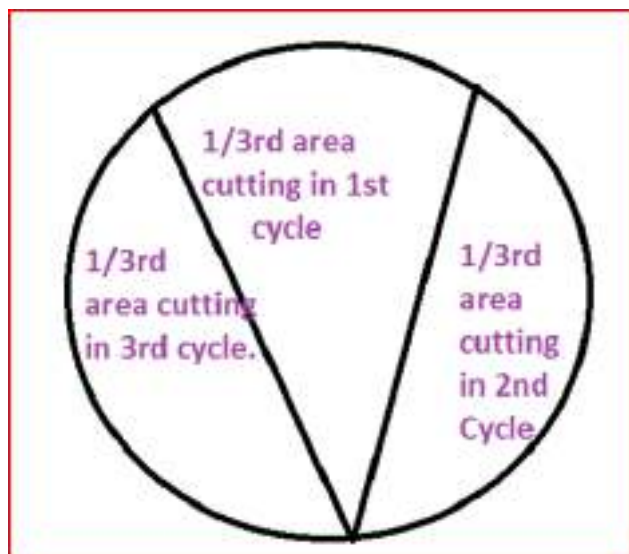
18.6.8.4 Rules applicable to specific treatment types:

1. Treatment Type – A.

- a. Commercial felling will be done in those clumps, which have more than the prescribed minimum number of culms in each.
- b. Cultural operations will be carried out in clumps having less than the prescribed minimum number of culms in each. In such clumps commercial felling will not be done.

2. Treatment Type – B

- i. There will be no commercial felling in any clump.
- ii. Only cultural operations will be carried out which will include:
 - a. Felling of all dead, dried, over-matured, burnt, broken and grossly damaged bamboos.
 - b. Broken or cut bamboos or high stumps in green condition, having length of 2.5 meters or more, may be retained, if necessary, to maintain size of the clumps.
 - c. The minimum number of culms to be retained per clump as prescribed in foregoing paragraphs for various quality classes may not be strictly followed if necessity so arises.
 - d. The congested bamboo clumps shall be clear felled by forming segments. The maximum number of segments, under which a congested clump shall be worked, will be three and at each working not more than one segment will be cut. Where three segments are formed, the middle segment will be in the shape of a triangle having apex at the periphery. Only this middle segment shall be felled at the first working. In subsequent cycles, side segments should be felled. Diagram showing divisions of the clump in these segments is given below:



3. Treatment Type – C

- Only cultural operations will be carried out in the existing bamboo clumps.
- The bamboo potentiality of such forests will be augmented by raising bamboo plantation. The minimum area to be planted annually will be 40 hectares or one third of the area under this type.
- Tending and cultural operations in the area planted with bamboo will be done as per the standard practice.

18.6.8.5: Precautionary measures (Do's and Don'ts) in Bamboo Coupe:

Besides the prescriptions contained in the Bamboo Cutting Rules, some general principles are required to be followed to avoid any damage to the Bamboo Clumps. The simple guidelines will improve coupe working without damage to the present / future crop.

Do's	Don'ts
<ul style="list-style-type: none"> ➤ Sharpen the cutting instrument daily. ➤ While cutting a leaned bamboo Culm, cut from the inner side. ➤ Give a slanting cut to bamboo than a horizontal cut. ➤ Leave all 1st year and 2nd year old bamboo, invent its number is more than minimum bamboo required in clumps. ➤ See that Rhizomes are not disturbed in cutting 	<ul style="list-style-type: none"> ➤ Never use blunt cutting instruments. ➤ Avoid splitting of bamboo stumps. ➤ Never lit a fire near to bamboo clumps. ➤ Never cut peripheral bamboo culms. ➤ Never cut bamboo just



<p>process.</p> <ul style="list-style-type: none">➤ Clean the bamboo clumps after cutting and remove the debris to a ditch or road side.➤ Collect bamboo twigs and takeout for fencing in nearby plantations.➤ Never leave a congested clump, though it is not economical.➤ Start cutting bamboo from top to bottom of a hilly terrain.➤ Start cutting from interior part of the coup than from Road side.	<p>after a good rain during working.</p> <ul style="list-style-type: none">➤ Don't remove branches of standing bamboo above 3m. it helps interlocking the bamboo each other and withstand wind pressure.
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18.6.8.6 Cutting Rules for Daba Bamboos (*Bambusa arundinacea*):

All bamboo culms in a clump which are more than 3 years old shall be harvested on Culm selection basis provided the number of culms left uniformly distributed in a clump shall not less than 10. In case of congested clumps where Culm selection is not possible the clump should be carefully felled by forming segments as per any of two diagrams given above and depending on the interlocking of the bamboos with a view to provide support to the remaining segments against wind damage. The maximum number of segments under which a congested clump should be worked will be three and at each working not more than one segment will be cut. Stumps higher than 50 cm or more than two internodes should not be left uncut. Where three segments are formed, the middle segment will be in the shape of a triangle. Only the middle segment should be felled at the first working. Two Diagrams showing divisions of the clump in three segments are given above.

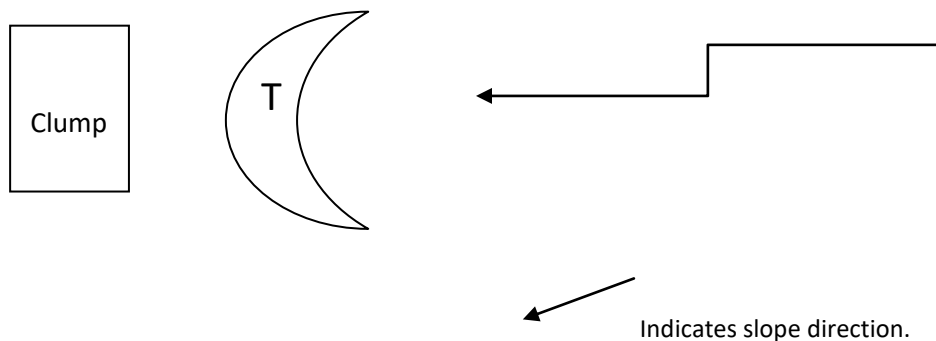
18.6.9 Simultaneous Silvicultural Operations:

Since productivity of the bamboo forest depends on proper and timely silvicultural operations, it should be ensured to carry out such operations during / or immediately after the year of actual harvest. Even, the early stage established natural regeneration shall also be taken care of at the time of silvicultural operations so as to add to the future crop of the bamboo forests. These operations shall preferably be done along with the main cutting and comprise of the following components.

- I. All cutting debris shall be removed and the clump shall be left cleaned.



- II. If any clump has not been cleaned at the time of felling, such clumps shall also be attended to through pruning in addition to the climber cutting. If any high stumps have been left, those shall also be cut back.
- III. The exposed rhizomes shall be covered with soil scrapped from the uphill side of a hilly or undulating terrain not more than 20cm thick over the pre-working level. Where ever, necessary, vegetative barriers shall also be erected on the downhill side to support the soil till its stabilization; this shall be concentrated mainly in steep slope areas above 30°.
- IV. Care should be taken to ensure that no damage is caused to the rhizomes and rootstock.
- V. As a moisture conservation measure, half-moon trenching shall also be dug on the uphill side of the clump in concave shape. No damage shall be caused to rhizomes and rootstock.
- VI. Besides, pulverization and sufficient soil working around the clumps shall be done to improve the overall quality and productivity of the bamboo forests.
- VII. Attempt is to be taken to cover entire area in the same year of working



T : Half Moon Trench

18.6.10 harvesting of Bamboo in a Gregarious flowering Situation:

Sporadic flowering in bamboo forests is normally observed. In case of gregarious flowering entire forest is under flowering. A comparison Statement on Sporadic Flowering / Gregarious Flowering is furnished below for academic interest.



Sporadic Flowering	Gregarious Flowering
Scattered nature of flowering only Few clumps are involved in flowering.	Flowering occurs almost in the entire areas.
Only few culms flower in a clump	It involves almost all or some proportion Flowering takes place in all the culms in clump.
The culm may or may not die after flowering	All the culms of a clump die after flowering.
The clump does not die.	Flowering is followed by the death of the clump
It takes place usually irregularly almost every alternate year.	If follows a cycle of long interval 20 to 65 years.
	It progress in a definite direction like an epidemic wave.
	It takes 2 to 4 years to complete the flowering in the area.

In Selection forest, the age of clump varies and accordingly varies the intensity of gregarious / sporadic flowering. The delay in flowering in poor sites is due to the effect of site quality, which is related with the growth, and storage of starch, sugar and other substances in the clump, which help flowering. In a well-managed forest intensity of flowering is less in comparison to an un-worked forest consisting congested clumps. Intensity of flowering is more in area having more biotic interference in form of grazing and fire in comparison to protected area. It is important to identify the characters of flowering in *Salia Bamboo* to decide appropriate management technique.

In case of gregarious flowering, all flowered bamboo to be removed just after seeding in month of December. Adequate arrangement is to be made to cut and remove all bamboo without leaving any culms / clumps.

18.6.11 Regeneration:

18.6.11.1 Simultaneous Silvicultural Operation (SSO):

Simultaneous Silvicultural Operation (SSO) is a regeneration practices required to be completed in the same year of working. SSO induces coming up new Karadi in the clumps. In



case of delay, the rising of Karadi is also slowed down / delayed. As a result one year will be lost for getting good kardi in bamboo clumps.

Besides the SSO it is proposed to improve bamboo forests in two ways i.e. assisting High Forest System by broadcasting Bamboo seeds and Restocking by planting.

18.6.11.2 Broadcasting of Seeds:

Just after coupe is surrendered or in month of June 1st fortnight, Salia Bamboo seeds @ 5 Quintals per year in a coupe / treatment section for two consecutive year is to be broadcasted . In very barren hard soils, ground preparation i.e. howing of soil is recommended to receive the seeds. It will also retain the seeds being carried out by runoff. Just after germination and growth above 1 meter height, the seedlings may be thinned out to a spacing of 2mx2m and thinned out seedlings to be planted in open space. Strict Fire protection measures are to be adopted for five years to allow seedlings to establish and clump formation. If so required, the slow forming clumps may be assisted by application of fertilizer / Farm Yard Manure. This is to be adopted in both coupe sections and treatment section during the allotted year. This treatment is also to be extended to gregarious flowering area.

Treatment of gregariously flowered areas& Seed broadcasted area:

- Bamboo seedlings at a spacing of about 2 m x 2 m are to be adopted and retained and the rest are to be thinned out and planted elsewhere.
- Cleaning, soil working and weeding is to be done around the adopted bamboo seedlings up to a radius of 50 cm.
- To maintain the continuity, planting up of bamboo rhizomes is also to be resorted to especially in big gaps.
- The area should be closed for grazing.
- Elaborate fire protection measures are also to be taken.

18.6.11.3 Planting of bamboo:

Planting of bamboo is a good option to restock the depleted bamboo forests. Standard planting techniques as per approved cost norm is to be followed. A 400 plant density per hectare is suggested. Instead of seed origin seedlings which take a long time for clump



formation, it is suggested to have bamboo seedlings from layering method and planting of off sets after dismantling the raised congested clumps.

NB; Raised congested clumps have no future at all in restocking a bamboo forest rather; it symbolizes bad management of bamboo forests.

Quantum of activities Suggested:

- a) Bamboo Silvicultural Operation in entire assigned area i.e. 23398.2277 ha x 2 & 1/2 Cycle in the plan period = 58495.573ha
- b) Bamboo Seed broad casting: 13 series x 4 section x 5 quintals x 2 year x 2 & 1/2 cycle = 1300 quintals
- c) Planting of Bamboo over 10% of the area assigned i.e. 10% of 23398.2277 = 2339.8 ha in 10 years.

18.6.12 Associated regulations and measures:

There are bamboo artisans whose livelihood depends on bamboo forests. They usually required 1st year / 2nd year bamboo for their use. The demand and the bamboo cutting rules are contradicting. As a result cutting of 1st year / 2nd year bamboo in an unscientific way prevails all over. This is one reason for depletion of Bamboo Forests. Now it is proposed to regulate their need by selectively availing required bamboo under supervision of Foresters.

Similarly, in western Odisha collection of very young shoots i.e. Karadi for food purpose is very prevalent. This practice is to be checked through

- Through Legal means.
- Through Public awareness from June to November every year. Voluntary organizations working in field of motivation, training and publicity may be engaged for the purpose.
- Constant patrolling by special squad is essential. Framing of complete working modalities is suggested.





CHAPTER- 19

NON TIMBER FOREST PRODUCE (OVERLAPPING) WORKING CIRCLE

19.1 Name of working circle:

The Non Timber Forest Produces (NTFP) including Medicinal & Aromatic Plants (MAP) is mostly seen in moist forests of Charmal, Naktideul and Girishchandrapur Range of the division. Besides Char, kendu, Kusuma, myrobalance, Siali leaves, Kendu leaf, Bana haldi, Satabari, Sarpagandha, Honey are available to a greater extent in this division. Bamboo has been covered under a separate Working Circle of this Plan. For management of Kendu leaf, separate divisions i.e. Rairakhol Kendu leaf Division and Athmallik KL Division are looking after it exclusively. For management of rest of the NTFP available in the division this **Non Timber Forest Produce (Overlapping) Working Circle [NTFP (O) WC]** has been constituted. The entire forest area excluding those of erstwhile Social Forestry Plantation and area declared as PF due to its small and scattered in nature has been assigned to this Working Circle. The area assigned is **101761.1785 ha or say 1017.61 Sq. Km.**

19.2 General constitution of working circle:

The entire natural forests of the Division have been assigned to this Working Circle for management for production, conservation and propagation of NTFP species of this locality. The Range wise distribution of assigned area is as follows.

Table No 19.1 Area under NTFP (O) WC				
Range	RF	PRF	DPF	Total
Rairakhol	16234.284	962.39	728.86	17925.5340
Badbahal	5205.500	800.48	0	6005.9800
Charmal	11596.5625	1075.72	326.49	12997.9635
Badmal	4537.895	3182.34	0	7720.2350
Naktideul	26238.567	3401.56	1695.85	31335.9770
GCPur	24571.690	687.79	515.2	25773.7860
Div Total	88384.4985	10110.28	3266.4	101761.1785
%	86.85	9.94	3.21	100.00



19.3 General characteristics of vegetation:

The forests of Rairakhol Division are mostly classified to Moist Deciduous Forest, Dry Deciduous Forest, Dry Scrub Forests, Riparian fringe forests. The forest characteristics from flora point of view have already been discussed in chapter 2 and its floral diversity under Chapter-3. From Non Timber Forest Produce point of view the available important species in Rairakhol Division are furnished below.

19.3.1 Fibre yielding Plants:

Table No 19.2 Fibre yielding Plants of Rairakhol Division

Local name	Botanical name	Useful parts	Purpose of using
Siali	<i>Bauhinia vahalii</i>	Fiber	Binding of K.L & making of rope
Bara	<i>Ficus bengalensis</i>	Tree	Rope making
Aswastha	<i>Ficus religiosa</i>	Tree	Rope making
Palasa	<i>Butea monosperma</i>	Root	Rope making

19.3.2 Oil Yielding Plants:

Table No 19.3 Oil Yielding Plants of Rairakhol Division

Local name	Botanical name	Useful parts	Purpose of using
Karanja	<i>Pongamia pinnata</i>	Seed	Medicines
Kusuma	<i>Schleichera oleosa</i>	Seed	Soap making & cooking
Kochila	<i>Strychnos nux-vomica</i>	Seed	Medicines
Mahula	<i>Madhuca indica</i>	Seed	Edible
Neem	<i>Azadirachta indica</i>	Seed	Medicines
Sal	<i>Shorea robusta</i>	Seed	Edible oil & food
Champa	<i>Mischelia champaca</i>	Flower	Perfume
Eucalyptus	<i>Eucalyptus hybrid/gaobulus</i>	Leaf	Medicine
Polanga	<i>Calophyllum inphyllum</i>	Seed	Soap making

19.3.3 Gum & Reign Yielding Plants:

Table No 19.4 Gum & Reign Yielding Plants of Rairakhol Division

Local name	Botanical name	Useful parts	Purpose of using
Dhaura	<i>Anogeissus latifolia</i>	Gum	Paper sizing & printing
Genduli	<i>Sterculia urens</i>	Gum	Gum is edible and used for preparation of confectionary items
Babul	<i>Acacia nilotica</i>	Gum	Calico printing dying and sizing material for silk and cotton
Khaira	<i>Acacia catechu</i>	Khair	Pan chewing
Salai	<i>Boswellia serrata</i>	Gum	Perfume
Sal	<i>Shorea robusta</i>	Resin	Used in puja varnish and paint making



19.3.4 Fruit Bearing Plants:

Table No 19.5 Fruit Bearing Plants of Rairakhol Division

Local name	Botanical name	Purpose of using
Amla	<i>Emblica officinalis</i>	Medicinal value
Amba	<i>Mangifera indica</i>	Edible
Aswastha	<i>Ficus religiosa</i>	Fruits edible
Bahada	<i>Terminalia belerica</i>	Medicinal value
Bara	<i>Ficus bengalensis</i>	Fruits eaten by birds and animals
Baula	<i>Mimusops elangi</i>	Fruits edible
Bela	<i>Aegle marmelos</i>	Edible fruits
Bhalia	<i>Semicarpus anacardium</i>	Medicinal use
Burkoli	<i>Zyzyphus mauritiana</i>	Fruit is edible
Bharu	<i>Bunchnania lanzan</i>	Edible fruits
Dimiri	<i>Ficus glomerata</i>	Edible fruits
Gambhari	<i>Gmelina arborea</i>	Fruits eaten by animals
Harida	<i>Terminalia chebula</i>	Fruits for medicine
Jamun	<i>Syzygium cumini</i>	Edible fruits
Kendu	<i>Diospyros melanxylon</i>	Edible fruits
Karanja	<i>Pongamia pinnata</i>	Oil and medicine
Kusuma	<i>Schleichera oleosa</i>	Edible oil and fruits
Kochila	<i>Strychnos nux-vomica</i>	Fruits for medicine and edible by birds
Mahula	<i>Madhuca indica</i>	Edible oils and fruits
Neem	<i>Azadiracta indica</i>	Medicine and oil
Panas	<i>Artocarpus heterophyllus</i>	Edible fruits
Sal	<i>Shorea robusta</i>	Edible oil
Simul	<i>Bombax ceiba</i>	Yield cotton
Tentuli	<i>Tamarindus indica</i>	Edible fruits

19.3.5 Tannin Yield Plants:

Table No 19.6 Tannin Yield Plants of Rairakhol Division

Local name	Botanical name	Useful part	Purpose of using
Amla	<i>Emblica officinalis</i>	Fruits	Medicinal value
Arjun	<i>Terminalia arjuna</i>	Barks and fruits	Leather
Babul	<i>Acacia nilotica</i>	Barks and fruits	Leather
Bahada	<i>Terminalia belerica</i>	Fruit	Medicine & Leather
Harida	<i>Terminalia chebula</i>	Fruit	Medicine & Leather
Dhaura	<i>Anogeissus latifolia</i>	Leaves	Leather
Sunari	<i>Cassia fista</i>	Barks & Fruits	Medicine
Sal	<i>Shorea robusta</i>	Barks & Fruits	Leather



19.3.6 Medicinal & Aromatic Plants:

The herbs, shrubs, trees, climbers considered as Medicinal and Aromatic plants (MAP) normally seen in the division is enlisted below.

Table No 19.7 List of MAP of Rairakhol Division

Sl No	Local name	Botanical name	Parts of Plant having Medicinal & Aromatic value.
1	Satabari	<i>Asparagus racemosus</i>	Roots
2	Ashok	<i>Saraca saraca</i>	Bark, Flower
3	Chandan	<i>Santalum album</i>	Root, wood
4	Sarpagandha	<i>Rauwolfia serpentina</i>	Rhizobium
5	Anantamula	<i>Hemidesmus indicus</i>	Tuber
6	Bana haladi	<i>Curcuma sp.</i>	Modified stem
7	Palua	<i>Curcuma aromatica</i>	Root
8	Guluchi	<i>Tinospora cordifolia</i>	Leafs & stem
9	Bai danka	<i>Mucuna pruriens</i>	Leafs & stem
10	Gilla	<i>Casualpinia decapetala</i>	Seed
11	Dhataki	<i>Woodfordia fruticosa</i>	Flower
12	Harida	<i>Terminalia chebula</i>	Fruit
13	Bahada	<i>Termanalia belirica</i>	Fruit
14	Amla	<i>Emblia officinalis</i>	Fruit
15	Bela	<i>Aegle marmoles</i>	Fruit & leaf
16	Chireita (Bhin Nema)	<i>Swertia chirayita</i>	Leaf & stem
17	Palas	<i>Butea monosperma</i>	Flower

19.3.7 NTFP Of other importance:

Table No 19.8 List of NTFP of Other Importance – Rairakhol Division

Sl No	Local name
1	Hill Broom
2	Wax
3	Honey
4	Mush room
5	Kardi (Young Bamboo Shoot)
6	Sal Leaf
7	Siali Leaf



19.4 Management Unit:

The forests coming within a range is considered as a management unit for all purpose of this Working Circle. The unit and area assigned has been furnished at Table No 19.1 and reproduced below.

Table No 19. 9 Management Unit for NTFP- Rairakhol Division

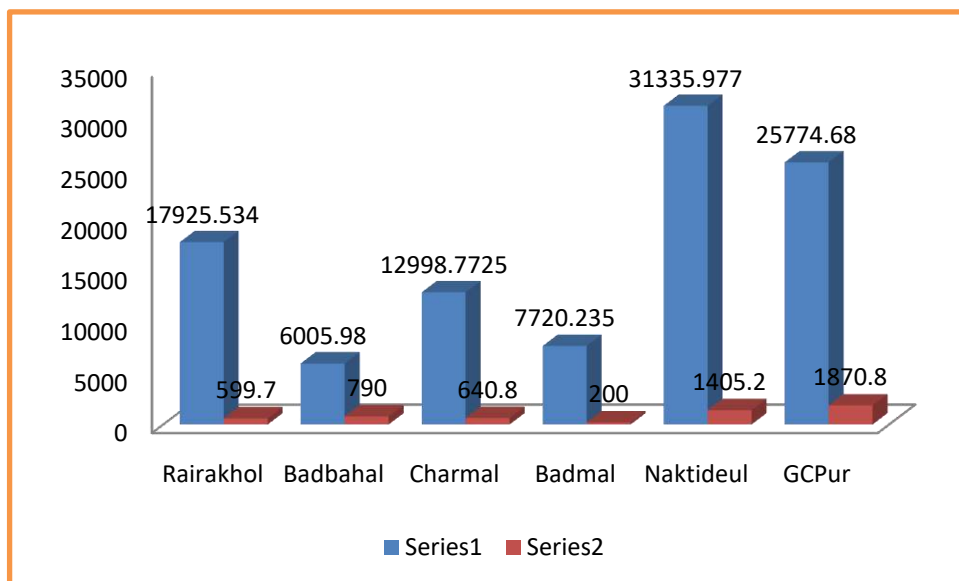
Sl No	NTFP management Unit	Total	Percentage	Remarkable Species of Importance.
1	Rairakhol	17925.5340	17.62	Harida, Bahada, Mahula, Tamarind
2	Badbahal	6005.9800	5.90	Tamarind, Mahula, Myrobalance
3	Charmal	12998.77250	12.77	Sal leaf, Siali leaf,
4	Badmal	7720.2350	7.59	Sal leaf, Siali leaf,
5	Naktideul	31335.9770	30.79	Sal leaf, Siali leaf, Mahula, Mango, Myrobalance
6	GCPur	25774.68000	25.33	Sal leaf, Siali leaf, Mango, Myrobalance
Total		101761.1785	100.00	

19.5 Blocks, compartments and JFM area:

The area assigned to VSS under JFM Resolution 2011 has been indicated in Table No 13.3 under JFM (O) Working Circle. The range wise area assigned to VSS is furnished below.

Table No 19.10 Management Unit for NTFP- Rairakhol Division

Sl No	NTFP management Unit	Total Area	Area assigned to VSS	Percentage
1	Rairakhol	17925.5340	599.70	3.35
2	Badbahal	6005.9800	790.0	13.15
3	Charmal	12998.7725	640.80	4.93
4	Badmal	7720.2350	200.0	2.59
5	Naktideul	31335.9770	1405.20	4.48
6	GCPur	25774.6800	1870.80	7.26
Total		101761.1785	5506.50	5.41



19.6 Special objectives of Management:

The special objectives of management are as follows.

- i. To educate VSS / JFM Committee and Gram panchyat about scientific collection methods of NTFP on a sustainable basis.
- ii. To educate primary collectors of NTFP about contribution of NTFP towards their livelihood and share of income from NTFP.
- iii. To educate VSS / Primary collectors about propagation of various herbs / shrubs / climbers and how to improve the stock in forest both quality and quantity.
- iv. To enhance abundance of NTFP species in forest through regulatory mechanism in non-assigned VSS areas / VSS areas.
- v. To conserve and protect the depleting natural medicinal plant resources in the forest area.
- vi. To encourage local community for ex-situ / in situ conservation of NTFP & medicinal plants through VSS.
- vii. To generate self employment and livelihood support for the forest fringe dwellers.
- viii. To develop and disseminate scientific harvesting, processing and storage techniques relating to NTFP products.
- ix. To share market information to primary gatherers.
- x. To impart training on value addition



19.6.1 Analysis of the crop:

No systematic study has been made to assess the potentiality of NTFP species wise. However on general observation, the area is rich in Sal leaf, Siali Leaf & Fiber. , Kendu, Chara, Bahada, Harida, Anla, Kusum, Bana Haladi, Tamarind, Mango, Jack Fruit, Honey, Wax, Siali Leaf & Fibre, Sal seeds, various barks and tubers. It is desired to have a complete study and documentation of available NTFP and MAP in the region. The availability of NTFP is in a declined trend all over the division with unscientific collection of NTFP resources.

19.6.2 Silvicultural system:

No silvicultural System is prescribed for management of NTFP species found in the forests. It is proposed to manage the NTFP resource through

- Regulated collection & trading with Value addition by regular training.
- Impart training on Scientific Collection.
- Improve growing Stock by checking biotic interference.
- In-situ & Ex-situ Conservation.

19.6.3 Collection Cycle:

The NTFP like fruits / leaves, tubers, etc are normally collected in an annual cycle depending on its maturity and requirement/ utility. Honey, wax, mushrooms are widely collected depending upon availability & season. Many MAP (Medicinal & Aromatic) Plants are collected as and when required throughout the year.

19.6.4Harvesting Period:

Various NTFP Species are collected at different stages of flowering to fruiting / tender to matured leaf, Barks and tubers etc The Calendar of collection / harvesting of NTFP species is furnished below.



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Sl	Name	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
1	Amla												
2	Bahada												
3	Banatulsi seeds												
4	Bel												
5	Broom grass												
6	Cashew nut												
7	Char seed												
8	Dantari bark												
9	Genduli gum												
10	Gum												
11	Harida												
12	Honey												
13	Honey wax												
14	Kamal gundi												
15	Karanja seed												
16	Kendu fruits												
17	Kendu leaf												
18	Khair												
19	Khajuri leaves												
20	Kochila seed												
21	Kurei fruit												
22	Kusum seed												
23	Lemon grass												
24	Lodha bark												
25	Mahua flower												
26	Mahua seed												
27	Mango												
28	Mango kernel												
29	Marking nut												
30	Mushroom												
31	Neem seed												
32	Phen phena bark												
33	Sal resin												
34	Sal seed												



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Sl	Name	Jan	Feb	Mar	Apri	May	Jun	July	Aug	Sep	Oct	Nov	Dec
35	Semal cotton												
36	Siali fibre												
37	Siali leaf												
38	Sunari Bark												
39	Tentuli												
40	Thatch grass												

19.6.5 Division into Management Section:

For collection & marketing of NTFP, the Gram Panchyats are regulating the collection, Registration of Primary gatherer etc at Panchyat Level as per NTFP Policy and Orissa Gram Panchayats (Minor Forest Produce Administration) Rules 2002. For forest point of view no further section has been suggested. Hence Range is taken as an administration & execution unit.

19.6.6 Calculation of the yield:

Except Kendu leaf and Bamboo there is no record to indicate the quantum of NTFP that can be collected from the division. It is difficult to assess the yield that can be harvested without causing harm to trees / wildlife and regeneration of the species.

19.6.7 Collection Sequence.

The collation of NTFP is particularly a time bound operation. The part of the tree herbs / shrubs that are use full for any purpose determines the collection sequence. The time schedule for various items has been furnished 19.6.4 above.

19.6.8 Collection procedure as per Rules.

Orissa Gram Panchayats (Minor Forest Produce Administration) Rules 2002 The state government made these rules in November 2002, which has following salient features. ·

- The GP shall have the power to regulate procurement and trading of MFP, whether produced in government lands and forest areas within the limits of Grama or collected from the Reserved Forests and brought into the Grama.
- Priority would be given to the VSS and its members for collection and trading of MFP.
- Price fixation would be done by the Panchayat Samiti (PS) in September and would be circulated to different offices of district administration and to all the GPs. The Gram Sabha would ratify prices fixed and necessary changes can be made based on the local



needs. If Panchayat Samiti fails to fix the price then the District Collector would call a meeting of PS preferably in October to fix up the minimum procurement prices.

- The trader registered to procure MFP from the GP shall furnish monthly return and also annual return on a prescribed format. The GP shall furnish an annual return on the procurement and sale to the Forest Range Officer.
- In case of violation of payment of minimum procurement prices by the registered traders, the Sarapanch shall conduct an inquiry and then it shall be discussed in the GP meeting and then GP shall resolve to cancel the registration of the trader.
- If the trader after cancellation of the registration continues to procure MFP from the GP area then the Sarapanch or Secretary shall lodge complaint before the DFO. The MFP seized by the DFO from the trader shall be publicly auctioned and the sale proceeds thereof be deposited under the appropriate head of account under the Orissa Forest Act.
- If a trader is engaged in procurement of MFP without registering with the GP then the Sarapanch or Secretary shall lodge complaint before the DFO for taking appropriate action.
- Process of Price fixation of NTFP The government has a system of fixation of minimum price for procurement of MFP in order to protect the tribal and forest dwelling communities from exploitation. The fixation of minimum procurement price was started in 1971 by the Agriculture and Cooperation Department. The price was then fixed at the district level. During the last 30 years there have been many changes in the structure and mechanism of price fixation in the state.
- Now there are two different types of price fixation mechanisms in Orissa. For the nationalised items there is an advisory committee at the state level to decide the prices (started in 1982) and for other produces, which are under the control of Gram Panchayat, the Panchayat Samitis have been empowered in November 2002 to fix up the minimum procurement prices. Till 1997 a committee under the chairmanship of the District Collector fixed prices at the district level and the concerned Revenue Divisional Commissioner was approving these prices.
- Usually by the end of September every year the committee was supposed to fix up the prices, which would remain in force till next September.
- In 1997 the Welfare Department fixed the prices of NTFP at the state level especially keeping the operation of TDCC in mind. It continued till 2000. After the transfer of



ownership rights to Gram Panchayat in 2000 the mechanism for fixation of price was to be done by the GPs.

- In November 2002 the government finally declared that the minimum procurement prices for NTFP would be fixed at the Panchayat Samiti level, which is being followed.
- The prices would be fixed in September in a meeting attended by the DFO, representatives of TDCC, OFDC and TRIFED. Once the prices are being fixed it would be discussed in Gram Sabha and Gram Panchayat to approve it. The GP can also make some changes in the prices based on the local needs. If the Panchayat Samiti fails to fix up the prices then the District Collector would call for a meeting to fix up the prices. Price fixation has always remained as a matter of concern.
- The registered traders should give a monthly report of the volume of different NTFP collected, sold and transferred to other places to the concerned GPs and the trader would also submit an annual return. Each GP has to submit an annual report to the Forest Range Officer.
- Secondly, GP has the authority to reprimand the traders who are found to be paying less than the minimum procurement price fixed by the Government. The concerned Sarapanch will carry out an inquiry if there is a complaint in this regard.
- The GP has the ownership right over MFP it can't seize the MFP procured by an illegal trader. This would be seized by the DFO and the sale proceeds would not come to the GP as it would go to the government.

19.6.8.1 Scientific Collection Procedure:

Collection procedure for a sustainable harvest is most important in scientific management. The collection procedure varies for different parts of trees / plants. An attempt have been made to categorize the NTFP items depending upon parts of utility and method of collection. These are as follows.

Many times, while collecting NTFP items, the local inhabitants do not use proper scientific method. The setting fire in the forest floor for collecting Sal seed, cleaning beneath Mohua trees by setting fire for collecting Mohua flowers, lopping of branches bearing seeds and fruit uprooting the plants bearing useful roots and tubers, complete debarking of trees having barks of commercial importance etc are the examples of unscientific exploitation. The items shall be collected without causing any harm to the trees and plants yielding them. Following scientific methods are suggested for collection of various NTFP items.



i. Leaf:

Leaf is the vital part of a plant. Photosynthesis takes place in the leaf. Hence removal of leaves reduce production of food materials for the plant. Only matured leaves can be removed if necessary. In many cases tender leaves are useful as a NTFP e.g. Sal leaf, Siali leaf, Palas leaf etc in that case leaves can be collected by plucking the leaf alone. In no case a branch can be sacrificed to collect leaf easily. In a year not more than $1/3^{\text{rd}}$ of the leaf in a branch can be collected in different spell. This will not hamper the growth of the plant.

ii. Bark:

Bark of a plant is the protecting cover against external injury and against pathogens. Removal of bark of a tree / plant exposes it to external diseases. The debarking of trees yielding bark of commercial importance, viz, Lodha, Medha, Phenfena, Arjun, Asan, and Ashok etc is to be done at least atleast 3 feet above the ground so as to prevent injuries from fire, microbes and white ants. The debarking should be confined to the arms reach only for preventing damage to tender barks and juvenile buds. It is to be confined to one face only and should not exceed more than $1/3^{\text{rd}}$ of surface of the bole. The remaining portion of bole should be left untouched so as to maintain continuity of the cambium. However, in view of the PCCF, Orissa instructions vide memo No. 10144 (31) dt.24-04-91, the lease for barks are to be discontinued on silvicultural grounds.

iii. Fruits / Seeds:

Fruits and Seeds are means of propagation of most of the species. Collection of Fruits / seeds should be taken up when the fruits are matured. In no case immature fruits should be collected as the desired result / medicinal value is not obtained from an immature fruits / seeds. All fruits should not be collected as there will be no seed / fruits for further propagation. For collection of fruits / seeds, it is observed that the branches containing ripe and green fruits are cut down and carried to home for selective plucking. This is the most destructive practice being followed. The following points may be bear in mind while collecting fruits / seeds.

- Only Ripe fruits to be collected.
- No lopping of branches containing the fruits.
- Tree branches to be shacked vigorously so that ripe fruits will fall. Then it can be hand pricked.



- If the fruits are small then collect the panicle / bunch having matured fruits above 75%.
- Clean the forest floor by a broom for ease collection from ground rather setting fire to have a clean floor.
- Leave at least $1/3^{\text{rd}}$ of fruits on the tree for seed dispersal by animals / birds for future regeneration.

iv. Flowers:

Flowers of many plants are required for medicinal / Dye purpose. Dhatki, Sankha puspa (Aparajita), Palas, Ashok etc are collected. Mahua Flower is also collected in huge scale for alcohol and Cattle feed. While collecting flowers the following precautionary measures required to be taken.

- Some flowers fall freely from trees just after few hours of blooming. In such case collect the same from ground i.e. Mahul. Some mahua flowers shall be left on ground every day for wild animals.
- Some flowers remain attached to calyx for a long time. In that case, collect the flower handpicked climbing the tree.
- In cases of very small flowers, the entire inflorescence may be collected. It should be collected from the tree crown here and there not in a continuous fashion.
- Not more than $1/3^{\text{rd}}$ of flowers should be removed from tree as it will mature to fruit / seed and held its propagation.
- Always remember that flower / fruits/ seeds are the future crop of the forest and its collection shall be limited leaving $2/3^{\text{rd}}$ of the crop for future regeneration.

v. Tubers / Roots / Rhizomes:

Tubers / Roots / Rhizomes of herbs / shrubs / climbers are used for medicinal and for food purpose. Primary collectors dig out the Tubers / Roots / Rhizomes and throw the plant to die. The primary collectors shall be trained to take the lower part of the tuber. Rhizomes and top of the tuber which is used for propagation should be replanted in the same pit duly compacted to give rise a new plant for the next season. After planting, the debris are required to be removed from the site so as to save the tuber / rhizome from fire.



vi. Gum and resin:

Now availability of Gum and resins has been reduced. Still then Sal resins are being collected in many parts of the division. While collecting gums and resins, no deep cut shall be given to the trees yielding them. Artificial incision made over trunk should not be too large and deep to adversely affect the growth of trees. Intensive tapping for gums and resins is to be avoided as it may lead to damage and death of trees. The blazing will be done in staggered manner and not haphazardly. The shape of blaze should be triangular with angles pointing towards the ground. The initial blaze should be given at the breast height.

vii. Bark.

Barks of many trees are use full as medicine. Ashok Bark, Lodha, Phenphena barks, Asan barks are most commonly collected from forests. Bark is the protective cover of any plant. Once bark is damaged, it is susceptible to attack by any insects / disease. Bark should not be removed within 2m above the ground level or from main trunk. It can be collected from branches of the tree, climbers etc. from a particular branch not more than 30% of the surface area, bark should not be stripped off.

viii. Honey & Wax:

Collection of Honey & Wax by tribal is an age old practice. The method adopted is very destructive and many Bee group are destroyed in the process. Sometimes bee hives were torched with naked fire killing most of the bee. Honey is extracted by squeezing the entire comb by hand, which leads to accumulation of dirt in the honey. The honey collectors are required to be trained to collect honey by using slight smoke, removing the honey from the comb by using extractor. Then the comb shall be placed appropriately for use by the bee workers.

The forest fringe villagers should be educated about use of insecticides in agricultural crop and damaged caused to bee / other useful insects

ix. Mushrooms:

Mushrooms are collected from forest floor during rainy season. Mushrooms are usually spreads through Spoors. Not more than 705 of the mushroom should be collected from forest floor so as to have a better collection during the season.



19.6.9 Measures to Improve Production of NTFP Items:

In all the rehabilitation areas NTFP yielding species are to be given due importance. Efforts are to be made to improve regeneration of NTFP yielding species in all forest blocks. As per the site requirement, the proportion of fruit bearing and NTFP yielding species are to be encouraged. The growth of existing NTFP yielding species is to be boosted by taking suitable silvicultural measures. The NTFP yielding species are not to be felled unless dead and uprooted. Over exploitation of seeds of various important NTFP, yielding species is to be prevented for encouraging natural regeneration. The following points may be kept in mind to improve NTFP status in forest.

- Harvest / collect NTFP items by trained local collectors. Extensive training may be organized by the department. This is the only way to save NTFP resource in forests.
- Over exploitation is to be prevented. During collection period, forest staff should remain vigilant.
- Items of NTFP and period of Collection may be displayed at vintage points and VSS members are made aware of the fact.
- Steps to be taken to avoid unhealthy competition for collection. This leads to premature collection, cutting of branches even felling trees for collection of fruits.

19.6.10 Regeneration:

Regeneration of NTFP species in forests will improve quality collection. For inducing regeneration of NTFP species both In-situ conservation and ex-situ conservation is suggested.

19.6.10.1 In-situ Conservation:

The forest blocks of Charmal, Naktideul and Girishchandrapur Range bear good NTFP species. It is recommended to have in situ conservation plots for good seed production, future propagation and will act as store house of NTFP Species of the locality. The area needs to be closed to grazing and strict fire protection measures and no collection for five years will substantially enhance NTFP availability in the area and locality.

19.6.10.2 Ex-situ Conservation:

Under Ex situ conservation it is proposed to have plantations of important NTFP species which became rare and endangered in the locality. It is proposed to cover at least 100 ha of plantation of following species in different patches of Naktideul, Charmal, Badmal and GCpur Range.



- a) *Ashok (Saraca indica)*
- b) *Harida (Terminalia chebula)*
- c) *Anla (Emblica officinalis)*
- d) *Genduli (Sterculia urens)*
- e) *Sunari (Cassia fistula)*
- f) *Guluchi (Tinospora cordifolia)*
- g) *Satabari (Asparagus racemosus)*
- h) *Siali (Bauhinia vahlii)*
- i) *Santalum album*

19.6.10.3 Demonstration Plots:

In order to educate the public / baidyas and students Demonstration plots of climbers, hrubs, shrubs having medicinal value are required to be developed within the division on limited scale. A ten hectare demonstration plot may be developed in one compartment suitable and near to Rairakhol / Charmal / Naktideul.

19.6.11 Associated regulations and measures:

As per *the Orissa Grama Panchayats (Minor Forest Produce Administration) Rules, 2002*, collection of most of the NTFP is vested with the Gram panchyat. The Rule is at **Annexure-XVIII** and NTFP policy of 2000 rule is attached as **Annexure-XIX**.The provisions may be followed for all purpose relating to NTFP (Minor forest Produce).





CHAPTER -20

WILDLIFE (OVERLAPPING) WORKING CIRCLE [WL(O)WC]

20.1 Name of Working Circle:

Wildlife is an integrated part of forest management. The National Forest Policy 1988 has emphasized the need to conserve Wild Life and their habitat. Wildlife Management is the management process influencing interactions among and between wildlife, its habitats and people to achieve predefined impacts. It attempts to balance the needs of wildlife with the needs of people using the best available science. Wildlife Management is interdisciplinary that deals with protecting endangered and threatened species and subspecies and their habitats, as well as the non-threatened agricultural animals and game species. The Wildlife Management program emphasizes both applied and basic research in wildlife ecology, management, education and extension.

Wildlife Management takes into consideration the ecological principles such as carrying capacity of the habitat, preservation and control of habitat, reforestation, predator control, re-introduction of extinct species, capture and reallocation of abundant species and management of “desirable” or “undesirable” species.

In order to have a basic management approach this working circle has been constituted i.e. **Wildlife (Overlapping) Working Circle**. All forest blocks included for management except Village Forest & Protected Forest which are small and Scattered are also included in this working circle. The total area assigned to this Working Circle is 101761.1785 ha.

20.2 General constitution of working circle:

The entire natural forests of the Division have been assigned to this Working Circle for management for conservation and propagation of available Wildlife of this locality. The Range wise distribution of assigned area is as follows.



Table No 20.1 Area under WL (O) WC				
Range	RF	PRF	DPF	Total
Rairakhol	16234.284	962.39	728.86	17925.5340
Badbahal	5205.500	800.48	0	6005.9800
Charmal	11596.5625	1075.72	326.49	12997.9635
Badmal	4537.895	3182.34	0	7720.2350
Naktideul	26238.567	3401.56	1695.85	31335.9770
GCPur	24571.690	687.79	515.2	25773.7860
Div Total	88384.4985	10110.28	3266.4	101761.1785
%	86.85	9.94	3.21	100.00

20.2.1 Special features:

1) Tal Kholgarh Elephant Corridor:

Elephants are big migratory animals and move a long distance in search of food and require substantial areas. But habitat loss, expansion of human habitation and fragmentation of traditional elephant corridors has forced the elephants to split into a number of meta-populations or herds and move to new areas in search of food and shelter. As a result of this, the interface of elephant and man has increased manifold. This results in conflicts with humans due to elephants raiding or destroying of agricultural fields/ crops. And as retaliation by villagers, there is killing of elephants either by electrocution or poisoning.

In order to protect the animals and its habitat there is a need to connect these fragmented patches of forest, which is called a corridor. This corridor will not only help the animals move without any disturbances, but also increase the chance of genetic interchange. As the risk of inbreeding within the localized patch of forest will be reduced, it will result in a healthy population.

Traditionally fourteen corridors have been identified in the State which were to be used by elephants during course of their migration. These corridors need to be protected. All round development like human settlements, roads, railway line, electric lines, canal and mining etc is the main cause of corridor fragmentation.

Tal- Kholgarh corridor is an accepted Elephant corridor linking Rahan RF to Kholgarh RF Compartment No 8 covering a distance of 6.30 km width 0.50 km to 0.8 km covering an area of 4.56 sq. Km. The corridor passes through Tal RF and San Rengali PF.



2) Tiger Landscape of Naktideul:

The future of the tiger in Similipal Satkosia forests will be determined by intensity of wildlife management and intensive tiger conservation across adjoining forests and connectivities which Similipal has with neighbouring states. The consolidation of Similipal-Satkosia Tiger Corridor apart, what is significantly gaining importance is the need for ensuring forest connectivity between those of Odisha, with that of Jharkhand and then on with the forests of Bihar, Chattisgarh, and Madhya Pradesh. This might be a possible link for animal sustainability in the central Indian- eastern Indian landscape, which will replicate India's other success stories of conservation and result in an increase in tiger population. This will enable tigers from secured habitats being able to move out into new areas for territory, within this landscape. Odisha forests' connectivity with those of Jharkhand especially Saranda forests assume major importance here. Saranda is also a prime elephant habitat and forms the core of the Singhbhum Elephant Reserve. It has been reporting presence of tigers of and on. Although the mining pattern in the Saranda forest forced the elephant to move to Odisha which has now become a regular pattern. Elephant herds move from Saranda to Similipal in Odisha through the Badam Pahar (Odisha) –Dhobadhobin (Jharkhand) forest corridor and Badam Pahar (Odisha)–Karida (Jharkhand) forest corridor. Also, the major source population of tigers in Odisha is in Similipal. It has the potential to sustain a much larger population size due to its large habitat, and there might be a possibility that the tiger population, if increased, would also migrate through these connecting corridors, along the landscape, if properly secured and managed.

Wild tigers occupy around 7% of their historic range in the world and occupy less than 40% of the habitat they did in the 1990s. Most of the remaining tiger populations today inhabit increasingly fragmented and isolated patches of land in an expanding human-dominated landscape.

Over the last several years, India has been working to improve tiger conservation by declaring as many protected Tiger Reserves as possible — with the state of Odisha having notified 2 (two) viz. Similipal Tiger Reserve & Satkosia-Baisipalli Tiger Reserve. A Tiger Reserve is a category of Protected Area (PA) under the provisions of the Wildlife Protection Act, and has administrative and funding mechanisms that are different from other categories of PAs. However, because landscapes outside the tiger reserves are changing so drastically, just protecting isolated islands of habitat surrounded by an ocean of development will not be enough to protect the big cats into the future. mainly because tigers don't stay inside Tiger



Reserve boundaries. Maintaining connectivity through corridors across a 'Landscape' is therefore vital for tiger recovery and for maintaining local support for tiger conservation. It is here that the Central Indian-Eastern Indian Tiger Landscape assumes critical importance, for the future of tigers of not only Similipal Tiger Reserve, but across a host of protected areas located therein viz. Gautam Buddha Wildlife Sanctuary in Bihar, Koderma WLS, Hazaribagh WLS, Lawalong WLS, Palamau Tiger Reserve, and Saranda forest in Jharkhand, Bandhavgarh Tiger Reserve and Sanjay Tiger Reserve in Madhya Pradesh, Guru Ghasidas Tiger Reserve in Chattisgarh and Similipal Tiger Reserve in Odisha. This landscape is based on the assumption that the landscape would have been contiguous in the not so distant past and therefore forms a common gene pool. Conservationists have been voicing for securing this landscape in the coming years. However, there are some limitations to corridor connectivity between these protected areas, with linear development projects and anthropogenic pressures as the common ones. Many national highways pass through these protected areas, and several others are in the queue for permission. Such infrastructure has an essential contribution to habitat fragmentation. Increased iron mining intensity in the Saranda forest poses a threat to the remaining forest corridor that connects the Saranda and Similipal Tiger reserve. Although this part of India has been heavily modified by human activity, there are still opportunities to maintain connectivity between the different reserves and protected areas. Tiger Reserves are incredibly important as anchors for conserving tigers in India, but as the pressures of development mount outside the reserves, land managers and decision makers will need to consider how tigers use the landscape outside the reserves. These linkages need to be identified and protected in order to preserve natural biological processes such as long-range movements, which are integral for large carnivore conservation. A landscape-based conservation approach is what required for tiger conservation for Similipal in Odisha. These landscapes also support some of the most vulnerable and marginalized human populations as well as critical ecosystem functions. At the same time, pressures on these areas are also immense and include hydropower development; road and rail expansion; logging and extractive industries; and expanding agricultural estates. As a landscape species requiring large and diverse habitats, rich in prey and with minimal human disturbance, the challenges to the long-term survival of tiger are clear. Protecting and restoring the ecological integrity of such landscapes is considered the last line of defense against tiger extinction in the wild. As a part of linking Satkosia with Khalasuni, Tiger landscape of Naktideul is of paramount importance.



20.3 General characteristics of Fauna available:

Rairakhol division is a part of Sambalpur Elephant Reserve in Sambalpur district and different wildlife are observed in this tract. Moist forests of Rairakhol division harbors diverse herbivore fauna. The apex carnivore “**Leopard**” is frequently encountered in this tract. Besides Leopard other carnivores animal are Wolf, Jungle Cat, Fox, Jackel, Hyena are in abundance. Herbivorous animals observed in this tract are Deer, Barking Deer, Wild boar, Bear, Sloth Bear, Sambar, Rabbits. Many reptiles, snakes, Mongoose, Lizards are also common to this locality. Details of fauna observed have been enlisted in Chapter-3 of this Plan.

20.4 Management Series and JFM areas:

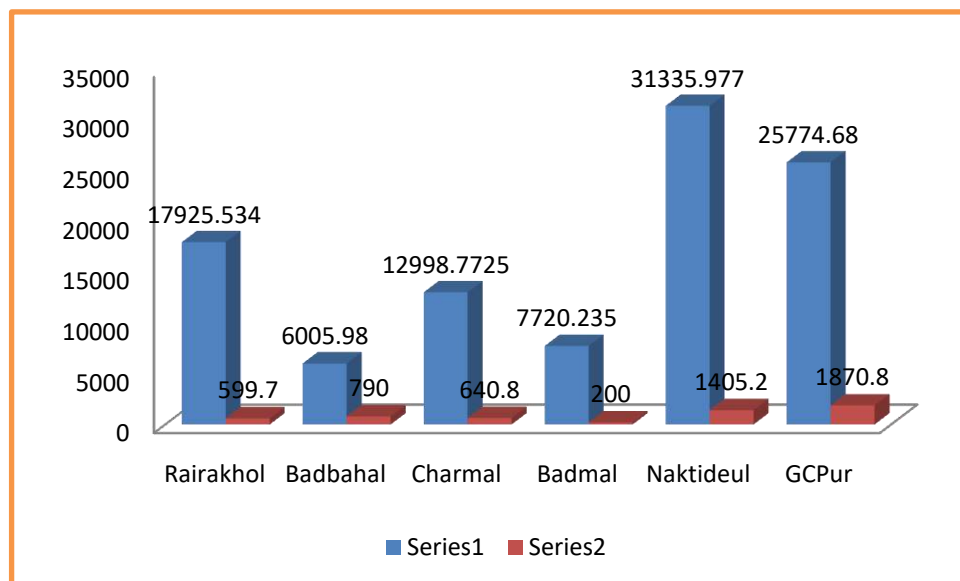
For administrative convenience, the assigned area is divided in the Wildlife Management Unit. Each Range is considered as one unit. The unit wise area is as follows.

Table No 20.2 Constitution of Wildlife Management Unit- Rairakhol Division						
Sl No	Range	RF	PRF	DPF	Total	% Area
1	Rairakhol	16234.2840	962.3900	728.8600	17925.5340	17.6
2	Badbahal	5205.5000	800.4800	0.0000	6005.9800	5.9
3	Charmal	11596.5625	1075.7200	326.4900	12997.9635	12.8
4	Badmal	4537.8950	3182.3400	0.0000	7720.2350	7.6
5	Naktideul	26238.5670	3401.5600	1695.8500	31335.9770	30.8
6	GCPur	24571.6900	687.7900	515.2000	25773.7860	25.3
Div Total		88384.4985	10110.2800	3266.4000	101761.1785	100

20.5. Blocks, Compartments and JFM area:

For participatory management area has been assigned to VSS under JFM Resolution, 2011. The area assigned to VSS in each block has been indicated at Chapter-13 Table No 13.3. The abstract is furnished below.

Table No 20.3 Area assigned to VSS for Protection & participatory Management				
Sl No	Range	Total area in Ha	Area assigned to VSS in Ha	Percentage to Total area
1	Rairakhol	17925.534	599.7	3.35
2	Badbahal	6005.98	790	13.15
3	Charmal	12998.7725	640.8	4.93
4	Badmal	7720.235	200	2.59
5	Naktideul	31335.977	1405.2	4.48
6	GCPur	25774.68	1870.8	7.26
Div. Total		101761.1785	5506.5	100



20.6 Special objectives of Management:

The Special objectives of the management of this Working Circle are within the scope of general objectives of management. The special objectives are

- To Conserve, Protect and improve existing wild life and their habitat.
- To Protect & Improve the Tal- Kholgarh Elephant corridor.
- To develop Naktideul Tiger landscape for a greater Tiger Territory.
- To enhance bio-diversity and Wild Life population in the region.
- To involve people in management of Wildlife & associate them in preventing crime against Wild animals.
- To build up scientific knowledge on wildlife resources of the region.
- To train personnel at various levels for conservation and management of wildlife.
- Carry out research relevant to management including the development of techniques appropriate to Indian conditions especially to this locality.
- To educate people about wildlife and need for their conservation.
- To prevent sporadic and strategic crime against wild animals / birds.
- To protect Life and properties of public against animal depredation.

20.6.1 Concentration of Fauna.

The animal concentration is moderate to good in the division. The probability of sighting of animals in a forest block is more than 30%. The most sighted animals are Elephant, Wild boar, Deer, Barking Deer, Wolf, Hyena, Python. Peacock, Jungal Cat, Languor etc



20.6.2 Management Approach:

For management of wildlife the basic elements are outlined as follows.

Management of wildlife depends on certain elements such as public support and awareness to protect wildlife and their habitats.

- a) Public Participation:** It is necessary to make local people realise and accept the idea and importance of wildlife protection. Public interaction can help in making local people responsible and cooperate in enforcement of wildlife management laws and regulations. Their feedback should also be taken for effective functioning of wildlife management.
- b) Public Awareness:** People should understand the concept of conservation of natural resources. The wildlife managers and other responsible persons should held public discussions, shows, and talks and should also take help of other media like newspapers, magazines, radio and television to make people aware about the basic concepts behind wildlife management. This can stop people from exploiting natural resources, which is the major threat to wildlife and their habitats
- c) Education:** The role of education in public awareness programs is very important. There should be environmental subjects based on wildlife conservation in school and college curricula. The well-educated and trained specialists on environmental and forest issues should participate in public training and interact with people and solve their queries to make them more responsible towards their wildlife management duties.
- d) Nature Interpretation Centres:** Nature interpretation centres may include setting up of educational camps or exhibition in nearby regions of wildlife importance.
- e) Coordination:** Wildlife management is operated at four basic levels – local, state, national and international. Overall coordination for animal conservation, propagation and management is essential.

In general the following guiding Principle may be adopted.

The general management practices involves

- a) Improvement of existing habitat and Development of new habitat for any species found in the locality.
- b) Preservation of existing wetlands.
- c) Adequate Fire Protection Measures.
- d) Providing a conducive and safe breeding zone for existing animals.



- e) Protect nesting of migratory Birds in Mahanadi River and Hirakud Reservoir.
- f) Provide water to animals during summer.
- g) Create & maintain grass lands.
- h) Remain vigilant against poaching of animals by live electric wire and loops.
- i) Take legal action against poachers.
- j) Public education / awareness camps on wild animals.

20.6.3 Methods of Treatment:

20.6.3 (i) Improvement of Habitats:

Special habitats are biological in origin and provide habitat functions for small Wild animals. They include snags, snag recruits, den trees, down wood, isolated large old trees, trees with fluting boles, buttresses, lianas, some significant species of fruit bearing trees and shrubs. These special habitats have been neglected in the past. Care should be taken while implementing the prescription of the Plan to maintain these special habitats.

a) Snags:

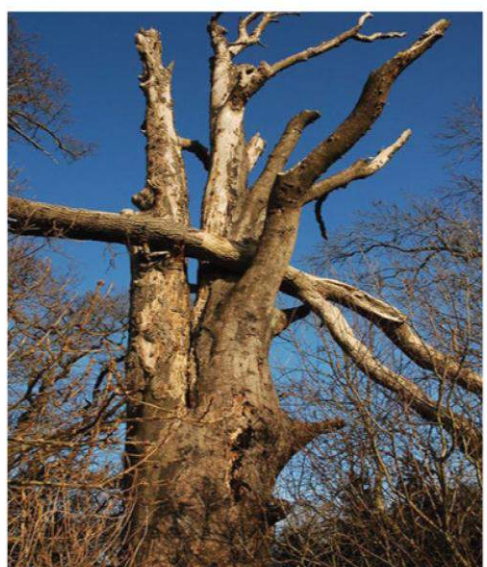
As a thumb rule, maintain at least the 5 tallest and largest diameter snags per hectare, in a well distributed design in all silvicultural treatments. Retained snags need to appear in the compartment history. These are vital for a variety of primary hole-nesting birds like Woodpeckers and Barbets, which are colonized by secondary hole-nesters like Hill Mynas, Rollers, and Owlets etc during subsequent years.





b) Snag Recruits:

Likewise maintain 5 snag recruits per hectare. These are dying trees, mostly affected by heart rot fungus but not quite dead. They can be recognized by their external symptoms. All such trees, which are being retained, need to be reflected in the compartment histories. These, along with snags provide a very good substrate for epiphytic orchids, birds and insects.





c) Down Wood:

Many species require or use down wood (fine and coarse woody debris) as habitat. Where forestry has been practiced for several rotations large proportions of these species are considered threatened. Key attributes determining the suitability of down wood as habitat are decay stage, tree species, and size, specifically diameter. Both quantity and distribution of suitable down wood influence species' presence and abundance.

In felling operations, among the rejects, apart from lops and tops, large size irregular shaped hollow logs often feature. Being uneconomical they usually remain on site, or are converted into fuel wood. Such large sized woody material provides critical ecological functions in support of maintenance of vegetation and animal diversity, besides serving the functions of cover and microhabitat for several species. The largest size hollow logs, or rejects for any reason need to be maintained at the rate of at least three logs per hectare, and as far as practicable evenly distributed. These should suitably find place in the compartment history.





d) Large Old Trees:

These would naturally occur in low densities. The Ficus species should not be counted among these, since Ficus is not felled even otherwise. Large old trees of different species as and when encountered need to be reserved in any felling or tending operation. These retained trees (2 to 4 per ha) need to be entered in the compartment histories and serve as daytime roosts or nesting sites for birds, large owls of Bubo species.

e) Trees with Fluting Boles, Buttresses and Holes:

These are expected to occur in very low densities represented by a small number of species. They provide significant microhabitat functions for small mammals like the Mouse Deer and reptiles. One such trees at least, the largest possible, needs to be retained per hectare and entered on the compartment history.

f) Lianas and Tangled Climbers:

Climber cutting operation is a standard practice, which has been prescribed in all Working Circles. However lianas provide significant habitat functions in support of mobility of arboreal animals, and depending on animal species, serve as resting and escape cover for primates. They are equally important for arboreal small carnivores, some rodents and lizards. A climber with tangles is especially important. It is recommended that woody well distributed tangled climbers all over the area may be retained & entered in the compartment histories.

g) Fruit Bearing Trees and Shrubs:

In all operations keeping fruit bearing tree species in felling or tending operations is the standard practice. Species providing fruits to local human inhabitants and Wild Life are to be retained / nursed and propagated. The information on human use is probably complete but the same cannot be said to Wild Life. The species liked by animals/ birds needs to be elaborately listed by local observation and distribution needs to be recorded.

h) Roosting or Nesting Trees:

All trees which are known to support nesting colonies of water birds or roosting congregations of raptors or other birds need to be retained. This is crucial especially with



reference to vultures, which are critically endangered along with Pallas's Fishing Eagle and White-bellied Sea Eagle, which have become very rare in this tract. It helps migratory birds along Rivers / creeks etc.

i) Maintenance of Creeks:

From forests nallas are flowing to Mahanadi and Gohira River. Such nalla / creeks are required to be maintained so that water is retained on nalla for a longer period. This can be constructed with series of low masonry bonds of different RL.



j) Maintenance of Wet lands:

Wetlands are breeding grounds of reptiles, birds etc. Day by day wetlands are vanishing due to land filling / construction etc. Many wetlands are under administrative control of Revenue department. Initiative is to be taken by the forest department to map the wetlands through Satellite imagery and GPS. The list of such wetlands needs to be approved by the District administration and maintenance of such wetlands may be regulated by the Forest department. The maintenance involves

- Demarcate extent of wetland.
- Partial de-silting of wetland.
- Allow growth of submerged weeds palatable to birds to some extent.
- Allow fish fauna / snails/ crabs to breed & grow naturally.
- Prevent fishing, poaching of birds in the designated wetland.

K) Creation & Maintenance of Grass Land:

The common wildlife species available in the division are herbivorous. They also support carnivores to sustain on their prey base. Day by day grass lands are reducing posing a stress time for herbivorous. It is highly required to create and maintain grass lands inside forest blocks, Village forests, river banks, near wetlands and swampy areas. This will boost the concentration of food base for herbivorous vis a vis carnivores.



I) Providing water to animals:

The forest blocks are mostly of hilly terrain and water impounding within forest area is poor. During summer, provision of water inside the forests is important. Hence creation of water holes / Water body and impounding of water through check dams is suggested.

20.6.3 (i) Providing Protection:

It is of paramount importance to provide adequate protection to available fauna / migratory birds and elephants/ tiger / leopard. Adequate protection measures are required. Deployment of squad, construction of watch tower and patrolling are suggested measures for protection of Wildlife.

20.6.3(ii) Detail study of Animal behaviour & scientific Documentation:

Detail study of various animal behaviours / life cycle, reason for dwindling population and effect of increase in human interface is required in depth with a scientific approach. Periodical documentation is also stressed upon.

20.6.3(iii) Creation of Public awareness & public participation in management:

For better management and co-habitation with animals, required public awareness is required. It is proposed to conduct awareness camps with villagers, School Children and other functionaries including voluntary organizations.

20.6.4 Threat to wild animals & Suggested Mechanism:

The threats to wildlife have been dealt with at length in chapter-3. Some of important threats are

- a) Annual Fire and loss of Ground Flora.
- b) Heavy biotic interference and intrusion by domestic animals (Cattle/ Goat/ Sheep)
- c) Transmission of contagious diseases from domestic cattle to Wild animals.
- d) Poaching by putting nets/ loops and live electric wires.
- e) Hunting of birds.
- f) Public irritation against crop damage.

In order to handle the situation it is proposed to

- Prevent forest fire with the help of VSS/ Public.



- Equip the forest staff with modern fire fighting tools.
- Have intelligence network deep inside the forest especially close to Sanctuary.
- Make public aware about ill effect of loss of bio diversity and loss of threatened flora and fauna.
- Enforce provisions of the wildlife (Protection) Act, 1972.
- Take help of Wildlife Crime Investigation bureau in Inter District Organized Crimes.

20.6.5 Associated regulations and measures:

In order to combat against transmitted diseases from domestic cattle, regular cattle immunization program in forest fringe villages is required. Grazing though prohibited in forests, it could not be enforced. It can only be checked if grass land could be developed outside forest area.

The Tiger Landscape is an important issue for Rairakhol Division. Forests from Satkosia Tiger Reserve- Northern Reserved forests of Athamallick Division – Rail RF of Naktideul constitutes Tiger Landscape. Steps for its development is essentially required.

The attitude of public towards wildlife is required to be moulded to a conducive atmosphere. The mother earth is **“for all living creatures both Plant & Animals”**. This principle is to be adopted universally.





CHAPTER-21

JOINT FOREST MANAGEMENT (OVERLAPPING) WORKING CIRCLE [JFM(O)WC]

21.1 Joint Forest Management Working Circle:

Joint Forest Management often abbreviated as **JFM** is the official and popular term in India for partnerships in forest movement involving both the state forest departments and local communities. The policies and objectives of Joint Forest Movement are detailed in the Indian comprehensive National Forest Policy of 1988 and the Joint Forest Management Guidelines of 1990 of the Government of India.

Joint forest management is concept of developing relationships between fringe forest groups and forest department on the basis of mutual trust and jointly defined roles and responsibilities for forest protection and development. Odisha remains the first to pass the first resolution for JFM. At present, the JFM Resolution 2011 is the basis on which forests are assigned as follows.

“The forests of the State to be covered under this Resolution shall be grouped into the following two categories:

- (a) Reserved Forests, Protected forests, Village forests, Revenue forests etc. Not covered under Protected Areas.
- (b) Protected Areas (National Park and Sanctuaries) excluding Core Areas, and Mangrove Wetlands.

The Committee constituted for the first category of forests will be known as **Vana Surakshya Samiti (VSS)** while the Committee constituted for the second category will be known as **Eco-Development Committee (EDC)**. To have a common approach for Joint Forest management this Working Circle has been constituted and named as “**Joint Forest Management (Overlapping) Working Circle**” abbreviated as **JFM (O) WC**.

21.1.2 Salient Features of Joint Forest Management:

Joint Forest management encourages the development of partnerships between local people and forest department to manage forest resource jointly. It provides a communication structure for consultation and negotiation between forest Department and forest users and provides legalized access for the local communities to forest lands. JFM encourages local people to protect forest areas in order to prevent free grazing of livestock and to assist in



preventing illegal activities by outsiders. JFM assures local people that a certain proportion of the intermediate and final harvests from forest lands will accrue to them.

21.2 General Constitution of Working Circle:

The main principle of JFM is to motivate the forest communities to protect the forest from over exploitation so that it meets the subsistence needs of the rural poor. JFM represents a significant shift in India's forest policy that balances community and government interest while remaining sensitive to local conditions, institutions and forest dependence. With this background, the JFM Resolution has outlined the category of Forests that has been assigned or to be assigned to VSS / EDC. The scope is spelled out as follows.

Area that can be assigned to VSS may be Reserved Forests, Protected forests, Village forests, Revenue forests etc. not covered under Protected Areas.

Area that can be assigned to EDC may be Protected Areas (National Park and Sanctuaries) excluding Core Areas, and Mangrove Wetlands.

At present 160 has been constituted as per JFM Resolution and functioning as such. Besides VSS constituted under JFM Resolution 1993 / 2011, there is one Village Forest Committees constituted under the Odisha Village Forest Rules, 1985 for management of 57.86 ha of Village Woodlots created during Social Forestry Project. The Forests assigned to various VSS have been indicated in Chapter 13. The abstract of area assigned to VSS is furnished at Table No 21.1 . The total area assigned is 101761.1785 ha.

Table No 21.1 Area assigned to JFM(O) WC- Rairakhol Division (area in Ha)

Sl No	Range	No of VSS	RF	PRF	DPF	Total area allotted	Total area under management	Percentage
1	Rairakhol	23	257.7	100.0	242.0	599.70	17925.5340	3.35
2	Badbahal	26	590.0	200.0	0	790.0	6005.9800	13.15
3	Charmal	19	263.7	269.1	108.0	640.80	12998.7725	4.93
4	Badmal	27	50.0	150.0	0	200.0	7720.2350	2.59
5	Naktideul	33	746.20	94.00	565.0	1405.20	31335.9770	4.48
6	Girishchandrapur	32	1697.8	0	173.0	1870.80	25774.68	7.26
	Div Total	160	3605.40	813.10	1088.0	5506.50	101761.1785	5.41

(NB Excluding VF and PF)



Besides the RF, PRF, PF and DPF village forests of Social Forestry Project is being managed as per provisions of the Odisha Village Forest Rule, 1985. The range wise area assigned is also at Table -21.2.

Table No 21.2 VFC No & Area assigned (in Ha)			
Sl No	Range	No of VSS	VF area
	Rairakhol	1	57.86
	Total	1	57.86

21.3 General characteristics of Vegetation:

The forests assigned to JFM (VSS) are mostly forest fringe area and categorized as Degraded Forests.

The village forests assigned to VFC (Village Forest Committee) are all manmade forests raised in between 1985 to 1993. The crop density varies from 30% to 70% and bears a good crop mostly of Eucalyptus, Acacia, San Chakunda, Bamboo etc. In some places Teak has been planted.

21.4 Felling Series / Cutting Section and JFM Area:

The JFM assigned area is an Overlapping Working Circle. The forests assigned to respective independent working Circle will be applicable. Mostly the forests are assigned to Rehabilitation Working Circle, Protection Working Circle, Plantation Working Circle and also Bamboo (overlapping) Working circle.

21.5 Blocks, Compartments and JFM Area:

The area, allotted to different VSS is depicted on the Management Map (Topo Map of 1:50000 Scale). The list of VSS / EDC and area assigned is furnished in Chapter 8 of this plan.

21.6 Special Objectives of Management:

The special objectives of Management of this Working Circle are as follows.

- i) To restock the degraded Forests through community participation.
- ii) To ensure protection, regeneration and management of the forest wealth through a participatory approach.



- iii) Mass Awareness campaign and motivation to the villagers is to be spread to every forest fringe village.
- iv) To make the people and Forest Department equal partners in management process.
- v) Demarcation and Survey of the area allotted under V.S.S.
- vi) Artificial regeneration in the degraded forest area is to be taken up to restore the barren and blank area.
- vii) Soil and Moisture Conservation Measures have to be adopted in the VSS assigned area and preparation of micro-plan to each VSS.
- viii) To reduce the dependency on forest, income generating activities are to be created.
- ix) The other Department involve in peoples participatory aspects like Agriculture, Horticulture, Soil Conservation, veterinary; Health, mass education etc. have to be involved to achieve all-round socio-economic development of the village.
- x) To develop VSS as an institution at local level to manage **“Natural Resource”**.
- xi) To have special thrust on **“Fringe Forest Management.”**

21.6.1 Analysis of the crop:

The Forests assigned to VSS are mostly degraded in nature except plantations under various schemes like Forest Development Agency and Social Forestry Project Plantations. Crop varies from natural forest to monoculture like Eucalyptus. Crop Density also varies from 30% in case of natural forest to 70% in plantations.

21.6.2 Silvicultural System:

The VSS area is under overlapping working circle. It overlaps with Rehabilitation Working Circle, Protection Working Circle, Plantation Working Circle and also Bamboo (Overlapping) Working Circle. The silvicultural system prescribed to these working circles will be followed as applicable. The Micro Plan of VSS is required to be revisited after approval of this working plan so as to accommodate the prescriptions of the working plan. The overall prescription of Micro plan shall be in line of prescriptions of this working Plan. In case of any contradictory prescription in micro plan is made by any VSS, the working plan prescription will supersede the micro plan prescription.



21.6.3 Method of Execution:

1. Demarcation of VSS Area:-

Demarcation of area assigned to VSS is very important task. The demarcation of area is to be done with pillar posting. It helps to give a specific identity to the VSS and to motivate them to protect and to avoid dispute between the villages. A uniform system may be adopted over the entire division while demarcating the VSS area. The Village forests of erstwhile Social Forestry Project needs special thrust as village forests have remained unattended since 2003.

A five year cycle for demarcation should be drawn up and it may be made mandatory for all Section Foresters / Range Officers to complete the demarcation process as scheduled. A special drive for it is essential.

2. Preparation of Micro-plan:-

Micro-plans should be prepared for each VSS irrespective of whether money for implementation is available or not. The micro-plan should be prepared keeping in view the overall prescription of the concerned Working Circle. Prescription like prescribed exploitable girth class of different species of the final harvest, specific marking rules, limiting the final yield with due emphasis conservation measures and biotic pressure etc. should be followed while preparing the micro-plan. The yield in the area assigned to the VSS should be calculated with due consideration to safeguard against erosion, illicit felling and other biotic pressure. The Plantation and Soil and Moisture Conservation Measures is to be undertaken and effort should be taken to obtain funds from different sources and while preparing the Micro-plans, PRA exercise are to be followed. Other tools like GIS and MIS can also be taken in to account. The detail process has been provided in the JFM Resolution-2011 Para -10. The same should be followed. In case of village forest, the management plan shall be prepared as per Rule 11 of the Odisha Village Forest Rule, 1985 (as amended vide F.F. and A.H. Deptt. Notification No. 27109 Dt. 17.11.1989).

3. Plantation & Choice of Species.

In many of the VSS assigned area due to protection by villagers' bamboo and other species have attend harvestable situation. After harvesting, the area may be planted up. The Choice of Species may be carefully decided so as to suit the soil condition and requirement of the villagers.



Whenever plantation exist in VSS allotted area, these plantation should be thinned and pruned as per requirements. (Prescription under Plantation Working Circle may be the guiding principle) Sweeping of floor of the plantations and twigs should be avoided since it affects the cycling of nutrients. Grazing and fire protection should be provided to all plantations. In natural vegetation area where crop is approaching established stage regulated grazing may be allowed after discussion in the VSS. These prescriptions should serve as a guideline while preparing the micro-plan in these areas.

4. Incentive Schemes for the VSS

The following incentive based activities shall be introduced under the Joint Forest Management (JFM) in order to increase village participation.

- (i) Entry Point Activities (E.P.A.)** in other words called Community Development Works (CDW) which includes small community infrastructures such as water tanks, rural roads/community halls as desired by the villagers which attract people's attention to the forest development activities. Forest/water conservation related activities as well as non-forest activities can also be selected for CDW based on the needs of each VSS. CDW shall be selected based on the Rapid Rural Appraisal (RRA)/Participatory Rural Appraisal (PRA) and incorporated in the Micro Plan prepared by the VSS. The implementers of these activities should start preferably before the plantation and other activities take place. The JFM Committee is required to collect user's fee for the assets provided by the CDW. EPAs are part of the community mobilization process taken up in the respective villages at the initial stage of project implementation. EPA will be selected in a well facilitated participation manner.
- (ii) Income Generation Activities (I.G.A.)** shall be identified at the micro planning stage. However, the local NGOs shall be required to provide inputs with regards to the marketability potential of the goods to undertake the IGAs by Self Help Groups (SHG) existing within a VSS. It is confirmed that IGA are not restricted in the forest related activities but any potential IGA activities are to be encouraged based on the agricultural, horticultural and forestry etc. produces are concerned. The value addition in the produces may be encouraged with handholding, capacity building and market linkage supports provided by the NGOs. Each Self Help Groups (SHG) may be provided. Revolving Fund supports from JFM Committee on loan basis to



undertake the Income Generation Activities. Prior to beginning of IGAs a market research will be undertaken by the group of specialists from specialized market research organization. It will look at a macro level market environment as well as field level situations in close collaboration with the NGOs assigned to the community. A final shortlist of potential options of project areas based IGAs for forest dependents and other poor communities will be assessed through the market research study for implementation to the IGAs. IGA will be implemented by the Self Help Groups through the help of Revolving Fund loans provided to the JFM Committee.

(iii) The Basic Livelihood Improvement Activities: Under such component, the fulfilment of basic human needs to make the local people capable for participating in JFM activities are to be prioritized during the micro planning process in the community. The provision of incentives to the local people towards the information dissemination on environmental protection and basic livelihood improvement activities. The following activities may be facilitated in the community on priority basis.

- a) Medical & Health Camps in convergence with the Govt. PHC/Hospitals.
- b) Prevention and Control of Vector & Water Borne Diseases.
- c) Reproductive and Child Health Care through providing seeds to VSS for kitchen garden.
- d) Non Formal Education Centres in the VSS for drop outs to school going.
- e) Promotion of Fuel Efficient Devices in convergence with OREDA.

(iv) Capacity Building Programmes: To enable VSS to manage the respective JFM areas, organizations and forests a standard JFM Management Manual in Odia will be prepared. Different trainings modules also to be prepared by the consultant agencies for imparting trainings to the JFM Committee in the following thematic areas.

- (a.) Maintenance and submission of records, reports and bills to forest departments at VSS level.
- (b.) Financial management, budgeting and book keeping.
- (c.) Duties and responsibilities of the General Body and Executive Body
- (d.) Conflict resolution mechanism.
- (e.) Forest protection and management arrangements.
- (f.) Sustainable harvesting management for different forest products.



- (g.) Beneficiary management within the community.
- (h.) Exposure trips/ exchange visits.
- (v) **VFDF (Village Forest Development Fund):** A financial establishment is essential for the VSS activities to be sustained. Provisions of budget for EPA, Revolving Fund for Income Generation Activities and Basic Livelihood Improvement Activities should be made under the Forest Department for implementation of a scheme. VSS will contribute to a Village Forest Development Fund by raising money from user fees for the asset created under EPA, penalty for illegal actions, interest from bank savings and sales for the forest products. The budget provided by the Forest Department for EPA, IGA & Livelihood Improvement Activities should be utilized only for the original designed objectives of a scheme while VFDF could be flexibly used according to the needs of the VSS. Provision of Corpus Fund may also be arranged under a scheme for strengthening of the JFM, VFDF. It suggested that at least 50% of the savings of the VFDF should be allocated for maintenance of the forest area after completion of the scheme.
- (vi) **Formulation of Micro Planning:** A Micro Planning is a comprehensive document to guide the VSS in pursuing all forest management for its JFM area, community development and institutional development and other intervention under a scheme designed. The VSS will be responsible for formulation of their Micro Plan which will be assisted by the contracted NGOs/Experts and the forest division concerned. PRA for resource assessment for analysis will be conducted for this purpose. Micro Planning is vital for any JFM Committee for ensuring their participation at different levels of implementation of a scheme.
- (vii) **Engagement of specialized agencies for input support to JFM**
 - 1. For Micro Planning Preparation- Local NGOs
 - 2. For capacity building of JFMC- Local NGOs
 - 3. For IGAs- Specialized IGA Support Agencies
- (viii) **Training camps for VSS Members.**

The JFM Resolution-2011, Para-9, the role of Forest department has been defined. The role includes



- To assist in capacity building of VSS / EDC members on different aspects of forest management, planning, silviculture, nursery technology, forest laws, accounting, book keeping, micro-enterprise development, value addition and processing of NTFPs etc.
- To provide technical help to the VSS / EDCs in preparation and implementation of the Micro plan/ annual work programme.

To fulfill the responsibility in this aspect, it is recommended that the DFO, may arrange training camps for 2/3 days duration for VSS members where plantations/ Rehabilitation and harvesting operation is likely to be taken during the same year / coming year. It may be made an annual feature and included in the work schedule of the division.

21.6.4 Usufruct Sharing Mechanism:

The Joint Forest Management Resolution 2011 Para 11 elaborately deals with usufruct sharing. The Para is reproduced for immediate reference.

“11. Usufruct sharing:

(i) The VSS / EDC shall be entitled to the usufructuary benefits from the assigned forests as under:—

(a) Usufructs like fallen leaves, fodder grasses, thatch grass, broom grass, fencing materials, brushwood, fallen lops, tops and twigs to be used as fuel shall be available to the members free of cost.

(b) All intermediate yields in the shape of small wood, poles, firewood etc as maybe obtained as a result of silvicultural operations and bamboo harvested in VSS / EDC assigned area shall be made available to the VSS / EDC members in a manner as may be decided by EC. If sold at a price, the funds so obtained shall be deposited in the VSS / EDC account.

(c) In case of Kendu leaves and specified forest produce other than bamboo, if any, the VSS will have the right to collect the same from the assigned forest but these items will be disposed of as per the prevailing provisions of Government and practices.

(d) While maintaining the forest cover in perpetuity, if any major harvest or final felling occurs in the assigned forest, the same shall be taken up by the forest department as per the prescription of the working plan/ duly approved micro plan. In case of natural calamities, harvesting of wind-fallen trees shall be treated as final harvest. Priority will be given to the



members of the VSS /EDC for salvaging and harvesting work. Valuation of the produce so obtained shall be done and information shared with the VSS /EDC and the produce will be sold / disposed of by the forest department or by agents of the forest department. The VSS / EDC will receive 50% share of the sale price after deduction of proportionate harvesting cost and this will be deposited in the "VSS account". The VSS may also opt for 50% of the forest produce so harvested if it is for their bona fide domestic use and they agree to pay the proportionate cost of harvesting.

(e) In case of village woodlots created and maintained by the VSS / EDC on non-forest land, all usufructs including interim and rotational harvests shall go to the VSS / EDC.

(f) In the event of a natural calamity occurring in the village there may be a demand for house building materials and other forest produce from the assigned forest. In such cases, the VSS / EDC may go for harvesting the required quantity of timber or other forest produce as a deviation to the Micro Plan, with due approval of the Divisional Forest Officer concerned.

(ii) The EC shall be responsible for the distribution of the usufructuary benefits equitably among the members of the VSS. Need of the group or community, who do not have any livelihood support other than depending on the forests, should be specially considered.

(iii) In cases where member/ a group of members of the VSS /EDC play a major role in the collection of intelligence, detection and seizure of illegal forest produce in transit the concerned VSS/EDC shall be entitled to the prescribed percentage of the sale price of the forest produce as per Rule 4 (3) of the Orissa Rewards for Detection of Forest Offences Rules, 2004. Such amount shall be deposited by the DFO in the "VSS account/EDC account" after disposal of the seized produce following due procedure of law."

In case of Village Forest created during Social Forestry Project, the sharing mechanism will be as per Rule -9 of the Village Forest Rule, 1985. The rule reads as follows.

"9. Sharing of Forest Produce:

(1) The beneficiaries shall on payment, as prescribed under Rule 13, be entitled to the forest produce from the village forest for their bona fide use or consumption. The beneficiaries shall obtain necessary permit under Rule 8 in case of their bona fide use or consumption. The Committee will be entitled to sell part of the forest produce for generating funds for



management and regeneration of the village forests and the buyer shall obtain necessary permit under the Rule 8 for transportation of the village forest produce.

(2) The Committee shall be responsible for the proper distribution of all available forest produce from the village forest amongst the beneficiaries for their bona fide use or consumption on the basis of one equal share for each kitchen as far as possible. The Committee shall maintain a record of distribution of the forest produce and all the distributions made before a particular meeting shall be reviewed in the said meeting of the Committee.

21.6.5 Rights and Concessions:

Rights and Concessions in this Working circle shall be regulated in accordance with the provision of the relevant gazette notification of the respective forest blocks and the Government of Odisha policy with regard to JFM. Community rights as allowed under The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 will also be honoured. The provisions of the Odisha Village Forest Rule, 1985 will also be followed for allowing the rights and concession to villagers.

21.6.6 Scope of expanding JFM Working Circle:

(i) Out of 56034.6039 ha of forest area under management fold, 27506.4330 ha has been assigned to different JFM committee (Both VSS and VFC) which workout to be 49.08% of the forest area. There is ample scope to increase the area under JFM. At present “**AJY -Aama Jungal Yojana**” is being implemented which provides an avenue to expand area under JFM.

(ii) There are many forested area under the administrative control of Revenue department. The JFM resolution 2011 has extended its purview to manage Revenue Forests in a **Joint Forest Management** approach. Where PRI (Panchyat Raj Institutes) are interested in management of such forests, the same may be taken for management under VSS.

21.6.7 Evaluation of Performance & Incentive:

The incentive to VSS / VFC or any other group is always drive the group in a positive direction. It encourages the villagers for better participation. The Principal Chief Conservator of Forests, Odisha Bhubaneswar has formulated a set of parameters for evaluation of performance of VSS. The Government also rewards the VSS every year either on “World Forest day” or World



Environment day in state level functions. The evaluation is being carried out on ten important criteria and each point is evaluated out of 10 mark scale. The criteria's are

- a. Extent of Forest area under effective control, Protection and management of VSS.
- b. Regularity & frequency of holding meetings of General Body and Executive committee of the VSS, proper attendance in those meetings, deliberation of vital issue and record keeping.
- c. Improved status of Forest Protection.
- d. Quality of control exercised by the VSS on day- to- day management of the forest.
- e. Resolution of conflict.
- f. Sustainable collection of NTFP.
- g. Effective preservation & control of Forest Fire.
- h. Reduction of day- to- day dependency on Forest Produce.
- i. Effectiveness in implementation of afforestation, soil moisture conservation measures and silvicultural operation.
- j. Equity and gender equity.

Similarly the Divisional Forest Officer shall undertake motivation cum evaluation camps and reward the VSS / NGO/ Staffs for their contribution for Joint Forest Management.

21.6.8 Associated Regulations and Measures:

(i) The JFM area is mostly covered either plantations or degraded forest area intended to regenerate the area through Aided Natural Regeneration. Plantation area will be managed through clear felling with Standard followed by planting. During planting period till its establishment, control of Grazing is of paramount importance. In the Village Forest Rule, 1985, elaborated provisions have been made for Control of Grazing. Rule 10 of the Odisha Village Forest Rule is reproduced below for reference and guidance.

“Rule 10(1) The Committee shall regulate grazing in the village forest by alternately closing and opening of areas for such period as it may deem proper and by such methods as it may adopt:

Provided that the provisions in the Orissa Forest (Grazing of Cattle) Rules, 1980 shall, as far as possible may be adopted to regulate such grazing.

(2) The Committee shall have the power to impound the cattle that enter the village forest contrary to these rules.



(3) Pasture development and fodder cultivation in Gochar lands within the limits of the village may be taken up by the Committee in accordance with schemes drawn up by the Sub-Collector or the Divisional Forest Officer, or the Soil Conservation Officer in that regard, For implementing the schemes, the Committee shall ensure that every household owning cattle has access to the benefit of the scheme.”

The same principle may be extended to the VSS area / area worked out under National Afforestation Program by Forest Development Agency. The Divisional Forest Officer shall declare the plantation area, Regeneration area closed to Grazing at least for three years from year of plantation. After third year Rotational Grazing may be allowed depending upon growth Pattern of plantations.

(ii) Auditing / accounting of VSS Account.

The accounting procedure for VSS has been well defined in the JFM Resolution. The accounts of VSS involved in FDA program, AJY are regularly maintained and audited. In case of other VSS, the Secretary of VSS shall make it a point to update the Account and get audited annually. It will increase the interest of VSS and transparency in VSS Executive Committee activities.

In VFC constituted during Social Forestry Project may not have their own account? The Secretary of VFC may open an account jointly as in line of Rule 12 of the Odisha Village Forest Rules-1985 and in line of JFM Resolution-2011 & up to date amendments.

(iii) Regular Meeting of EC/ General body:

In many VSS / VFC monthly meeting of EC and Annual Meeting of General body is found to be irregular. The Secretary of VFC / VSS shall make a point to convey / conduct regular meeting of VSS / VFC in his jurisdiction.





CHAPTER-22

TREE OUTSIDE FOREST (TOF)

22.1 Name of working circle:

The Forest area in Rairakhol Division is about 75.67 % of Geographical area. Out of the forest area recorded around 28.68% area is of Revenue Forest land. Besides the forests, under administrative control of Forest department about 405.96 Sq.KM of Revenue forests (21.7% of the Geographical area) remain outside the management purview. Plantations are being raised under various schemes like Forest Development Agency, Mahatma Gandhi National Rural Employment Guarantee Act (MANREGA), CAMPA, Farm Forestry, Avenue Plantations etc. Hence its management is of equal importance. In order to provide a management strategy for these plantations / natural forests, it is proposed to constitute “**ToF Working Circle**”. Total area allotted is 4157.69 ha and 414 .0 RKM Avenue Plantation.

22.2 General Constitution:

The TOF are integrated contribution of Plantations Raised outside the conventional Forest area by Forest Department, Horticultural plantation and other department, Plantations raised by private individuals in their fellow land and back yard, Agro Forestry practices, Avenue Plantations and Institutional Plantations.

The plantations raised during last plan period outside the Forest area are included in this Working Circle. The total area planted is 4157.69 ha and 414 RKM Avenue Plantation.

Under Farm Forestry program 48.508 lakh seedlings have been distributed and it is estimated that **3031.44**ha area might have been planted up out of these seedlings distributed.

These two types of plantations i.e. Misc. Plantation and Avenue Plantation will be considered for ToF management. The revenue forests though contribute to TOF to a greater extent, a general guideline will be prescribed for its management.

22.2.1 Plantations outside the Forest area.

The plantations raised outside the forest area comes to 4157.69 ha. The year wise Plantation raised and assigned to this Working Circle for management are at Table No 22.1



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Table No 22.1 List of Plantations Raised Outside the Forest Area

Sl No	Name of Range	Name of Plantation Site	Year of Plantation	Area in Ha.
1	Redhakhol	Maulabhanja K.F	2014-15	30.00
2	Redhakhol	Terbeda K.F	2014-15	50.00
3	Redhakhol	Brahmani K.F	2014-15	70.00
4	Redhakhol	Sandimunda K.F	2014-15	5.00
5	Redhakhol	Laiza K.F	2015-16	40.00
6	Redhakhol	Chhatrapur K.F	2015-16	30.00
7	Redhakhol	Kalindra K.F	2015-16	6.50
8	Redhakhol	Paikmal K.F	2016-17	30.00
9	Redhakhol	Dalkhaman K.F	2016-17	7.80
10	Redhakhol	Daincha K.F	2017-18	40.00
11	GCPur	Gaudpali K.F	2010-11	50.00
12	GCPur	Dimirikuda KF	2010-11	50.00
13	GCPur	Dhalpur KF	2010-11	50.00
14	GCPur	Balikiari KF	2014-15	50.00
15	GCPur	Badbahal KF	2014-15	10.00
16	GCPur	Tileimal KF	2015-16	30.00
17	GCPur	Kaunsipal KF	2016-17	50.00
18	GCPur	Pithauguda KF	2016-17	20.00
19	GCPur	ChardaposhiKF	2017-18	25.00
20	GCPur	Jaresingha KF	2017-18	25.00
21	GCPur	Jaresingha KF	2018-19	20.00
22	GCPur	Tikilipada KF	2018-19	30.00
23	Redhakhol	Sampur	2010-11	50.00
24	Redhakhol	Baishnabajhuli	2010-11	55.00
25	Redhakhol	Khajurijharen	2010-11	50.00
26	Charmal	Chudapudug	2010-11	50.00
27	Charmal	Dimirikuda	2010-11	50.00
28	GCPur	Dhalpur	2010-11	50.00
29	Naktideul	Gadadharpur	2010-11	65.00
30	Naktideul	Lusura	2010-11	50.00
31	Naktideul	Arkhakud	2010-11	55.00
32	Badbahal	Dhaurakhman	2010-11	55.00
33	Badmal	Badmal	2010-11	60.00
34	Badmal	Suliadadar	2011-12	20.00



Table No 22.1 List of Plantations Raised Outside the Forest Area

SI No	Name of Range	Name of Plantation Site	Year of Plantation	Area in Ha.
35	Naktideul	Kunjamura	2011-12	40.00
36	Badmal	Lamtidadar KF	2012-13	35.00
37	Naktideul	Ghosramal PF	2012-13	25.00
38	Naktideul	Jharbeda	2012-13	40.00
39	Naktideul	Hitasara	2012-13	10.00
40	Redhakhol	Daincha	2013-14	15.00
41	Badbahal	Tal-Kholgarh (AR)	2013-14	10.00
42	Naktideul	Bhetiaberni	2014-15	10.00
43	Naktideul	Gadakhhol	2014-15	25.00
44	Redhakhol	Tandabira KF	2014-15	15.00
45	Redhakhol	Maulabhanja VF	2014-15	30.00
46	Redhakhol	Brahamani KF	2014-15	70.00
47	Redhakhol	Buruda KF	2014-15	100.00
48	Charmal	Sarapal KF	2014-15	50.00
49	Redhakhol	Saradhapur KF	2014-15	80.00
50	GCPur	Balikiary KF	2014-15	50.00
51	Naktideul	Sahebi VF	2014-15	100.00
52	Naktideul	Liburi VF	2014-15	70.00
53	Naktideul	Kadobahali VF	2014-15	50.00
54	Naktideul	Govindpur KF	2014-15	85.00
55	Badbahal	Badkuda KF	2014-15	50.00
56	Badbahal	Laindmal KF	2014-15	20.00
57	Badbahal	San-Rengali KF	2014-15	50.00
58	Badmal	Rengali-Badmal KF	2014-15	50.00
59	Badmal	Kasanda VF	2014-15	20.00
60	GCPur	Badbahal KF	2014-15	10.00
61	GCPur	Jatesingha KF	2014-15	10.00
62	GCPur	Fulkusum KF	2014-15	10.00
63	Naktideul	Bhalugadia KF	2014-15	10.00
64	Naktideul	Koing KF	2014-15	10.00
65	Naktideul	Nevrapal KF	2014-15	10.00
66	Badmal	Pipilikani KF	2014-15	20.00
67	Badmal	Kasanda KF	2014-15	10.00
68	Badmal	Sunamudi KF	2014-15	10.00



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Table No 22.1 List of Plantations Raised Outside the Forest Area

Sl No	Name of Range	Name of Plantation Site	Year of Plantation	Area in Ha.
69	Badmal	Balbaspur KF	2014-15	10.00
70	Badmal	Ladlada KF	2014-15	10.00
71	Badmal	R-Badmal to Govindpur	2015-16	20.00
72	Naktideul	Tileimal KF	2015-16	30.00
73	GCPur	Podamal KF	2015-16	20.00
74	Naktideul	Penthabahal KF	2015-16	10.00
75	Badmal	Budhikhamar KF	2015-16	20.00
76	Badmal	Kusurda KF	2015-16	20.00
77	Redhakhol	Laiza	2015-16	40.00
78	Redhakhol	Chhatrapur KF	2015-16	30.00
79	Naktideul	Ghosramal KF	2015-16	35.00
80	Naktideul	Hitasara KF	2015-16	20.00
81	Naktideul	Dhatukimal KF	2015-16	40.00
82	Badmal	Tudabahal KF	2015-16	30.00
83	Badmal	Sunamudi KF	2015-16	30.00
84	Badmal	Mochibahl KF	2015-16	30.00
85	Badmal	Badpati	2015-16	15.00
86	Badmal	Kaudiapali	2015-16	40.00
87	Badbahal	Khajurijharen	2015-16	5.00
88	Badbahal	Khajurijharen	2015-16	33.39
89	Redhakhol	Dalki VSS	2016-17	20.00
90	Redhakhol	Charbati VSS	2016-17	40.00
91	Redhakhol	Paikmal KF	2016-17	30.00
92	Charmal	San-Hindol KF	2016-17	30.00
93	Charmal	Bandhantaila KF	2016-17	40.00
94	GCPur	Kausipal KF	2016-17	50.00
95	GCPur	Pithaguda KF	2016-17	20.00
96	Naktideul	Lusura KF	2016-17	100.00
97	Badbahal	Chhandpur KF	2016-17	50.00
98	Badbahal	Gadakhhol KF	2016-17	50.00
99	Badmal	Chhelibahal KF	2016-17	20.00
100	Badmal	Balbaspur KF	2016-17	30.00
101	Redhakhol	Daincha KF	2017-18	40.00
102	Charmal	Berhampura KF	2017-18	25.00



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Table No 22.1 List of Plantations Raised Outside the Forest Area

Sl No	Name of Range	Name of Plantation Site	Year of Plantation	Area in Ha.
103	Charmal	Bansajal KF	2017-18	25.00
104	Naktideul	Sahebi KF	2017-18	50.00
105	Naktideul	Bindpur	2017-18	50.00
106	Badmal	Mochibahal KF	2017-18	50.00
107	Badmal	Telighana KF	2017-18	40.00
108	GCPur	Jaresingha KF	2017-18	25.00
109	GCPur	Saradhapur KF	2017-18	25.00
110	Badbahal	Pankimal KF	2017-18	50.00
111	Badbahal	Gadakhhol KF	2017-18	50.00
112	Badbahal	Samsingha KF	2018-19	25.00
113	Badbahal	Dimirimunda KF	2018-19	25.00
114	Badmal	Patupali KF	2018-19	40.00
115	Naktideul	Lampafuli KF	2018-19	35.00
116	Charmal	Rasibeda KF	2018-19	25.00
117	GCPur	Jaresingha KF	2018-19	20.00
118	GCPur	Tikilipada KF	2018-19	30.00
119	Redhakhol	Sadhumunda VSS	2019-20	5.00
120	Badmal	Telighana VSS	2019-20	25.00
Total				4157.69

Table No 22.2 Abstract of Plantation raised outside the Forest area.

Range / Year	Redhakhol	Badmal	Charmal	Badbahal	Naktideul	GCPur	Total
2010-11	155	60	100	55	170	200	740
2011-12		20			40		60
2012-13		35			75		110
2013-14	15			10			25
2014-15	450	130	50	120	370	140	1260
2015-16	146.5	205		38.39	135	50	574.89
2016-17	127.8	50	70	100	100	140	587.8
2017-18	80	90	50	100	100	100	520
2018-19		40	25	50	35	100	250
2019-20	5	25					30
Total	979.3	655	295	473.39	1025	730	4157.69



22.2.2 Avenue Plantation (TOF)

The list of Avenue plantations is at Table No 22.2 below.

Table No: 22.2 List of Avenue Plantations Raised during last plan period& beyond.				
Sl No	Year	Name of Road	RKM Planted	No of Seedlings Planted.
1	2008-09	NIL	NIL	NIL
2	2009-10	NIL	NIL	NIL
3	2010-11	NIL	NIL	NIL
4	2011-12	NIL	NIL	NIL
5	2012-13	Charbati-Angarpada	5.88	1470
		Laiza-Gugua	2.12	530
		Giripur-Kisinda	7.0	1750
6	2013-14	Kisinda to Panimura	16.7	4175
		Kisinda to Dhalpur	3.30	825
7	2014-15	Tandabira to Champalinala	20.0	5000
		Hemamura to Jhinkidadar	6	1500
		Daincha to Hinteri	4	1000
		Chudapud to Bhatrapur	16	4000
		Saradhapur to Badtaila	8	2000
		Dhalpur to Machhadihi	6	1500
		Jamjori to Bindpur	4	1000
		Batgoan to Keotberni	8	2000
		Sahebi to Rengali	5	1250
		Jamujori to Bagbar	4	1000
		Hatibahal to Kankandpada	7	1750
		Tribanpur to Rahan	7	1750
		Khandahatachhato	6	1500
		Khandahata	5	1250
		Rengali to Sonapur border	5	1250
		Saiberni to Satsama	5.0	1250
		Kusunda to Sagjori	11	2750
8	2015-16	Rengali Badmal-Gobindpur	20	5000
9	2016-17	Naktideul-Sahebi	14	2500
		Madhupur-Bhatra	03	750
		Kankanpada-Kukudabahali	03	750
		Muturumunda-Daincha	06	1500



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Table No: 22.2 List of Avenue Plantations Raised during last plan period& beyond.

Sl No	Year	Name of Road	RKM Planted	No of Seedlings Planted.
		Daincha-Laiza	06	1500
		Badhindol-Gambhariberni	06	1500
		Dhunkchhali-Brahamani	06	1500
		Gugua –Giripur	10	2500
		NH Road-Rasibeda	04	1000
		NH Road-Nuapada	04	1000
		Badmal-Bantaloi	08	2000
		Jamjori-Angabira	10	2500
		Kello RD road-Ranja	4	1000
		RD road to Kasibahal	6	1500
		RD road to Hatibahal	4	1000
		Tribanpur RD road to Sarapal	6	1500
		Kusurda to Gopalpur	10	2500
11	2017-18	Sahebi-Jamjori	16	4000
		Charbati-Betgarh	6	1500
		Charmal-Berihassahi	4	1000
		Tribanpur-Sarapal	4	1000
		Buromal-Balikiary	10	2500
		Bandhupali-Saradhapur	4	1000
		Buromal-Kholgarh village	4	1000
		Keutberni-Basaloi	6	1500
		Ranchi -Vijaybada NH to Dimirimunda village	4	1000
		Rengali to Chakamunda	3	750
12	2018-19	Amjhari to Tribanpur	4	1000
		Sanhindol to Musakata	7	1750
		Rengali to Chakamunda	3	750
		Kasanda to Sunamudi	3	750
		Lusura to Ghosramal	4	1000
		Kholgarh to Mangalpur	4	1000
		Balikiary to Fulkusum	12	3000
		Kalindar to Badmal	04	1000
13	2019-20	Balikiary to Talab	07	1750
		Podabalanda to Barbank	03	750



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Table No: 22.2 List of Avenue Plantations Raised during last plan period& beyond.

Sl No	Year	Name of Road	RKM Planted	No of Seedlings Planted.
		Kasibahal to Karadapal	03	750
		Tribanpur to Amjhari	04	1000
		Kadalipali to Sangrampur	03	750
		Total	414	102500

22.3 General constitution of working circle:

The area allotted to this Working circle consists of various mixed Plantation with survival about 75%. The growth Status varies depending upon age of plantation. Plantations raised during 2007-08 to 2014-15 are considered as established. Rest of plantations are expected to be established within the plan period.

22.4 General characteristics of vegetation:

The plantations included for management under this working Circle are either plantations of mixed species of short rotation mostly fuel wood and fodder species, timber species, fruit bearing species with an expectation to create a man made forest to provide green cover to barren land. Avenue plantations have been taken up to have an aesthetic value and to provide shed to passerby. No yield is expected from these plantations.

22.5 Treatment series/ sections and JFM areas:

For management convenience four Treatment Series are constituted i.e. Rairakhol- Badbahal TOF Series, Badmal- Charnal TOF Series, Naktideul TOF Series and GCPur TOF Series. For Avenue Plantation one Series namely Rairakhol Avenue Series is constituted. The area assigned to each series is as follows (Table no 22.3)



22.5.1 Rairakhol Badmal TOF Series

Table No 22.3 Rairakhol Badbahal TOF Series

Sl No	Range	Site	Year	Area
1	Redhakhol	Maulabhanja K.F	2014-15	30.00
2	Redhakhol	Terbeda K.F	2014-15	50.00
3	Redhakhol	Brahmani K.F	2014-15	70.00
4	Redhakhol	Sandimunda K.F	2014-15	5.00
5	Redhakhol	Laiza K.F	2015-16	40.00
6	Redhakhol	Chhatrapur K.F	2015-16	30.00
7	Redhakhol	Kalindra K.F	2015-16	6.50
8	Redhakhol	Paikmal K.F	2016-17	30.00
9	Redhakhol	Dalkhaman K.F	2016-17	7.80
10	Redhakhol	Daincha K.F	2017-18	40.00
11	Redhakhol	Sampur	2010-11	50.00
12	Redhakhol	Baishnabajhuli	2010-11	55.00
13	Redhakhol	Khajurijharen	2010-11	50.00
14	Badbahal	Dhaurakhman	2010-11	55.00
15	Redhakhol	Daincha	2013-14	15.00
16	Badbahal	Tal-Kholgarh (AR)	2013-14	10.00
17	Redhakhol	Tandabira KF	2014-15	15.00
18	Redhakhol	Maulabhanja VF	2014-15	30.00
19	Redhakhol	Brahamani KF	2014-15	70.00
20	Redhakhol	Buruda KF	2014-15	100.00
21	Redhakhol	Saradhapur KF	2014-15	80.00
22	Badbahal	Badkuda KF	2014-15	50.00
23	Badbahal	Laindmal KF	2014-15	20.00
24	Badbahal	San-Rengali KF	2014-15	50.00
25	Redhakhol	Laiza	2015-16	40.00
26	Redhakhol	Chhatrapur KF	2015-16	30.00
27	Badbahal	Khajurijharen	2015-16	5.00
28	Badbahal	Khajurijharen	2015-16	33.39
29	Redhakhol	Dalki VSS	2016-17	20.00
30	Redhakhol	Charbati VSS	2016-17	40.00



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Table No 22.3 Rairakhol Badbahal TOF Series

Sl No	Range	Site	Year	Area
31	Redhakhol	Paikmal KF	2016-17	30.00
32	Badbahal	Chhandpur KF	2016-17	50.00
33	Badbahal	Gadakhol KF	2016-17	50.00
34	Redhakhol	Daincha KF	2017-18	40.00
35	Badbahal	Pankimal KF	2017-18	50.00
36	Badbahal	Gadakhol KF	2017-18	50.00
37	Badbahal	Samsingha KF	2018-19	25.00
38	Badbahal	Dimirimunda KF	2018-19	25.00
39	Redhakhol	Sadhumunda VSS	2019-20	5.00
	Total			1452.69

22.5.2 Badmal- Charmal TOF Series

Table No 22.4 Badmal- Charmal TOF Series (BTOF)

Sl No	Range	Site	Year of Plantation	Area in ha
1	Charmal	Chudapudug	2010-11	50.00
2	Charmal	Dimirikuda	2010-11	50.00
3	Badmal	Badmal	2010-11	60.00
4	Badmal	Suliadadar	2011-12	20.00
5	Badmal	Lamtidadar KF	2012-13	35.00
6	Charmal	Sarapal KF	2014-15	50.00
7	Badmal	Rengali-Badmal KF	2014-15	50.00
8	Badmal	Kasanda VF	2014-15	20.00
9	Badmal	Pipilikani KF	2014-15	20.00
10	Badmal	Kasanda KF	2014-15	10.00
11	Badmal	Sunamudi KF	2014-15	10.00
12	Badmal	Balbaspur KF	2014-15	10.00
13	Badmal	Ladlada KF	2014-15	10.00
14	Badmal	R-Badmal to Govindpur	2015-16	20.00
15	Badmal	Budhikhamar KF	2015-16	20.00
16	Badmal	Kusurda KF	2015-16	20.00
17	Badmal	Tudabahal KF	2015-16	30.00
18	Badmal	Sunamudi KF	2015-16	30.00



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Table No 22.4 Badmal- Charmal TOF Series (BTOF)

Sl No	Range	Site	Year of Plantation	Area in ha
19	Badmal	Mochibahl KF	2015-16	30.00
20	Badmal	Badpati	2015-16	15.00
21	Badmal	Kaudiapali	2015-16	40.00
22	Charmal	San-Hindol KF	2016-17	30.00
23	Charmal	Bandhantaila KF	2016-17	40.00
24	Badmal	Chhelibahal KF	2016-17	20.00
25	Badmal	Balbaspur KF	2016-17	30.00
26	Charmal	Berhampura KF	2017-18	25.00
27	Charmal	Bansajal KF	2017-18	25.00
28	Badmal	Mochibahal KF	2017-18	50.00
29	Badmal	Telighana KF	2017-18	40.00
30	Badmal	Patupali KF	2018-19	40.00
31	Charmal	Rasibeda KF	2018-19	25.00
32	Badmal	Telighana VSS	2019-20	25.00
	Total			950.00

22.5.3 Naktideul TOF Series

Table No 22.5 Naktideul TOF Series (NTOF)

Sl No	Range	Site	Year of Plantation	Area in ha
1	Naktideul	Gadadharpur	2010-11	65.00
2	Naktideul	Lusura	2010-11	50.00
3	Naktideul	Arkhakud	2010-11	55.00
4	Naktideul	Kunjamura	2011-12	40.00
5	Naktideul	Ghosramal PF	2012-13	25.00
6	Naktideul	Jharbeda	2012-13	40.00
7	Naktideul	Hitasara	2012-13	10.00
8	Naktideul	Bhetiaberni	2014-15	10.00
9	Naktideul	Gadakhhol	2014-15	25.00
10	Naktideul	Sahebi VF	2014-15	100.00
11	Naktideul	Liburi VF	2014-15	70.00
12	Naktideul	Kadobahali VF	2014-15	50.00
13	Naktideul	Govindpur KF	2014-15	85.00



Table No 22.5 Naktideul TOF Series (NTOF)

Sl No	Range	Site	Year of Plantation	Area in ha
14	Naktideul	Bhalugadia KF	2014-15	10.00
15	Naktideul	Koing KF	2014-15	10.00
16	Naktideul	Nevrapal KF	2014-15	10.00
17	Naktideul	Tileimal KF	2015-16	30.00
18	Naktideul	Penthabahal KF	2015-16	10.00
19	Naktideul	Ghosramal KF	2015-16	35.00
20	Naktideul	Hitasara KF	2015-16	20.00
21	Naktideul	Dhatukimal KF	2015-16	40.00
22	Naktideul	Lusura KF	2016-17	100.00
23	Naktideul	Sahebi KF	2017-18	50.00
24	Naktideul	Bindpur	2017-18	50.00
25	Naktideul	Lampafuli KF	2018-19	35.00
	Total			1025.00

22.5.4 GCPur TOF Series

Table NO 22.6 GCPur TOF Series

Sl No	Range	Site	Year of Plantation	Area in ha
1	GCPur	Gaudpali K.F	2010-11	50.0
2	GCPur	Dimirikuda KF	2010-11	50.0
3	GCPur	Dhalpur KF	2010-11	50.0
4	GCPur	Balikiari KF	2014-15	50.0
5	GCPur	Badbahal KF	2014-15	10.0
6	GCPur	Tileimal KF	2015-16	30.0
7	GCPur	Kaunsipal KF	2016-17	50.0
8	GCPur	Pithauguda KF	2016-17	20.0
9	GCPur	ChardaposhiKF	2017-18	25.0
10	GCPur	Jaresingha KF	2017-18	25.0
11	GCPur	Jaresingha KF	2018-19	20.0
12	GCPur	Tikilipada KF	2018-19	30.0
13	GCPur	Dhalpur	2010-11	50.0



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Table NO 22.6 GCPur TOF Series

Sl No	Range	Site	Year of Plantation	Area in ha
14	GCPur	Balikiary KF	2014-15	50.0
15	GCPur	Badbahal KF	2014-15	10.0
16	GCPur	Jatesingha KF	2014-15	10.0
17	GCPur	Fulkusum KF	2014-15	10.0
18	GCPur	Podamal KF	2015-16	20.0
19	GCPur	Kausipal KF	2016-17	50.0
20	GCPur	Pithaguda KF	2016-17	20.0
21	GCPur	Jaresingha KF	2017-18	25.0
22	GCPur	Saradhapur KF	2017-18	25.0
23	GCPur	Jaresingha KF	2018-19	20.0
24	GCPur	Tikilipada KF	2018-19	30.0
	Total			730.0

22.5.5 Rairakhol Avenue Series

The list as furnished at Table No 22.7

Table No 22.7 TOF Series Constitution – Rairakhol Division

Sl No	Name of Treatment Series	No of Sites	Area in ha / RKM
1	Rairakhol Badmal TOF Series	39	1452.69
2	Badmal- Charmal TOF Series	32	950.0
3	Naktideul TOF Series	25	1025.0
4	GCPur TOF Series	24	730.00
5	Rairakhol Avenue Series	63	414 RKM
	Total		4157.69 ha+414 RKM

22.5.6 Treatment Section

For execution convenience each series is divided to 10 sections assigned to be worked in each year.



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1. Rairakhol Badbahal TOF Series

Table No 22.8 Sections of Redhakhol Badbahal TOF Series (RTOF)

Name of Series	Range	Year of Operation	Section No	Plantation assigned	Area in Ha	Section Total Area	Year of Plantation
Redhakhol Badbahal TOF Series (RTOF)	Redhakhol	2021-22	RTOF-I	Sampur	50.00	105.0	2010-11
	Redhakhol			Baishnabajhuli	55.00		2010-11
	Redhakhol	2022-23	RTOF-II	Khajurijharen	50.00	105.0	2010-11
	Badbahal			Dhaurakhman	55.00		2010-11
	Redhakhol	2023-24	RTOF-III	Daincha	15.00	175.00	2013-14
	Badbahal			Tal-Kholgarh (AR)	10.00		2013-14
	Redhakhol			Maulabhanja K.F	30.00		2014-15
	Redhakhol			Terbeda K.F	50.00		2014-15
	Redhakhol			Brahmani K.F	70.00		2014-15
Redhakhol Badbahal TOF Series (RTOF)	Redhakhol	2024-25	RTOF-IV	Sandimunda K.F	5.00	170.0	2014-15
	Redhakhol			Tandabira KF	15.00		2014-15
	Redhakhol			Maulabhanja VF	30.00		2014-15
	Redhakhol			Brahamani KF	70.00		2014-15
	Badbahal			Badkuda KF	50.00		2014-15
Redhakhol Badbahal TOF Series (RTOF)	Badbahal	2025-26	RTOF-V	Laindimal KF	20.00	170.0	2014-15
	Badbahal			San-Rengali KF	50.00		2014-15
	Redhakhol			Buruda KF	100.00		2014-15
Redhakhol Badbahal TOF Series (RTOF)	Redhakhol	2026-27	RTOF-VI	Saradhapur KF	80.00	188.39	2014-15
	Redhakhol			Laiza	40.00		2015-16
	Redhakhol			Chhatrapur KF	30.00		2015-16
	Badbahal			Khajurijharen	5.00		2015-16
	Badbahal			Khajurijharen	33.39		2015-16
Redhakhol Badbahal TOF Series (RTOF)	Redhakhol	2027-28	RTOF-VII	Laiza K.F	40.00	164.30	2015-16
	Redhakhol			Chhatrapur K.F	30.00		2015-16
	Redhakhol			Kalindra K.F	6.50		2015-16
	Badbahal			Chhandpur KF	50.0		2016-17
	Redhakhol			Paikmal K.F	30.00		2016-17
	Redhakhol			Dalkhaman K.F	7.80		2016-17



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Redhakhol Badbahal TOF Series (RTOF)	Redhakhol	2028-29	RTOF- VIII	Dalki VSS	20.00	180.0	2016-17
	Redhakhol			Charbati VSS	40.00		2016-17
	Redhakhol			Paikmal KF	30.00		2016-17
	Badbahal			Gadakhhol KF	50.00		2016-17
	Redhakhol			Daincha K.F	40.00		2017-18
	Redhakhol	2029-30	RTOF-IX	Daincha KF	40.00	90.0	2017-18
	Badbahal			Pankimal KF	50.00		2017-18
	Badbahal	2030-31	RTOF- X	Gadakhhol KF	50.00	105.0	2017-18
	Badbahal			Samsingha KF	25.00		2018-19
	Badbahal			Dimirimunda KF	25.00		2018-19
	Redhakhol			Sadhumunda VSS	5.00		2019-20
	Total				1452.69	1452.69	



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2. Badbahal- Charmal TOF Series

Table No 22.9 Sections of Badbahal- Charmal TOF Series (BTOF)

Name of Series	Range	Year of Operation	Section No	Plantation assigned	Area in Ha	Section Total Area	Year of Plantation
Badbahal- Charmal TOF Series (BTOF)	Charmal	2021-22	BTOF-I	Chudapudug	50.00	100.00	2010-11
	Charmal			Dimirikuda	50.00		2010-11
	Badmal	2022-23	BTOF-II	Badmal	60.00	80.00	2010-11
	Badmal			Suliadadar	20.00		2011-12
	Badmal	2023-24	BTOF-III	Lamtidadar KF	35.00	85.00	2012-13
	Charmal			Sarapal KF	50.00		2014-15
	Badmal	2024-25	BTOF-IV	Rengali-Badmal KF	50.00	90.00	2014-15
	Badmal			Kasanda VF	20.00		2014-15
	Badmal			Pipilikani KF	20.00		2014-15
Badbahal- Charmal TOF Series (BTOF)	Badmal	2025-26	BTOF-V	Kasanda KF	10.00	100.0	2014-15
	Badmal			Sunamudi KF	10.00		2014-15
	Badmal			Balbaspur KF	10.00		2014-15
	Badmal			Ladlada KF	10.00		2014-15
	Badmal			R-Badmal Govindpur	20.00		2015-16
	Badmal			Budhikhamar KF	20.00		2015-16
	Badmal			Kusurda KF	20.00		2015-16
	Badmal						
Badbahal- Charmal TOF Series (BTOF)	Badmal	2026-27	BTOF-VI	Tudabahal KF	30.00	90.00	2015-16
	Badmal			Sunamudi KF	30.00		2015-16
	Badmal			Mochibahl KF	30.00		2015-16
	Badmal	2027-28	BTOF-VII	Badpati	15.00	85.00	2015-16
	Badmal			Kaudiapali	40.00		2015-16
	Charmal			San-Hindol KF	30.00		2016-17
	Charmal	2028-29	BTOF-VIII	Bandhantaila KF	40.00	115.00	2016-17
	Badmal			Chhelibahal KF	20.00		2016-17
	Badmal			Balbaspur KF	30.00		2016-17
	Charmal			Berhampura KF	25.00		2017-18
	Charmal	2029-30	BTOF-IX	Bansajal KF	25.00	115.00	2017-18
	Badmal			Mochibahal KF	50.00		2017-18
	Badmal			Telighana KF	40.00		2017-18
	Badmal			Patupali KF	40.00	90.00	2018-19
	Charmal			Rasibeda KF	25.00		2018-19
	Badmal			Telighana VSS	25.00		2019-20
		Total Series			950.00	950.00	



3. Naktideul TOF Series (NTOF)

Table No 22.10 Sections of Naktideul TOF Series (NTOF)

Name of Series	Range	Year of Operation	Section No	Plantation assigned	Area in Ha	Section Total Area	Year of Plantation
Naktideul TOF Series (NTOF)	Naktideul	2021-22	NTOF-I	Gadadharpur	65.00	115.0	2010-11
	Naktideul			Lusura	50.00		2010-11
	Naktideul	2022-23	NTOF-II	Arkhakud	55.00	95.00	2010-11
	Naktideul			Kunjamura	40.00		2011-12
	Naktideul	2023-24	NTOF-III	Ghosramal PF	25.00	110.00	2012-13
	Naktideul			Jharbeda	40.00		2012-13
	Naktideul			Hitasara	10.00		2012-13
	Naktideul			Bhetiaberni	10.00		2014-15
	Naktideul			Gadakhol	25.00		2014-15
	Naktideul	2024-25	NTOF-IV	Sahebi VF	100.00	100.0	2014-15
Naktideul TOF Series (NTOF)	Naktideul	2025-26	NTOF-V	Liburi VF	70.00	120.0	2014-15
	Naktideul			Kadobahali VF	50.00		2014-15
	Naktideul	2026-27	NTOF-VI	Govindpur KF	85.00	85.0	2014-15
	Naktideul	2027-28	NTOF-VII	Nevrapal KF	10.00	70.00	2014-15
	Naktideul			Koing KF	10.00		2014-15
	Naktideul			Bhalugadia KF	10.00		2014-15
	Naktideul			Tileimal KF	30.00		2015-16
	Naktideul			Penthabahal KF	10.00		2015-16
	Naktideul	2028-29	NTOF-VIII	Ghosramal KF	35.00	95.00	2015-16
	Naktideul			Hitasara KF	20.00		2015-16
	Naktideul			Dhatukimal KF	40.00		2015-16
Naktideul TOF Series (NTOF)	Naktideul	2029-30	NTOF-IX	Lusura KF	100.00	100.0	2016-17
	Naktideul	2030-31	NTOF-X	Sahebi KF	50.00	135.0	2017-18
	Naktideul			Bindpur	50.00		2017-18
				Lampafuli KF	35.00		2018-19
	Total				1025.0	1025.0	



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4. GCPur TOF Series(GTOF)

Table No 22.11 Sections of GCPur TOF Series (GTOF)

Name of Series	Range	Year of Operation	Section No	Plantation assigned	Area in Ha	Section Total Area	Year of Plantation
GCPur TOF Series (NTOF)	GCPur	2021-22	GTOF-I	Gaudpali K.F	50.0	100.0	2010-11
	GCPur			Dhalpur	50.0		2010-11
	GCPur	2022-23	GTOF-II	Dimirikuda KF	50.0	100.0	2010-11
	GCPur			Dhalpur KF	50.0		2010-11
	GCPur	2023-24	GTOF-III	Balikiari KF	50.0	60.00	2014-15
	GCPur			Badbahal KF	10.0		2014-15
	GCPur	2024-25	GTOF-IV	Balikiary KF	50.0	80.00	2014-15
	GCPur			Badbahal KF	10.0		2014-15
	GCPur			Jatesingha KF	10.0		2014-15
	GCPur			Fulkusum KF	10.0		2014-15
	GCPur	2025-26	GTOF-V	Tileimal KF	30.0	100.00	2015-16
	GCPur			Podamal KF	20.0		2015-16
	GCPur			Kaunsipal KF	50.0		2016-17
	GCPur	2026-27	GTOF-VI	Kausipal KF	50.0	70.00	2016-17
	GCPur			Pithaguda KF	20.0		2016-17
	GCPur	2027-28	GTOF-VII	Pithauguda KF	20.0	70.00	2016-17
	GCPur			ChardaposhiKF	25.0		2017-18
	GCPur			Jaresingha KF	25.0		2017-18
	GCPur	2028-29	GTOF-VIII	Jaresingha KF	25.0	50.00	2017-18
	GCPur			Saradhapur KF	25.0		2017-18
	GCPur	2029-30	GTOF-IX	Jaresingha KF	20.0	50.00	2018-19
	GCPur			Tikilipada KF	30.0		2018-19
	GCPur	2030-31	GTOF-X	Jaresingha KF	20.0	50.00	2018-19
	GCPur			Tikilipada KF	30.0		2018-19
		Total			730.0	730.0	



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5. Rairakhol Avenue Series

Table No 22.12 Sections of Rairakhol Avenue Series (RAS)

Name of Series	Year of Operation	Section No	Plantation assigned	RKM	Section Total RKM	Year of Plantation
Rairakhol Avenue Series	2021-22	RAS-I	Charbati-Angarpada	5.88	35.00	2012-13
			Laiza-Gugua	2.12		
			Giripur-Kisinda	7.0		2013-14
			Kisinda to Panimura	16.7		
			Kisinda to Dhalpur	3.30		
	2022-23	RAS-II	Tandabira to Champalinala	20.0	46.00	2014-15
			Hemamura to Jhinkidadar	6.0		
			Daincha to Hinteri	4.0		
			Chudapud to Bhatrapur	16.0		
Rairakhol Avenue Series	2023-24	RAS-III	Saradhapur to Badtaila	8.0	42.0	2014-15
			Dhalpur to Machhadihi	6.0		
			Jamjori to Bindpur	4.0		
			Batgoan to Keotberni	8.0		
			Sahebi to Rengali	5.0		
			Jamujori to Bagbar	4.0		
			Hatibahal to Kankandpada	7.0		
Rairakhol Avenue Series	2024-25	RAS-IV	Tribanpur to Rahan	7.0	39.0	2014-15
			Khandahatachhato	6.0		
			Khandahata	5.0		
			Rengali to Sonapur border	5.0		
			Saiberni to Satsama	5.0		
			Kusunda to Sagjori	11.0		
	2025-26	RAS-V	Rengali Badmal-Gobindpur	20.0	46.0	2015-16
			Naktideul-Sahebi	14.0		2016-17
			Madhupur-Bhatra	3.0		
			Kankanpada-Kukudabahali	3.0		
			Muturumunda-Daincha	6.0		
Rairakhol Avenue Series	2026-27	RAS-VI	Daincha-Laiza	6.0	44.0	2016-17
			Badhindol-Gambhariberni	6.0		
			Dhunkchhali-Brahamani	6.0		
			Gugua –Giripur	10.0		
			NH Road-Rasibeda	4.0		
			NH Road-Nuapada	4.0		
			Badmal-Bantalo	8.0		



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Rairakhol Avenue Series	2027-28	RAS-VII	Jamjori-Angabira	10.0	40.0	2016-17
			Kello RD road-Ranja	4.0		
			RD road to Kasibahal	6.0		
			RD road to Hatibahal	4.0		
			Tribanpur RD road to Sarapal	6.0		
			Kusurda to Gopalpur	10.0		
Rairakhol Avenue Series	2028-29	RAS-VIII	Sahebi-Jamjori	16.0	44.00	2017-18
			Charbati-Betgarh	6.0		
			Charmal-Beribasahi	4.0		
			Tribanpur-Sarapal	4.0		
			Buromal-Balikiary	10.0		
			Bandhupali-Saradhapur	4.0		
Rairakhol Avenue Series	2029-30	RAS-IX	Buromal-Kholgarh village	4.0	42.0	2017-18
			Keutberni-Basaloi	6.0		
			Ranchi -Vijaybada NH to Dimirimunda village	4.0		
			Rengali to Chakamunda	3.0		
			Amjhari to Tribanpur	4.0		2018-19
			Sanhindol to Musakata	7.0		
			Rengali to Chakamunda	3.0		
			Kasanda to Sunamudi	3.0		
			Lusura to Ghosramal	4.0		
			Kholgarh to Mangalpur	4.0		
Rairakhol Avenue Series	2030-31	RAS-X	Balikiary to Fulkusum	12.0	36.0	2018-19
			Kalindar to Badmal	4.0		
			Balikiary to Talab	7.0		2019-20
			Podabalanda to Barbank	3.0		
			Kasibahal to Karadapal	3.0		
			Tribanpur to Amjhari	4.0		
			Kadalipali to Sangrampur	3.0		
			Series Total	414.0	414.00	

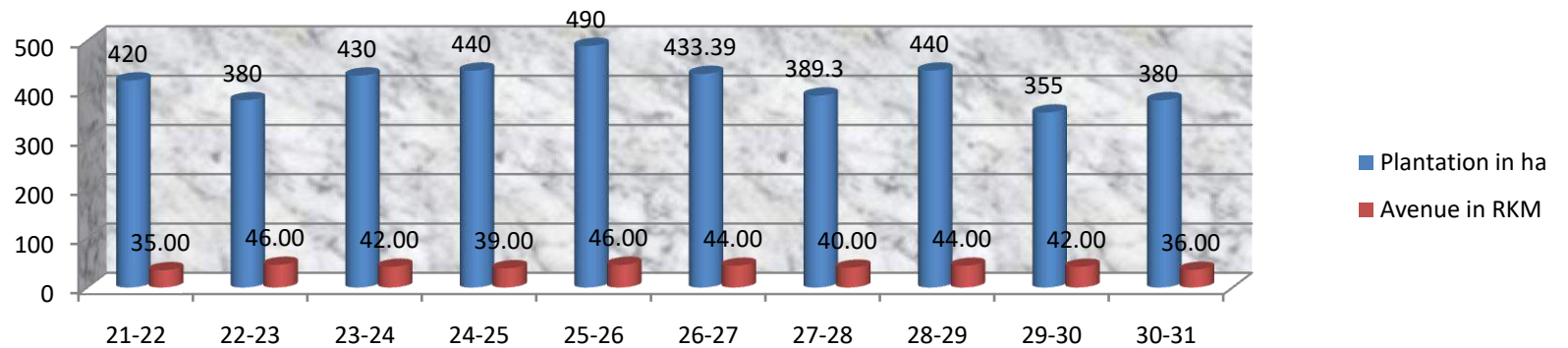


Revised working plan of Rairakhol Division (2021-22 to 2030-31)

6. Abstract of TOF Series:

Table No 22.13 Abstract of Treatment Sections – TOF Working Circle

Series name	Year										Total
	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	
Rairakhol Badmal TOF	105.00	105.00	175.00	170.00	170.00	188.39	164.30	180.00	90.00	105.00	1452.69
Badmal- Charmal TOF	100.00	80.00	85.00	90.00	100.00	90.00	85.00	115.00	115.00	90.00	950.00
Naktideul TOF	115.00	95.00	110.00	100.00	120.00	85.00	70.00	95.00	100.00	135.00	1025.00
GCPur TOF	100.00	100.00	60.00	80.00	100.00	70.00	70.00	50.00	50.00	50.00	730.00
S Total	420.00	380.00	430.00	440.00	490.00	433.39	389.30	440.00	355.00	380.00	4157.69
Rairakhol Avenue	35.00	46.00	42.00	39.00	46.00	44.00	40.00	44.00	42.00	36.00	414.00





22.5.7 Blocks, compartments and JFM area:

The area assigned to this TOF Working Circle involves two component i.e. Mixed plantation, and Avenue plantations. The area has not assigned to any VSS, the plantations have been raised on consultation with villagers.

22.6 Special objectives of Management:

The objectives of management are varied and depending upon category of plantations the special objectives TOF management & specific objectives are furnished as follows.

a) General Objectives:

- i. To increase tree cover of the district / division through planting outside the forest land.
- ii. To increase bio mass production by planting quick growing species.
- iii. To stabilize the loose soil through planting & protect catchment area of Mahanadi River / Tikira River.
- iv. To improve the aesthetic value along the road net work.
- v. To enhance the Economic Condition of People.
- vi. To increase availability of Bamboo for artisans.

b) Of Avenue Plantations:

- To improve the aesthetic value of the landscape,
- To ameliorate the climate,
- To provide shade to passer-by,
- To provide habitat to birds / reptiles/ rodents.
- To add tree cover.

c) Of Farm Forestry:

- To encourage public to have their own backyard plantation to meet their household requirement on firewood, fodder.
- To bring private land under tree planting.
- To supplement raw material availability for industries/ furniture woods.
- To make public less dependent on forests.

22.6.1 Analysis of the crop:

The assigned plantations are of following characters.



a) Mixed Plantations:

The crop planted within 2015-16 are considered as successful plantations & established with a survival rate of 75%. The average growth is of 5m height with GBH 10-30cm. The first growing species are contributing to Top Canopy. About 10-15% of planted species are considered as suppressed. Natural growth of Sal and its associates like Asan, Kendu, Bahada, Harida, Amla, karada and grasses in open spaces. Plantations taken up in between 2016-17 to 2020-21 are in sapling stage.

b) Avenue Plantations:

The avenue plantations raised along the road side are mostly surviving (80%). Due to adequate protection by Tree Guard the average height has reached above 3-4m in general. Neem, Karanja, Sisoo, kadamba, are showing prominent growth. Jamun, Mango, Jack Fruit are of middle order growth less than 3m. Flowering species survival is in between 50-60%.

c) Farm Forestry:

The farm forestry adopted by Forest Department involves distribution of species other than Eucalyptus. It has enriched the back yard tree cover. It is a form of involvement for tree growing concept.

22.6.2 Silvicultural system:

Silvicultural System to be adopted is *“Improvement of Stand by Silvicultural tending”*. Under this system all plantations will be treated for improving the quality of stands i.e. both height & Girth to bring the stand to more useful stage. Activities will be Thinning of appropriate Grade along with Soil & Moisture Conservation.

22.6.3 Rotation period:

The area assigned to this working Circle bears Teak and other timber Species. For Teak a rotation period of 100 years has been fixed. For other species found in TOF areas the rotation period fixed under Para 16.6.3 will be applicable. The same is reproduced at Table no 22.14 below



Table No 22.14 Rotation Period for various species in Plantation

Sl No	Species	Rotation Period in Year	Remark
1	Teak	100	In case of Plantations where Clear felling with Standard to be followed. Rotation period is applicable for Standards only.
2	Sisoo, Gambhari & other Timber species	100	
3	Eucalyptus, Other Soft wood, Acacia, Cassia etc	25	
4	Fruit bearing	As long as fruiting continues	

22.6.4 Harvestable diameters:

There is no prescription for final harvest of any plantation. Harvestable diameter prescribed under para 16.4 of this plan will be applicable for all other purpose if so required. The same is produced below for reference.

Table No 22.15 Harvestable Girth / Diameter of other planted species.

1	<i>Acacia auriculiformis</i> (Sunajhari)	90	29	
2	<i>Anacardium occidentale</i> (Cashew)			As long as Fruiting continues.
3	<i>Anogeissus acuminata</i> (Phashi)	180	57	
4	<i>Anthocephalus cadamba</i> (Kadamba)	150	48	
5	<i>Azadirachta indica</i> (Neem)	180	57	
6	<i>Bomax ceiba</i> (Simili)	150	48	
7	<i>Erythrina variegata</i> (Paladhua)	150	48	
8	<i>Gmelina arborea</i> (gambhari)	150	48	
9	<i>Melia azedarach</i> (Mahaneema)	120	38	
10	Fruit bearing species			As long as Fruiting continues.
11	Teak, Sisoo, Ghambhari	120	38	



22.6.5 Reducing factors and reduced areas:

There is no yield expected from this working circle except interim harvest in shape of **“Thinning materials”**. No reduction factor / reduced area has been prescribed in this working circle.

22.6.6 Treatment Cycle:

The plan period is ten years. Hence a treatment Cycle of ten year is adopted for this working Circle.

26.6.7 Division into Sections.

Each plantation / block has been assigned to one Series and each series has been divided in to ten sections as described under Para- 22.5.

22.6.8 Calculation of the yield:

No final harvest is prescribed for any plantations included in this working circle. From plantations no utilizable produce is expected.

22.6.9 Table of Treatment.

Each series constituted under Para 22.5 are sub divided to ten sections. Each section will be worked in the assigned year. The sections are given under Para 22.5.1. The abstract is produce at Table No 22.16 for ready reference.

Table No 22.16 Abstract of Treatment Sections – TOF Working Circle

Series name	Year										Total
	21-22	22-23	23-24	24-25	25-26	26-27	27-28	28-29	29-30	30-31	
Rairakhol Badmal TOF	105.00	105.00	175.00	170.00	170.00	188.39	164.30	180.00	90.00	105.00	1452.69
Badmal-Charimal TOF	100.00	80.00	85.00	90.00	100.00	90.00	85.00	115.00	115.00	90.00	950.00
Naktideul TOF	115.00	95.00	110.00	100.00	120.00	85.00	70.00	95.00	100.00	135.00	1025.00
GCPur TOF	100.00	100.00	60.00	80.00	100.00	70.00	70.00	50.00	50.00	50.00	730.00
S Total (in Ha)	420.00	380.00	430.00	440.00	490.00	433.39	389.30	440.00	355.00	380.00	4157.69
Rairakhol Avenue (in RKM)	35.00	46.00	42.00	39.00	46.00	44.00	40.00	44.00	42.00	36.00	414.00



22.6.10 Method of executing the Treatment:

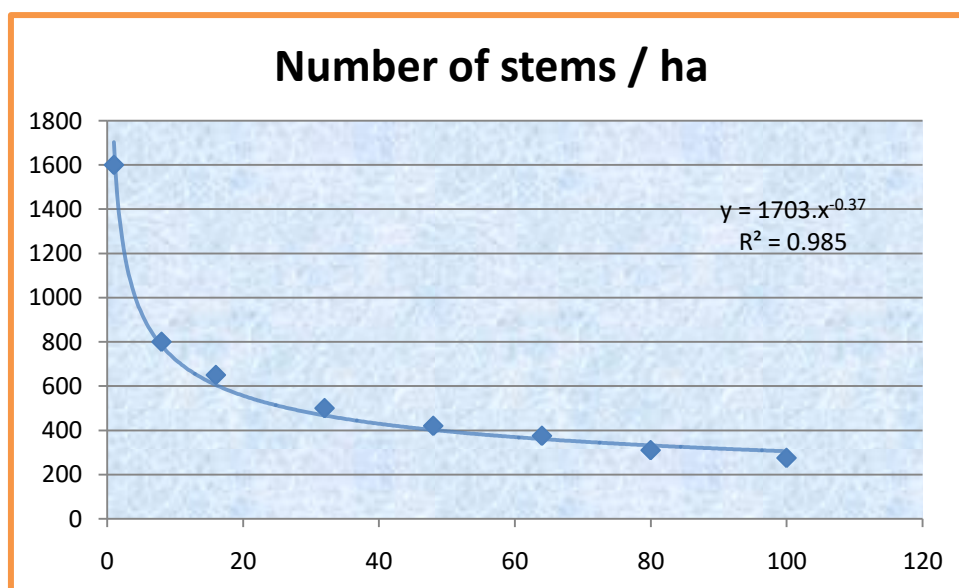
22.6.10.1 For All Plantation (TOFT) Series:

The following treatment is prescribed for plantations included under Teak Plantation (TOFT) Series.

- The plantation area assigned to a particular year is to be re demarcated as per map available in Plantation Journal.
- Basing on Latitude / Longitude of cardinal points the map to be shown on Topo map (1:50000 Scale) and a copy in Plantation Journal.
- The growth Status like Average Height, Girth at Breast Height (GBH), Survival Percentage i.e. number of stems per hectare available may be recoded.
- The number of Stems per ha (Standard as per Age of the Plantation) is to be ascertained from this graph below or equation.

Table No 22.17 Stand Table for Teak – Rairakhol Division

Age	Number of Planted trees	Age	Number of Planted trees	Remark
01	1600	48	420	Rotation age = 100 year
08	800	64	375	
16	650	80	310	
32	500	100	275	





$$y = 1703x^{-0.37}$$

Where y is the no of stem per ha and x is the age of plantation.

- C to D grade thinning is always recommended. In case the plantation is very congested then elite thinning may be preferred over other thinning. Various thinning and principle is furnished for general guidance.

22.6.10.2.1 Tinning Practices

The objectives of taking of thinning are

- i. To improve the hygienic condition.
- ii. To create best conditions of growth & obtain diameter growth of remaining trees.
- iii. Salvage the anticipated losses of the merchantable volume.
- iv. To obtain a desirable composition of crops.
- v. Retaining seed bearers.
- vi. Improvement in wood quality.
- vii. To obtain intermediate yield and increase net yield and financial out-turn.
- viii. Decomposition of raw hummus.
- ix. To reduce the risk of diseases and pests.

After thinning, the **results** expected are

- Reduced competition in root and crown,
- Reduced weed growth,
- Improved quality of wood,
- Regulation of rate of growth,
- Increase seed production,
- Reduction in the net cost of growing,
- Reducing the risk of fire and diseases,
- Encouraging the advanced growth,
- Fulfilling the market demands.

For undertaking thinning the following aspects are to be kept in mind.



- i) Before planning the nature and intensity of thinning preference between the intensity of thinning and quality of thinning should be decided.
- ii) The trees remaining after the thinning should be able to compensate for the loss in increment by trees removed in thinning.
- iii) There will be an optimum stocking for a given site and species.
- iv) For this individual trees are classified by height and size of crown and thinning is decided on the basis of which classes of trees are fit to be removed for maintaining the desired qualitative and quantitative nature of the thinning.
- v) The main purpose of the thinning is to release more space for future development of trees; the freedom of crown is the guiding factor for thinning purpose.
- vi) The retention of trees per unit should be decided first and then the number of trees to be removed should be marked accordingly.
- vii) The development of crown and stem are the deciding factor for sub-classification of the dominance classes of trees for the given site and species.
- viii) Tree classification in regular forests are done as under

22.6.10.2.2 Tree Classification based on height:

I) Dominant trees (D or D1)

It includes the trees that form the uppermost leaf canopy. They are the tallest trees that determine the top level of canopy they are also called pre-dominant trees.

II) Co-dominant trees (CD or D2)

These are shorter than dominant. About $5/6^{\text{th}}$ of the height of the dominant.

III) Sub-dominant trees (SD or D3)

They do not form part of the uppermost leaf canopy. Their height is about $3/4^{\text{th}}$ that of the tallest trees. They are also called dominated trees.

IV) Suppressed trees (S)

The height of the suppressed trees is about $1/2$ to $5/8^{\text{th}}$ of the height of the best trees. Suppressed trees grown below the crowns of the other trees in the stand. The leading shoots are over-topped by their neighboring trees or at least shaded on all sides by them.



V) Wolf trees (W)

The wolf trees are large, coarse and misshapen trees.

VI) Whips (Wh)

This class comprises bent over and badly leaning trees. Whips have tall, thin stems which are unstable and may cause damage to other trees when they sway.

VII) Dead, dying and moribund trees (m)

This category consists of trees that are dead or at the point of death.

VIII) Disease trees (k)

It includes trees that are infected with parasites and their growth is seriously affected due to infection.

IX) Reproduction or Regeneration (r)

It consists of recruits or regeneration.

X) Over mature or veterans.

22.6.10.2.3 Classification on the Basis of Crown

The crown spread may be taken as better indication than canopy position to understand growth potentialities of a tree. For this tree may be classification on the basis of the crown with average stem spacing as shown below:-

a) Spaced

Trees with free crown spreading having less than or equal to $3/4^{\text{th}}$ that of spacing.

b) Co-spaced

Trees with a free crown spread having $3/4^{\text{th}}$ to $1/2$ (50-75%) that of the available spacing.

c) Sub-spaced

Trees with the spread of free crown less than half but more than one-fourth $1/4^{\text{th}}$ of the spaced.



d) Mal-spaced

Trees with a very small spread of trees crown which is less than a quarter of the spaced.

e) De-spaced

Trees will no free crown with little vigor.

f) Dead, dying and low yielding trees

In the present situation, it is recommended to follow an ordinary thinning as described below.

This is known as “THINNING FROM THE BLOW” and consists of the removal of inferior individuals starting from the suppressed class, then taking the dominated class and ultimately some of the dominant class.

It is a very common form of selective thinning in regular crops. It has been devised to be in line with nature because only those trees which have been unsuccessful in the struggle for growth are removed first.

22.6.10.2.4 Grade of Ordinary Thinning

The thinning grades are defined by the spacing class removed so that a check may be made by comparing yield table numbers for the mean diameter in question. There are various grades of thinning e.g. A, B, C, D, E, grades.

i) A-Grade

Light thinning- removal of dead, dying, diseased and suppressed trees.

ii) B-Grade:

Moderate thinning - In addition to trees in A-grade further removal of defective dominated stems and whips. Advance growth which cannot be pruned or lopped may also be removed.

iii) C- Grade (Heavy thinning):

This includes trees in grade A and B and all remaining dominated defective, co-dominants that may be removed without making lasting gaps in canopy. The C grade thinning is the standard grade in vogue for yield table compilation.



iv) D-Grade (Very Heavy Thinning):

This includes trees of all above grades and some good dominants so that no lasting or permanent gap develops in canopy. The left over trees are with good boles and crowns, well spaced and evenly distributed over the site for future development.

v) E-Grade (Extremely Heavy Thinning):

This type of thinning is adopted mainly for research purposes. This is the heaviest thinning that can be made in the crop without creating permanent gaps in the canopy. Many dominant stems are also removed.

It is always better to make C-grade or D-grade thinning in a dense crop in which thinning has been unduly delayed. The removal of trees should be Economic or Hygienic value. In addition to above classes the intermediate grades of thinning such as C/D may be carried out.

22.6.10.2.5 Precautions in First Thinning

The first thinning is very important for any crop. The following factors should be considered at the time of first thinning.

- The thinning should take place before adjoining trees check one another's growth.
- The thinning should not be postponed on the ground that the poles obtained will be non-saleable or uneconomic.
- The age of first thinning should be taken on the basis of height or size attained.
- The heavy thinning should not be carried on poorer sites, drier areas and steeper slopes, because the gaps may not fill up due to poor growth of trees.
- All thinning should be done on the silvicultural lines.
- The light demander species may require heavier thinning as compared to the shade bearer species.
- It is best to carry out silvicultural thinning. Some admixture of secondary species may be retained where this is desired on silvicultural or protection grounds.

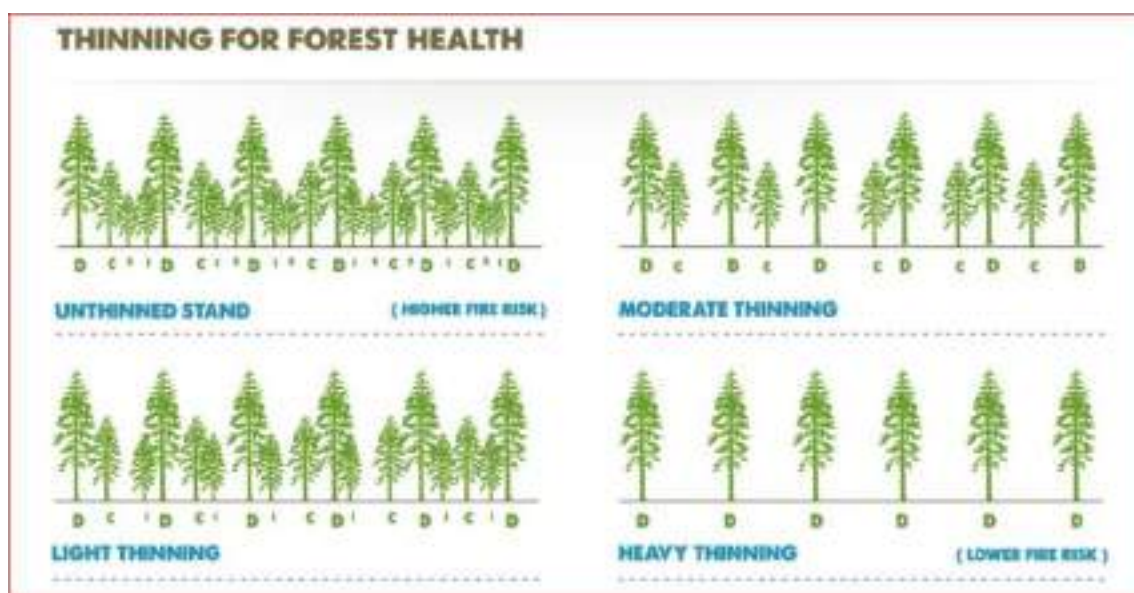
22.6.10.2.6 Thinning In Irregular Crops:

It is difficult to classify tree in an irregular crop. The general classifications which are used for the research purposes are THREE crown positions. It is suggested that in regular crops the degree of crown freedom and their further classification into large, medium and small crown sizes, should be taken in account



Crown Freedom	Free	Restricted	Confine
Crown development or crown size	Well developed or large	Average or medium	Poor or small

- The crown freedom is judged irrespective of the size of the tree and its position in the stratification.
- The thinning is an irregular crop is done by selection method.
- The trees to be cut are that which restrict the growth of their neighbours on all sides and should into more valuable than their neighbours.
- The aim should be to maintain a crop of all diameter classes in a sufficient number of maximum sustained yield.
- The valuable species are retained whereas inferior trees of all diameter classes are removed.
- The removal of trees is carried out in diameter classes.
- It aims at continuous improvement by repeated removal of inferior stems in all diameter classes so that basal area or standing volume becomes more or less equal to theoretical ideal value.





22.6.10.2.7 Factors Affecting Thinning Practice:

The following factors may be considered before the thinning practice:

1. Site Factors
2. Nature of species
3. Age

1. Site Factors

The site quality influence on thinning practice is that a relatively close canopy on the poorer sites should be maintained. On low quality sites heavy openings should not be made. The spacing out widely in earlier stages should not be carried out on hot, dry, slopes, on poor soils and on all sites where grass and other weed invasion is likely to occur. A poor site will usually support less stems per hectare than a good one.

2. Nature of Species

The shade-bearers are more tolerant of crown than the light demanders therefore more frequent thinning is needed for light demander species. Light demanders usually show good response to ordinary thinning where as shade-bearers to crown thinning. Sal, Sisoo, Asan, Teak, being light demanders require heavier grades of ordinary thinning.

3. Age

The crown formation depends on age and in young ages when the crown formation is not completed mechanical thinning or sticks thinning may be done with succession. The light demander species require heavier grade of thinning at frequent intervals in younger crops. On the other hand some species in middle age or maturity require crown thinning.

- After thinning, intensive Soil & Moisture Conservation practices are to be adopted so as to increase moisture regime of the plantation to induce growth.
- Protection against Grazing and fire is to be taken up with rigidity.

22.6.10.3 Avenue Plantation (JAS) Series:

Lot of Avenue plantations have been raised in the past plan period. After planting operation, no specific management practices have been set up. It is warranted to have a set of guiding principle for avenue plantation (TOF).



The avenue plantations included in this treatment series are at young stage. Considering the present condition, the following prescriptions are recommended.

- The avenue plantation site is to be visited and existing plants are to be recorded in the following form

Name of the Treatment Section	Name of the Road & Distance / Chainage in Km	Name of Species	Height in Meter	BGH in cm	Present Condition.	Remark / Suggestion.

- If any plant / tree is badly damaged and above 30cm GBH it is recommended to remove the plant and a new plant with promising growth is to be planted.
- Any old / hollow diseased tree likely to be fallen down in moderate wind is to be marked and enlisted. Such trees are to be jointly visited by Range Officer and any representative of PWD / NH Authority and record their suggestion on removal or retention. In case of suggestion for removal DFO is to intimate the district authority and take steps for its removal followed by planting in the assigned year.
- All retained plants above 30cm GBH are to be checked for hanging branches if found to be removed.
- The PWD / NH authority may be requested to put Radiant paints on trees at Breast Height for visibility during night.
- Similar exercise is recommended for other avenue plantations not included in this series.

22.6.10.4.1 Species suggested for Road Side Plantation.

Considering the soil characteristics, proximity to tourist spots, prone to cyclonic effect the following species are recommended for avenue plantations. It is also suggested for planting one species on both the sides over a length of 2 km to add to the beauty / aesthetic value of the road. Species suggested are

- Lagerstomia flusregin* (Patuli),
- Cassia fistula* (Sunari),
- Dalbergia sisoo* (Sisoo),
- Syzigium cumini* (Jamu)
- Mangifera indica* (Aam)



- f) *Samania saman* (Bada Chakunda)
- g) *Peltoferm pheroginium* (Radha Chuda)
- h) *Pathodia campanulata* (Mysore Queen)
- i) *Mimosps elongi* (Baula)
- j) *Azadirecta indica* (Meem)
- k) *Alstonia scholaris* (Chatiana)
- l) *Pongamia pinnata* (Karanja)

Planting of one year old promising seedlings in a block mixture than intimate mixture form is recommended.

22.6.11 Modalities for Farm Forestry:

Free seedlings are distributed for planting on private lands / back yard etc. It remained without follow of action. It is suggested to take up following action to evaluate the result.

- After distribution is completed by end of August, the distribution registers are to be examined to find out person those have taken more than 150 seedlings for planting.
- 10% of such cases, the person are to be located and his planting place is to be inspected by forester and technical suggestion for soil working, application of fertilizer and required suggestion is to be tendered.
- Its survival at end of December of same year is to be recorded.
- Some photographs are to be taken and album for every year is to be prepared and kept as record and for future reference.
- The economic benefits that flow to farmer are also required to be assessed for guidance.

22.6.12 Associated Regulations and Measures:

In the District / Division not much waste land is available. Every year atleast 100 ha of plantation outside the forest land (RF/ PRF/ PF and VF) is recommended for plantations. All out efforts is required to be made to plant outside the forest area to increase the forest cover of the district. Revenue Forests having good crop area may be brought to management fold after consolidation process.



22.6.12.1 Plantations / Natural Forests TOF

Besides plantations included in this working circle, there are plantations raised before the outgoing plan. Both Teak, Miscellaneous plantations have been raised. The prescriptions of this chapter may be extended to similar conditions / plantations.

22.6.12.2 Farm Forestry:

Farm Forestry by individuals for growing soft wood is to be encouraged. It will not only help in establishing tree cover but also assured supply of Raw materials to paper industries.





CHAPTER-23

REDUCE EMISSIONS FROM DEFORESTATION AND FOREST DEGRADATION (REDD+)

23.1. Introduction:

REDD+ stands for countries' efforts to "Reduce Emissions from Deforestation and forest Degradation", and foster conservation, sustainable management of forests, and enhancement of forest carbon stocks. Deforestation and forest degradation are the second leading cause of global warming, responsible for about 15% of global greenhouse gas emissions, which makes the loss and depletion of forests a major issue for climate change. In some countries, such as Brazil and Indonesia, deforestation and forest degradation together are by far the main source of national greenhouse gas emissions.

Eighty percent of the Earth's above-ground terrestrial carbon and forty percent of below-ground terrestrial carbon is in forests. In addition to the large contribution of deforestation and forest degradation to global emissions, combating both has been identified as one of the most cost-effective ways to lower emissions.

Deforestation and forest degradation are responsible for about 15% of global greenhouse gas emissions.

Currently, there appears to be a consensus that the issue of deforestation and forest degradation must be effectively tackled as it would otherwise limit the options available to reduce greenhouse gas emissions, greenhouse gas concentrations and increases in temperature to acceptable levels. Any reduction in the rate of deforestation and forest degradation has the benefit of avoiding a significant source of carbon emissions and reducing other environmental and social problems associated with deforestation.

Unlike afforestation and reforestation activities, which generally cause small annual changes in carbon stocks over long periods of time, stemming deforestation causes large changes in carbon stocks over a short period of time. Most emissions from deforestation take place rapidly, whereas carbon removal from the atmosphere through afforestation and reforestation activities is a slow process.



In addition to mitigating climate change, stopping deforestation and forest degradation and supporting sustainable forest management conserves water resources and prevents flooding, reduces run-off, controls soil erosion, reduces river siltation, protects fisheries and investments in hydropower facilities, preserves biodiversity and preserves cultures and traditions. With all that at stake it is clear what has to happen. With all the services that forests provide both to humanity and the natural world, there is now widespread understanding of a simple yet profound fact that forests are more important left standing, than cut. Out of that understanding, the Forest Carbon Partnership Facility has come up.

Country commitments to mitigate and adapt to climate change are an integral part of the 2030 Agenda for Sustainable Development with its 17 global goals that countries have adopted to guide development efforts. The REDD+ mechanism contributes directly to achieving Sustainable Development Goals (SDGs) 13 and 15. Those address climate change, reducing deforestation and sustainable use of ecosystems. REDD+ can also contribute to achieving other SDGs – including those which address poverty reduction, health and well-being, hunger alleviation, and improving institutions.

23.2 FAO's support to countries' Nationally Determined Contributions (NDCs):

With FAO's technical support, countries can use REDD+ actions as catalysts to deliver on their Nationally Determined Contributions (NDCs) towards climate change mitigation and adaptation. Agriculture, Forestry and Other Land Use (AFOLU) are among the climate actions that most countries have included their NDCs, which underscores the important role these sectors play in climate change mitigation and adaptation. Many NDCs have also made specific reference to REDD+ plans, offering an opportunity to mainstream REDD+ and climate efforts into countries' national planning processes and ultimately, actions on the ground.

23.3 REDD+ Implementation:

FAO's support to countries is based on technical expertise in assessing the drivers of deforestation and forest degradation and finding opportunities for forest carbon conservation, management and enhancement. FAO also helps countries design and implement REDD+ mitigation actions, which offer both carbon and non-carbon benefits, taking advantage of cross-sectoral expertise and building on existing experience. FAO works



to strengthen collaboration with other initiatives and helps to promote public-private partnerships to scale up investments on REDD+ implementation.

23.3.1 Country highlights:

Equatorial Guinea highlights the transformational role of women in climate action. Aiming to address gender inequalities and strengthen women's contributions to the planning of national climate action, Equatorial Guinea organized a national workshop with the participation of 53 women representing various sectors and social groups. The workshop complemented an ongoing participatory process to develop the country program for the Green Climate Fund (GCF), which defines the national priorities to contribute to the global fight against climate change, and ways to translate these priorities into projects to be submitted to the GCF.

The 21st session of the Conference of the Parties (COP21) of the United Nations Framework Convention on Climate Change (UNFCCC) was held in Paris in November and December 2015. All together 195 participating countries negotiated and adopted the Paris Agreement, which includes objectives to peak greenhouse gas emissions as soon as possible, to limit the global average temperature increase above pre-industrial levels to well below 2°C, and to pursue efforts to limit the increase to 1.5°C.

The Paris Agreement, which entered into force on 4 November 2016, requires Parties to put forward their best efforts through **“Nationally Determined Contributions”** (NDCs). These NDCs represent targets and actions for the post-2020 period. India ratified its' contribution the 2 of October 2016.

23.3.2 India's first NDC includes commitments:

Our country's commitment for **“Nationally Determined Contributions”** (NDCs) are

- To reduce the emissions intensity of its GDP by 33-35% from 2005 levels by 2030.
- To achieve about 40 percent cumulative electric power installed capacity from non-fossil fuel based energy resources by 2030 with the help of transfer of technology and low cost international finance including from Green Climate Fund (GCF).
- To create an additional carbon sink of 2.5 to 3 billion tonnes of CO₂ equivalent through additional forest and tree cover by 2030.



- To better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly agriculture, water resources, Himalayan region, coastal regions, health and disaster management.

India announces its INDC, pledges to cut emission intensity of its GDP by 33-35 per cent by 2030. All countries are required to submit voluntary climate action plans as contribution. These will form part of the outcome of Paris climate summit. India's INDC is fair, and its renewable energy and forestry targets are ambitious, says CSEAhead of the UN Conference of Parties on Climate Change, scheduled in December 2015 in Paris, India on Sunday submitted its Intended Nationally Determined Contribution (INDC) to the secretariat of the United Nations Framework Convention on Climate Change (UNFCCC). Delhi-based non-profit Centre for Science and Environment (CSE) has called the Indian INDC "fair" and its renewable and forestry targets "ambitious".

In its INDC, India has pledged to improve the emissions intensity of its GDP by 33 to 35 per cent by 2030 below 2005 levels. It has also pledged to increase the share of non-fossil fuels-based electricity to 40 per cent by 2030. It has agreed **to enhance its forest cover which will absorb 2.5 to 3 billion tons of carbon dioxide (CO₂, the main gas responsible for global warming) by 2030.**

India has accepted the huge impact that climate change is exerting and will exert on different sectors of its economy and has agreed to enhance investments to adapt in vulnerable sectors like agriculture, water resources, coastal regions, health and disaster management.

India has also reiterated its need for international finance and technology support to meet its climate goals. In this regard, it has said it would require at least US \$ 2.5 trillion (at 2014-15 prices) to meet its climate change actions between now and 2030.

India's forestry target is also very ambitious. It intends to create an additional carbon sink of 2.5 to 3 billion tonnes of CO₂ through additional forests by 2030.

Talking about the efforts already in the pipeline, the government highlights

- India's National Solar Mission,
- Green Energy Corridor projects,
- Swatchh Bharat,



- National Air Quality Index,
- Smart Cities,
- Paramparagat Krishi Vikas Yojana,
- Soil Health Card Scheme,
- Pradhan Mantri Krishi Sinchayee Yojana,
- National Mission for Clean Ganga etc among others.

23.3.3 Indicative Work plan to combat Climate Change:

- Government harps on sustainable lifestyle to fight climate change.
- Promising raising requisite funds and adopting new technology.
- More focus on agriculture, water resources, coastal regions, and health and disaster management.
- To tackle climate change by adopting healthy and sustainable lifestyle, which were “inherent in traditions and values of conservation & moderation.
- To reduce consumerism in our lifestyle & reduce to reduce per capita consumption by not wasting food and limiting the number of durables / cars per household.
- To have ambitious focus on energy efficiency and dramatic increase in renewable energy.
- To enhance dependency on non-fossil fuel-based energy.

23.3.4 Suggestive measures on Forestry Sector.

In forestry sector to combat climate change the following activities are suggested.

- a) To reduce felling of trees in all sphere and enhance creation of renewable energy.
- b) To reduce dependency on fossil fuel including that of firewood.
- c) To enhance use of solar energy / wind energy where ever possible.
- d) To motivate people to reduce consumerism & reduce generation of solid waste.
- e) Conserve water body and enhance efficient use of water.





CHAPTER-24

Water Resource Management & Climate Change

24.1 Introduction:

The forests are also sources of water (surface, sub-surface and ground water). Over exploitation of the ground water resources results in declining ground water levels; there is an urgent need to augment the ground water resources through suitable management interventions. It is desirable to have forest management practices dovetailed with the principles of watershed based development approach especially in the source areas of water.

The dynamic ground water resource of the district has been assessed quantitatively following the methodology recommended by Ground Water Estimation Committee. Sambalpur district has an annually replenish able ground water resource of 525.20 mcm. (52520 Ham). The existing gross Ground Water Draft for irrigation is 5611 Ham and existing gross ground water draft for domestic and industrial water supply is 2498 Ham. The net Ground Water availability for future irrigation & development is 43825 Ham. The stage of Ground Water development is 15.43%.

The Ground Water resource of Sambalpur district at a glance is as follows.

Table No. 24.1: Ground Water Resources of Sambalpur District

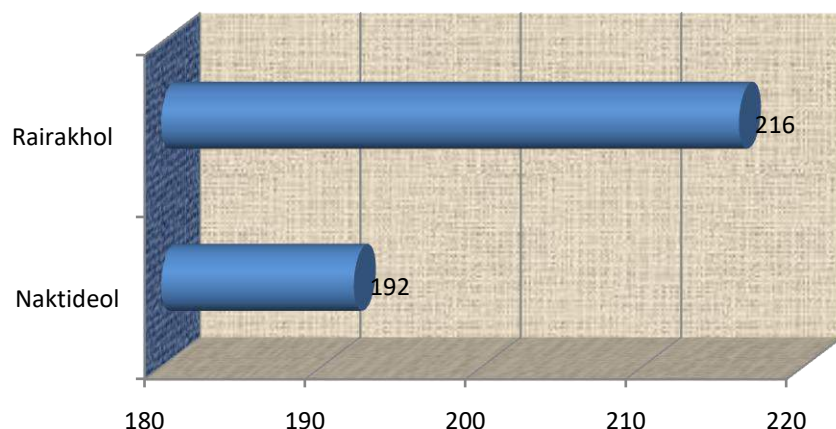
Sl No	Block	Utilizable GWR	Gross GW Draft (all uses)	Balance GWR	Requirements projected for 25 years	Available for Future use	Stages of GW development	Category
		In Ham	In Ham	In Ham	In Ham	In Ham	%	
1	Bamra	4475.00	791.00	212.64	1003.00	275.00	3409.00	22.41
2	Dhankauda	7454.00	392.00	774.66	1167.00	993.00	6069.00	15.66
3	Jamankira	4803.00	639.00	213.80	852.00	293.00	3871.00	17.74
4	Jujumura	7319.00	792.00	201.52	993.00	260.00	6267.00	13.57



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

5	Kuchinda	5068.00	787.00	210.07	997.00	288.00	3993.00	19.67
6	Maneswar	7048.00	590.00	217.21	807.00	299.00	6159.00	11.45
7	Naktideol	6080.00	631.00	146.84	778.00	192.00	5256.00	12.80
8	Rairakhol	6128.00	554.00	163.78	717.00	216.00	5358.00	11.70
9	Rengali	4145.00	435.00	357.72	792.00	267.00	3443.00	19.11
District Total		52520.00	5611.00	2498.00	8106.00	3083.00	43825.00	15.43

GW Available for Future use in HAM



24.1.1 Available Water body in Rairakhol:

The River Mahanadi flows on South and Tikira River on North. The nallas on the Sothern side drains to Mahanadi having a gentle slope towards South. The part of the division on northern side drains to River Tikira. The tract has a slope towards northern side. The drainage pattern is distinctly divided in to two half's i.e. towards River Mahanadi and towards Tikira / Brahmani.

There are seven MIP in the Division. These are as follows (Table No 24.2)



Table No 24.2 List of MIP in Rairakhol Division.

Sl. No.	Name of the Range	Name of the Section	Name of the Beat	Name of the G.P.	Name of Project
1	Badbahal	Kadaligarh	Ambajhari	Kadaligarh	Ambajhari Kata
2	Badbahal	Badbahal	Badbahal	Badbahal	Kerandi Jor
3	Badbahal	Badbahal	Podabalanda	NAC	Podabalanda Kata
4	Badbahal	Tribanpur	Godakhhol	Tribanpur	Telsingh Kata
5	Naktideul	Naktideul	Naktideul	Naktideul	Landimal RF Comp. No. 03 over Barabanka Nalha(Telimunda to Musakani Village)
6		Batgaon	Hitasara	Batagaon	Landimal RF Comp. No. 08 over kantiali Nalha(Gudanali to Keuntberni Village)
7			Jamjuri	Batagaon	Sankarpali KF (Sankarpali Kata)

24.2 Water Resource Management:

The Major water resources of the State / District are being managed by Water Resource Department of the Government of Odisha. For management of MIPs, Irrigation Department is looking after the projects under Water resource Department. Forest is the place of origin of all rivers / springs and perennial water sources. It is important to manage the water / runoff within the forest blocks.

24.3 Importance of Water Management from Forests:

The availability and quality of water in many regions of the world are more and more threatened by overuse, misuse and pollution, and it is increasingly recognized that both are strongly influenced by forests. Moreover, climate change is altering forest's role in regulating water flows and influencing the availability of water resources. Therefore, the relationship between forests and water is a critical issue that must be accorded high priority.

Forested catchments supply a high proportion of the water for domestic, agricultural, industrial and ecological needs in both upstream and downstream areas. A key challenge



faced by land, forest and water managers is to maximize the wide range of multi-sectoral forest benefits without detriment to water resources and ecosystem function. To address this challenge, there is an urgent need for a better understanding of the interactions between forests/trees and water, for awareness raising and capacity building in forest hydrology, and for embedding this knowledge and the research findings in policies. Similarly, there is a need to develop institutional mechanisms to enhance synergies in dealing with issues related to forests and water as well as to implement and enforce action program at the national and regional levels.

In the past, forest and water policies were often based on the assumption that under any hydrological and ecological circumstance, forest is the best land cover to maximize water yield, regulate seasonal flows and ensure high water quality. Following this assumption, conserving (or extending) forest cover in upstream watersheds was deemed the most effective measure to enhance water availability for agriculture, industrial and domestic uses, as well as for preventing floods in downstream areas.

Forest hydrology research conducted during the 1980s and 1990s suggests a rather different picture. Although the important role of upstream forest cover in ensuring the delivery of high-quality water has been confirmed, earlier generalizations about the benefits of upstream forest cover on downstream annual and seasonal flows were generally fallacious and misleading. Studies have shown instead that, especially in arid or semi-arid ecosystems, forests are not the best land cover to increase downstream water yield. Moreover, solid evidence has shown that in tropical ecosystems the protective role of upstream forest cover against seasonal downstream floods has often been overestimated. This is especially true in connection with major events affecting large-scale watersheds or river basins.

The International Year of Freshwater 2003 and the third World Water Forum (Kyoto, Japan, 2003) helped drive the incorporation of this understanding of biophysical interactions between forests and water into policies. The International Expert Meeting on Forests and Water, held in Shiga, Japan in November 2002 in preparation for these events, highlighted the need for more holistic consideration of interactions between water, forest, other land uses and socio-economic factors in complex watershed ecosystems. During the past five years, the Shiga Declaration has become a key reference for the development of a new generation of forest and water policies.



This article summarizes the state of current knowledge about forest and water interactions in watershed ecosystems. It summarizes some key issues that have emerged from discussion among forest hydrologists, other water-sector experts and policy-makers in the years since the Shiga Declaration, the third World Water Forum and the International Year of Freshwater.

24.3.1 The Present Practices:

The present practices for water resources management involves protection of catchment area of major rivers, Reservoirs and origin of springs. Important forest blocks coming within critical catchment area are managed under Selection Working Circle.

The degraded forest which constitutes about 9.81% is proposed to be managed under Rehabilitation Working Circle. Except in SWC and Plantation WC, No tree felling is recommended. Extensive Soil & Moisture conservation and tree planting in blank areas prescribed.

In case of Plantation working Circle, Planting has been prescribed. It is aimed for creation of good tree cover in blank areas including outside the forest area.

24.3 Constitution of Management Unit:

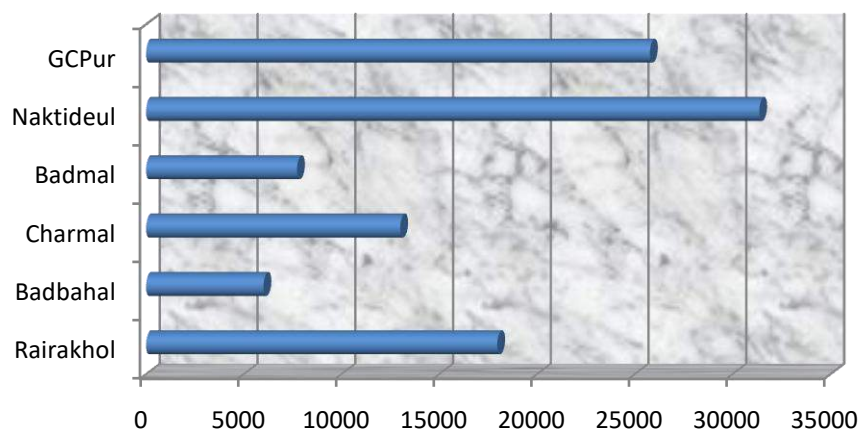
For management purposes each range will be taken as a unit. All forest blocks coming within the range jurisdiction will be the specific site for interventions.

Table No 24.3 Abstract of Area allotted to WR & CC Management

Range	RF	PRF	DPF	PF	VF	Total
Rairakhol	16234.284	962.39	728.86	38.393		17963.9270
Badbahal	5205.500	800.48	0			6005.9800
Charmal	11596.5625	1075.72	326.49			12998.7725
Badmal	4537.895	3182.34	0			7720.2350
Naktideul	26238.567	3401.56	1695.85		30.0	31365.9770
GCPur	24571.690	687.79	515.2			25774.6800
Div Total	88384.4985	10110.2800	3266.4000	38.3930	30.0000	101829.5715

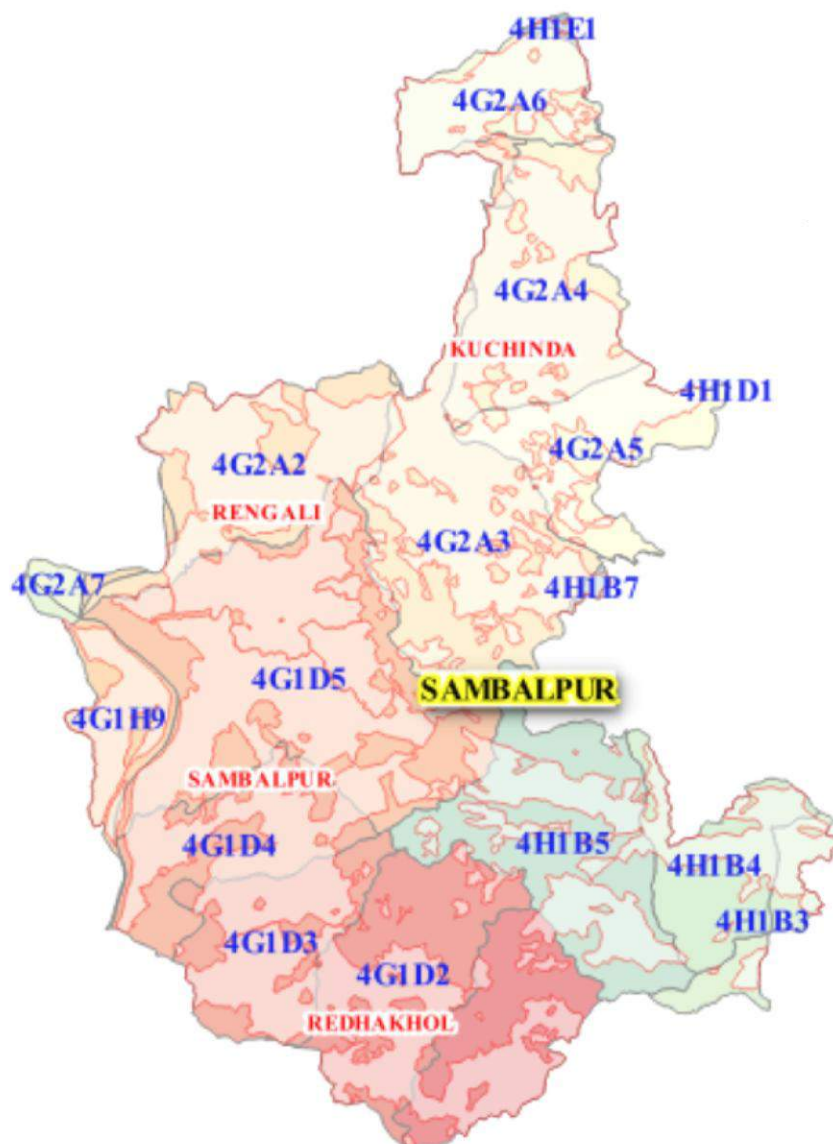


Area in Ha under WR & CC



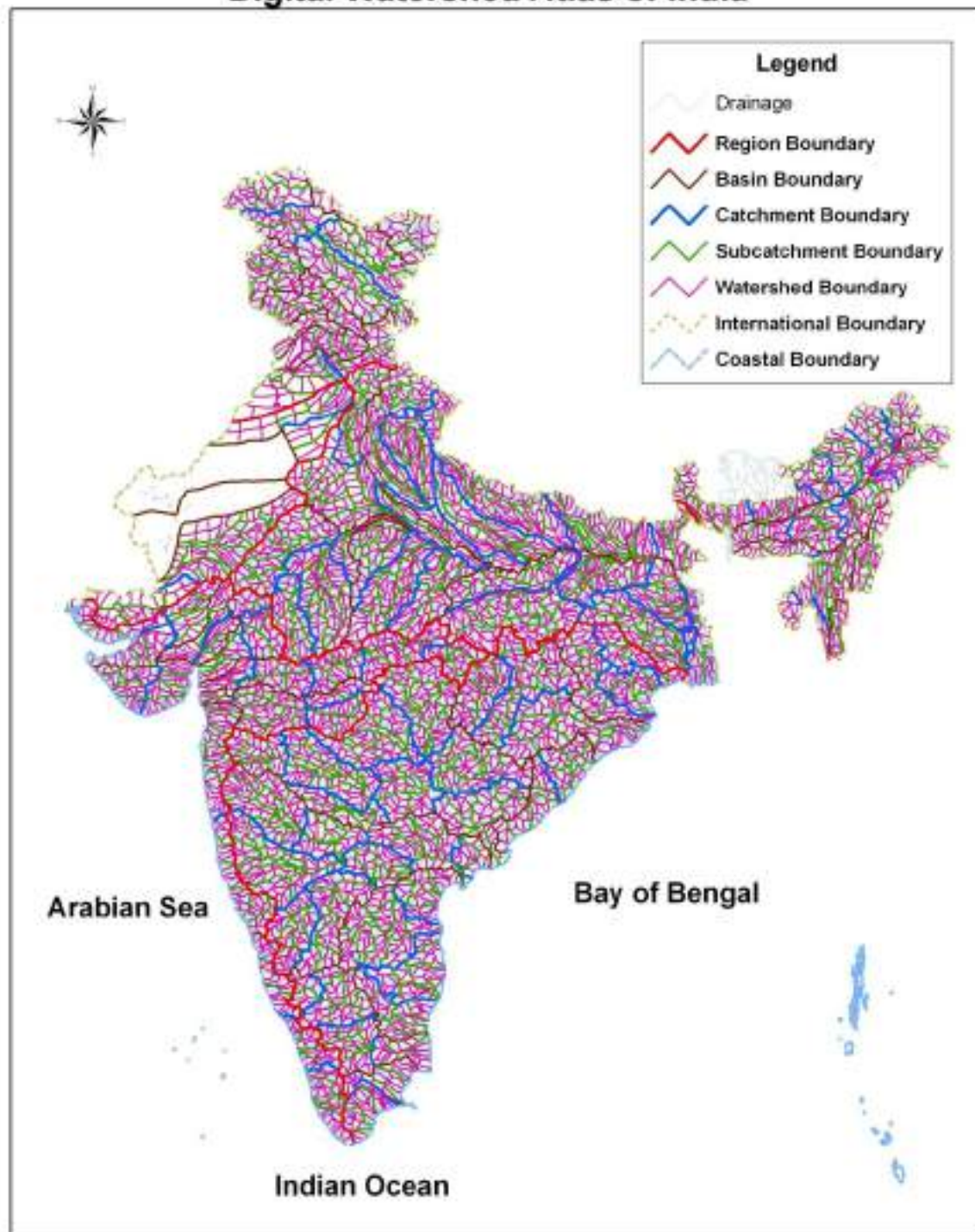
24.4.1 Sections / Sub Sections.

The Rairakhol division mainly drains to River Mahanadi and River Tikira. The Section sub unit of management for water resource is the water shed. The map of the watershed of Sambalpur District is furnished below. (Rairakhol Division is well marked on the Map)





Digital Watershed Atlas of India





24.5 Method of treatment:

The method of treatment is mainly focused on

- ii. Intensive Soil & Moisture Conservation.
- iii. Judicious use of Ground Water
- iv. Creation of Inland water body
- v. Rain water harvesting
- vi. Awareness program on “Importance of Water & its management”

24.5.1 Soil & Moisture conservation:

In any forest development program, Soil & Moisture Conservation will be taken up as an **“Integral part of all interventions”**. Under SMC activities, Loose Boulder Check dams, staggered trenches, Percolation Pits, Vegetative Check dams and Masonry structure will be executed in a forest block on an integral manner. Standard Procedure for SMC as found in standard text book on “Soil & Moisture Conservation” will be followed.

24.5.2 Judicious use of Ground water:

The third National Groundwater Conference, which concluded on the Centre for Water Resources Development and Management (CWRDM) campus came up with an eleven-point recommendation urging stakeholders in the sector to explore emerging techniques in managing groundwater resources.

The three-day sessions, which stressed the judicious use of groundwater resources, observed that water security could be achieved by adopting appropriate groundwater recharge practices. It called for the use of advanced tools such as geophysical techniques, remote sensing and GIS for groundwater exploration, assessment and management.

Effective measure

The use of groundwater modeling was highlighted as an effective measure in water resource assessment for sustainable groundwater development projects. Delegates during their presentations on water conservation models said drip irrigation and fertigation systems should be popularized among farmers. In areas where groundwater development was more than 70%, steps should be taken to ensure conservation of groundwater by adopting sprinkler and drip irrigation systems, they said.



The panelists also pointed out that coastal and urban hydrology were becoming increasingly important due to population pressure that exerted excessive stress on limited groundwater resources in such regions. The future water demand in these areas should be considered and groundwater resources should be judiciously used and protected, they said.

One of the major recommendations at the conference was the need to conduct more studies on seawater intrusion and submarine groundwater discharge using numerical modeling, geophysical and hydro-chemical techniques. Scientists who made the recommendation explained that such studies would highlight the importance of quantum of nutrient and freshwater discharge to the ocean which has larger societal implications.

Data base

Creating a data base system for integrated water resources management from basin scale to watershed scale was another suggestion made at the conference. Scientists said this should be backed up by legal framework so that the data base could be freely accessed by all stakeholders in the country.

Participatory Approach

Participatory hydrological monitoring improves the users' understanding of local groundwater resource characteristics and helps local communities to form a community opinion to support appropriate measures for managing the available resources equitably.

The objectives of participatory hydrological monitoring can be summarized as follows:

- Creating awareness on groundwater resource availability,
- Establishing the local micro catchment level rainfall-recharge relationship,
- Develop appropriate water use plans matching with the utilizable groundwater reserves, and
- Establish need for conservation of groundwater and need for increased recharge.

The project argued that farmers needed to develop their knowledge on local hydrological conditions before they could make sound decisions on groundwater management. It is also assumed that better awareness of the local hydrological balance would help motivate communities to optimally manage the available groundwater. In order to improve knowledge



and create awareness, APWELL project trained groundwater users as barefoot technologists with the task of collecting hydrological data.

24.5.3 Creation of Inland Water body:

It is proposed to create more water body (Inland water body) for retention of more surface water. It will ameliorate the local climate and reduce pressure on Ground water use.

24.5.4 Rain water harvesting:

Rainwater harvesting systems consists of the following components:

- Catchment- Used to collect and store the captured Rainwater.
- Conveyance system – It is used to transport the harvested water from the catchment to the recharge zone.
- Flush- It is used to flush out the first spell of rain.
- Filter – Used for filtering the collected Rainwater and remove pollutants.
- Tanks and the recharge structures: Used to store the filtered water which is ready to use.

The process of rainwater harvesting involves the collection and the storage of rainwater with the help of artificially designed systems that run off naturally or man-made catchment areas like- the rooftop, compounds, rock surface, hill slopes, artificially repaired impervious or semi-pervious land surface.

Several factors play a vital role in the amount of water harvested. Some of these factors are:

- The quantum of runoff
- Features of the catchments
- Impact on the environment
- Availability of the technology
- The capacity of the storage tanks
- Types of the roof, its slope and its materials
- The frequency, quantity and the quality of the rainfall
- The speed and ease with which the Rainwater penetrates through the subsoil to recharge the groundwater.



The rainwater harvesting system is one of the best methods practiced and followed to support the conservation of water. Today, scarcity of good quality water has become a significant cause of concern. However, Rainwater, which is pure and of good quality, can be used for irrigation, washing, cleaning, bathing, cooking and also for other livestock requirements.

Advantages of Rainwater Harvesting

The benefits of rainwater harvesting system are listed below.

- Less cost.
- Helps in reducing the water bill.
- Decreases the demand for water.
- Reduces the need for imported water.
- Promotes both water and energy conservation.
- Improves the quality and quantity of groundwater.
- Does not require a filtration system for landscape irrigation.
- This technology is relatively simple, easy to install and operate.
- It reduces soil erosion, stormwater runoff, flooding, and pollution of surface water with fertilizers, pesticides, metals and other sediments.
- It is an excellent source of water for landscape irrigation with no chemicals and dissolved salts and free from all minerals.

24.5.5 Awareness program on “Importance of Water & its management”

Regular awareness camp is required to be conducted at Range / Section and Beat level to drive the concept of Water resource management.

24.6 Climate Change:

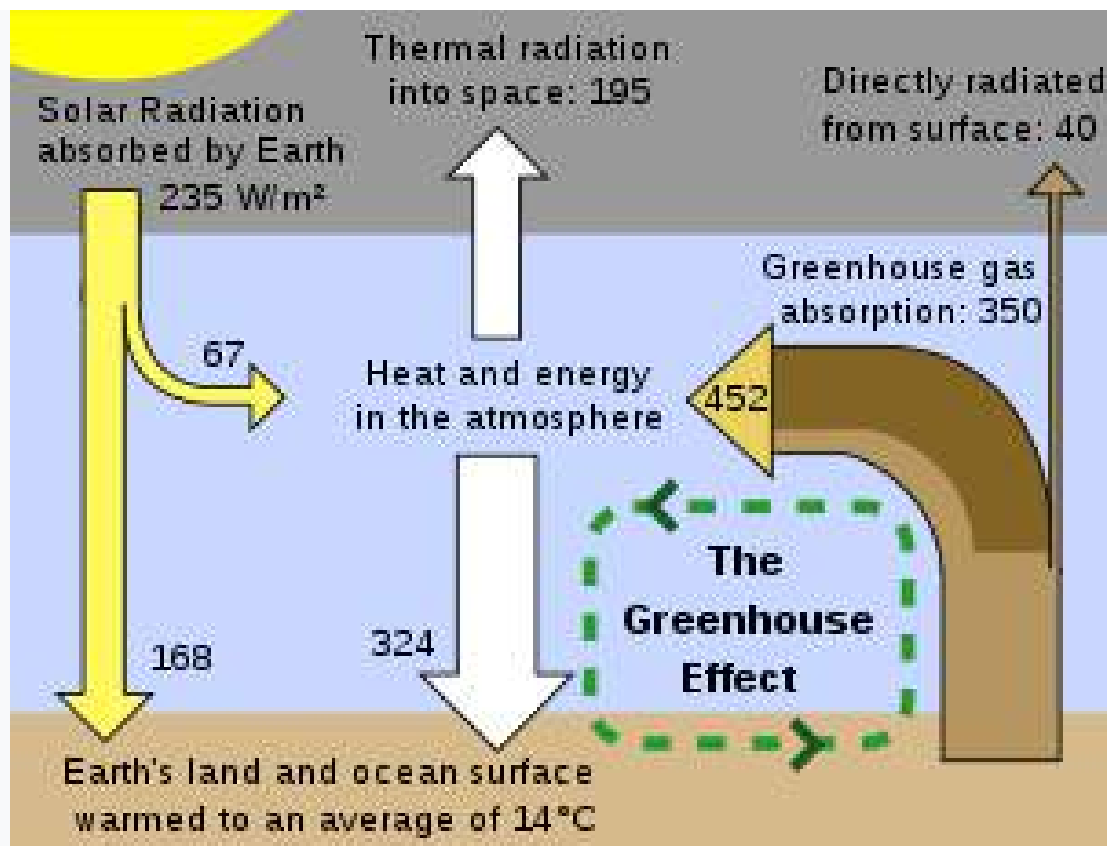
24.6.1 Climate Change and the future of forestry & forest research:

Climate change includes both **global warming** driven by human-induced emissions of greenhouse gases and the resulting large-scale shifts in weather patterns. Though there have been previous periods of climatic change, since the mid-20th century humans have had an unprecedented impact on Earth's climate system and caused change on a global scale.



The largest driver of warming is the emission of gases that create a greenhouse effect, of which more than 90% are carbon dioxide (CO₂) and methane. Fossil fuel burning (coal, oil, and natural gas) for energy consumption is the main source of these emissions, with additional contributions from agriculture, deforestation, and manufacturing. The human cause of climate change is not disputed by any scientific body of national or international standing. Temperature rise is accelerated or tempered by climate feedbacks, such as loss of sunlight-reflecting snow and ice cover, increased water vapour (a greenhouse gas itself), and changes to land and ocean carbon sinks.

Temperature rise on land is about twice the global average increase, leading to desert expansion and more common heat waves and wildfires. Temperature rise is also amplified in the Arctic, where it has contributed to melting permafrost, glacial retreat and sea ice loss. Warmer temperatures are increasing rates of evaporation, causing more intense storms and weather extremes. Impacts on ecosystems include the relocation or extinction of many species as their environment changes, most immediately in coral reefs, mountains, and the Arctic. Climate change threatens people with food insecurity, water scarcity, flooding, infectious diseases, extreme heat, economic losses, and displacement. These human impacts have led the World Health Organization to call climate change the greatest threat to global health in the 21st century. Even if efforts to minimise future warming are successful, some effects will continue for centuries, including rising sea levels, rising ocean temperatures, and ocean acidification.



Energy flows between space, the atmosphere, and Earth's surface. Rising greenhouse gas levels in the atmosphere are causing a net warming effect to act on Earth's climate system.

Many of these impacts are already felt at the current level of warming, which is about 1.2 °C (2.2 °F). The Intergovernmental Panel on Climate Change (IPCC) has issued a series of reports that project significant increases in these impacts as warming continues to 1.5 °C (2.7 °F) and beyond. Additional warming also increases the risk of triggering critical thresholds called tipping points. Responding to these impacts involves both mitigation and adaptation.

24.6.2 Mitigation:

Limiting climate change – consists of reducing greenhouse gas emissions and removing them from the atmosphere. Methods to achieve this include

- The development and deployment of low-carbon energy sources such as wind and solar,
- A phase-out of coal, enhanced energy efficiency, and forest preservation.



24.6.3 Adaptation:

Adoption consists of adjusting to actual or expected climate, such as through improved coastline protection, better disaster management, assisted colonization, and the development of more resistant crops. Adaptation alone cannot avert the risk of "severe, widespread and irreversible" impacts.

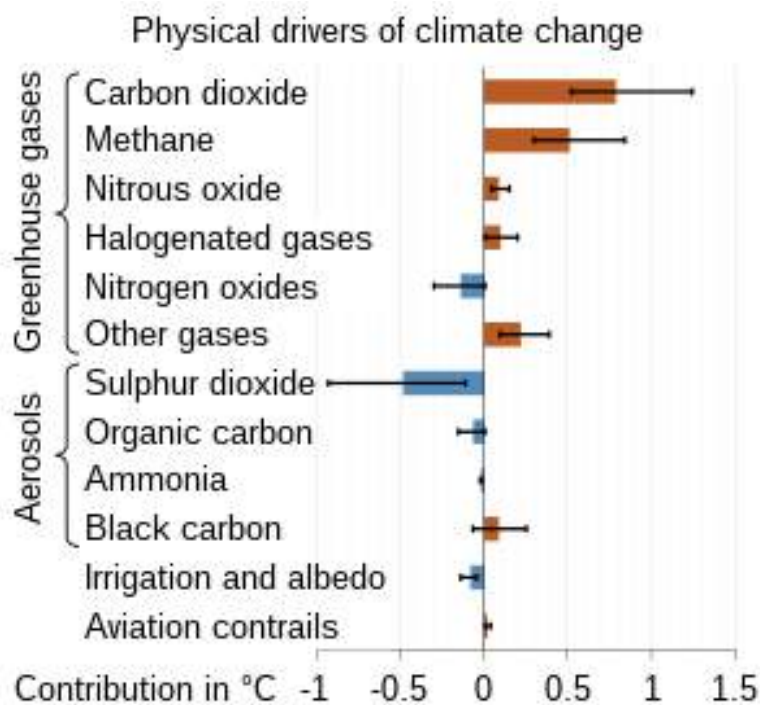
24.6.4 Paris Agreement:

Under the 2015 Paris Agreement, nations collectively agreed to keep warming "well under 2.0 °C (3.6 °F)" through mitigation efforts. However, with pledges made under the Agreement, global warming would still reach about 2.8 °C (5.0 °F) by the end of the century. Limiting warming to 1.5 °C (2.7 °F) would require halving emissions by 2030 and achieving near-zero emissions by 2050.

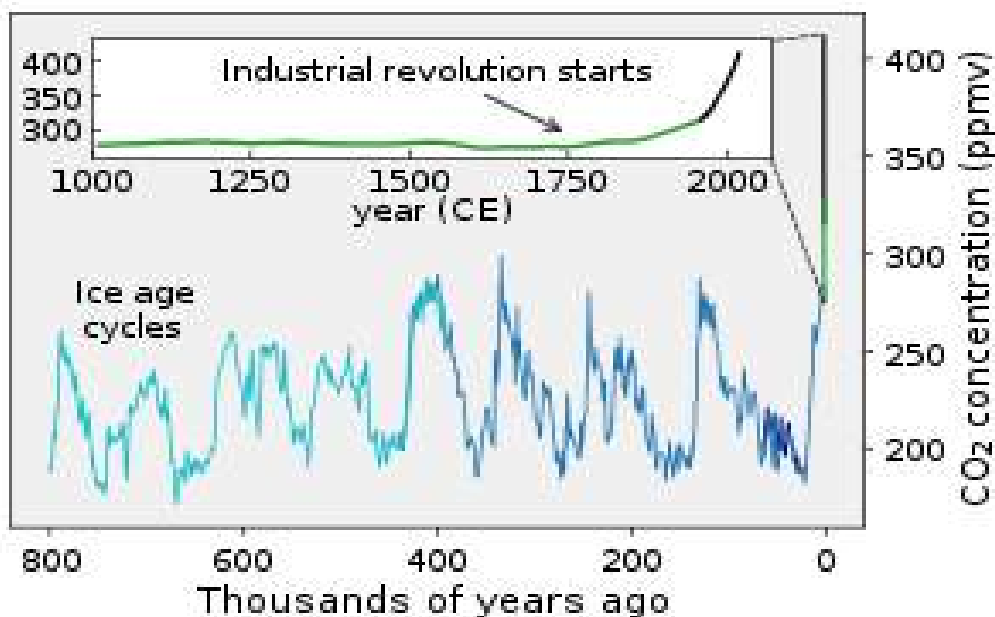
24.6.5 Drivers of Temperature Rise:

Contributors to climate change from the time period of 1850-1900 to the average from 2010-2019, as reported in the sixth IPCC assessment report. All drivers listed are human caused, as the IPCC found no significant contribution from internal variability or solar and volcanic drivers. The climate system experiences various cycles on its own which can last for years (such as the El Niño–Southern Oscillation), decades or even centuries. Other changes are caused by an imbalance of energy that is "external" to the climate system, but not always external to the Earth. Examples of external forcings include changes in the composition of the atmosphere (e.g. increased concentrations of green house gases), solar luminosity, volcanic eruptions, and variations in the Earth's orbit around the Sun.

To determine the human contribution to climate change, known internal climate variability and natural external forcing need to be ruled out. A key approach is to determine unique "fingerprints" for all potential causes, then compare these fingerprints with observed patterns of climate change. For example, solar forcing can be ruled out as a major cause because its fingerprint is warming in the entire atmosphere, and only the lower atmosphere has warmed, as expected from greenhouse gases (which trap heat energy radiating from the surface). Attribution of recent climate change shows that the primary driver is elevated greenhouse gases, but that aerosols also have a strong effect.



a) Greenhouse gases

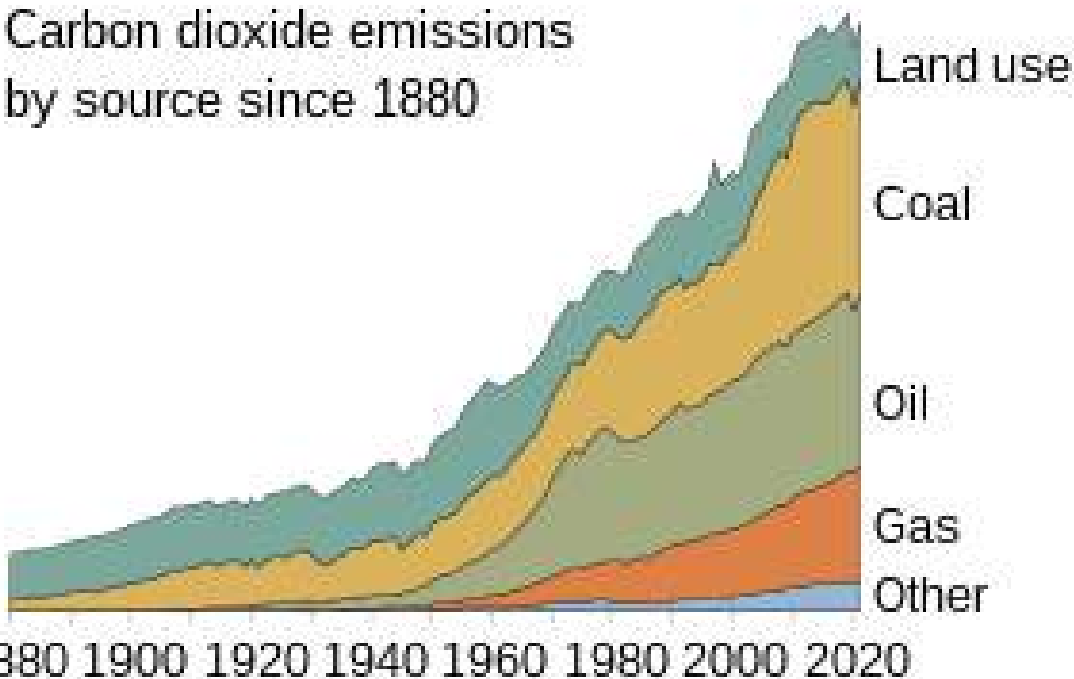




The Earth absorbs sunlight, then radiates it as heat. Greenhouse gases in the atmosphere absorb and reemit infrared radiation, slowing the rate at which it can pass through the atmosphere and escape into space. Before the Industrial Revolution, naturally-occurring amounts of greenhouse gases caused the air near the surface to be about 33 °C (59 °F) warmer than it would have been in their absence. While water vapour (~50%) and clouds (~25%) are the biggest contributors to the greenhouse effect, they increase as a function of temperature and are therefore considered feedbacks. On the other hand, concentrations of gases such as CO₂ (~20%), tropospheric ozone, CFCs and nitrous oxide are not temperature-dependent, and are therefore considered external forcings.

Human activity since the Industrial Revolution, mainly extracting and burning fossil fuels (coal, oil, and natural gas), has increased the amount of greenhouse gases in the atmosphere, resulting in a radiative imbalance. In 2019, the concentrations of CO₂ and methane had increased by about 48% and 160%, respectively, since 1750. These CO₂ levels are higher than they have been at any time during the last 2 million years. Concentrations of methane are far higher than they were over the last 800,000 years.

Carbon dioxide emissions by source since 1880



The Global Carbon Project shows how additions to CO₂ since 1880 have been caused by different sources ramping up one after another. Global anthropogenic greenhouse gas



emissions in 2018, excluding those from land use change, were equivalent to 52 billion tones of CO₂. Of these emissions, 72% was actual CO₂, 19% was methane, 6% was nitrous oxide, and 3% was fluorinated gases. CO₂ emissions primarily come from burning fossil fuels to provide energy for transport, manufacturing, heating, and electricity. Additional CO₂ emissions come from deforestation and industrial processes, which include the CO₂ released by the chemical reactions for making cement, steel, aluminum, and fertilizer. Methane emissions come from livestock, manure, rice cultivation, landfills, wastewater, coal mining, as well as oil and gas extraction. Nitrous oxide emissions largely come from the microbial decomposition of inorganic and organic fertilizer. From a production standpoint, the primary sources of global greenhouse gas emissions are estimated as: electricity and heat (25%), agriculture and forestry (24%), industry and manufacturing (21%), transport (14%), and buildings (6%).

Despite the contribution of deforestation to greenhouse gas emissions, the Earth's land surface, particularly its forests, remain a significant carbon sink for CO₂. Natural processes, such as carbon fixation in the soil and photosynthesis, more than offset the greenhouse gas contributions from deforestation. The land-surface sink is estimated to remove about 29% of annual global CO₂ emissions. The ocean also serves as a significant carbon sink via a two-step process. First, CO₂ dissolves in the surface water. Afterwards, the ocean's overturning circulation distributes it deep into the ocean's interior, where it accumulates over time as part of the carbon cycle. Over the last two decades, the world's oceans have absorbed 20 to 30% of emitted CO₂.

b) Aerosols and clouds

Air pollution, in the form of aerosols, not only puts a large burden on human health, but also affects the climate on a large scale. From 1961 to 1990, a gradual reduction in the amount of sunlight reaching the Earth's surface was observed, a phenomenon popularly known as *global dimming*, typically attributed to aerosols from biofuel and fossil fuel burning. Aerosol removal by precipitation gives tropospheric aerosols an atmospheric lifetime of only about a week, while stratospheric aerosols can remain in the atmosphere for a few years. Globally, aerosols have been declining since 1990, meaning that they no longer mask greenhouse gas warming as much.

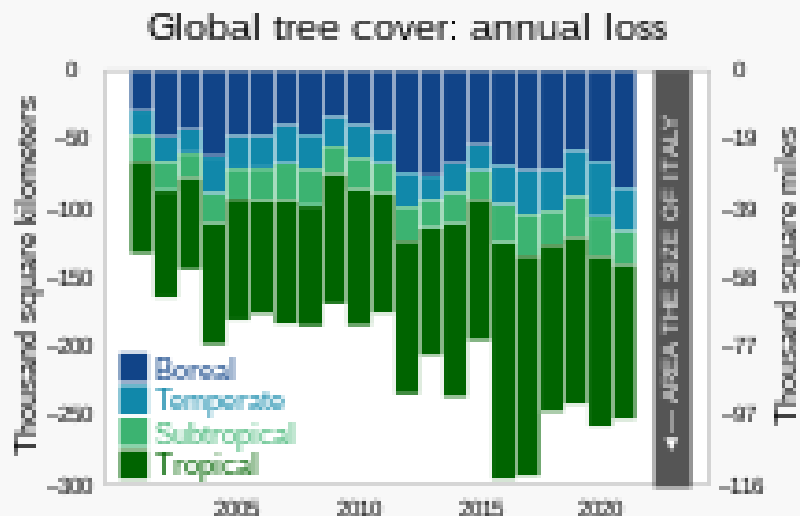
In addition to their direct effects (scattering and absorbing solar radiation), aerosols have indirect effects on the Earth's radiation budget. Sulfate aerosols act as cloud condensation



nuclei and thus lead to clouds that have more and smaller cloud droplets. These clouds reflect solar radiation more efficiently than clouds with fewer and larger droplets. This effect also causes droplets to be more uniform in size, which reduces the growth of raindrops and makes clouds more reflective to incoming sunlight. Indirect effects of aerosols are the largest uncertainty in radiative forcing.

While aerosols typically limit global warming by reflecting sunlight, black carbon in soot that falls on snow or ice can contribute to global warming. Not only does this increase the absorption of sunlight, it also increases melting and sea-level rise. Limiting new black carbon deposits in the Arctic could reduce global warming by 0.2 °C (0.36 °F) by 2050.

c) Changes of the land surface



The rate of global tree cover loss has approximately doubled since 2001, to an annual loss approaching an area the size of Italy.

Humans change the Earth's surface mainly to create more agricultural land. Today, agriculture takes up 34% of Earth's land area, while 26% is forests, and 30% is uninhabitable (glaciers, deserts, etc.). The amount of forested land continues to decrease, largely due to conversion to cropland in the tropics. This deforestation is the most significant aspect of land surface change affecting global warming. The main causes of deforestation are: permanent land-use change from forest to agricultural land producing products such as beef and palm oil (27%), logging to produce forestry/forest products (26%), short term shifting cultivation (24%), and wildfires (23%).



In addition to affecting greenhouse gas concentrations, land-use changes affect global warming through a variety of other chemical and physical mechanisms. Changing the type of vegetation in a region affects the local temperature, by changing how much of the sunlight gets reflected back into space (albedo), and how much heat is lost by evaporation. For instance, the change from a dark forest to grassland makes the surface lighter, causing it to reflect more sunlight. Deforestation can also contribute to changing temperatures by affecting the release of aerosols and other chemical compounds that influence clouds, and by changing wind patterns. In tropic and temperate areas the net effect is to produce significant warming, while at latitudes closer to the poles a gain of albedo (as forest is replaced by snow cover) leads to an overall cooling effect. Globally, these effects are estimated to have led to a slight cooling, dominated by an increase in surface albedo.

d) Solar and volcanic activity

Physical climate models are unable to reproduce the rapid warming observed in recent decades when taking into account only variations in solar output and volcanic activity. As the Sun is the Earth's primary energy source, changes in incoming sunlight directly affect the climate system. Solar irradiance has been measured directly by satellites, and indirect measurements are available from the early 1600s. There has been no upward trend in the amount of the Sun's energy reaching the Earth. Further evidence for greenhouse gases being the cause of recent climate change come from measurements showing the warming of the lower atmosphere (the troposphere), coupled with the cooling of the upper atmosphere (the stratosphere). If solar variations were responsible for the observed warming, warming of both the troposphere and the stratosphere would be expected, but that has not been the case.

Explosive volcanic eruptions represent the largest natural forcing over the industrial era. When the eruption is sufficiently strong (with sulfur dioxide reaching the stratosphere) sunlight can be partially blocked for a couple of years, with a temperature signal lasting about twice as long. In the industrial era, volcanic activity has had negligible impacts on global temperature trends. Present-day volcanic CO₂ emissions are equivalent to less than 1% of current anthropogenic CO₂ emissions.



24.6.6 Climate change feedback



Sea ice reflects 50% to 70% of incoming solar radiation while the dark ocean surface only reflects 6%, so melting sea ice is a self-reinforcing feedback.

The response of the climate system to an initial forcing is modified by feedbacks: increased by self-reinforcing feedbacks and reduced by balancing feedbacks. The main reinforcing feedbacks are the water-vapour feedback, the ice–albedo feedback, and probably the net effect of clouds. The primary balancing feedback to global temperature change is radiative cooling to space as infrared radiation in response to rising surface temperature. In addition to temperature feedbacks, there are feedbacks in the carbon cycle, such as the fertilizing effect of CO₂ on plant growth. Uncertainty over feedbacks is the major reason why different climate models project different magnitudes of warming for a given amount of emissions.

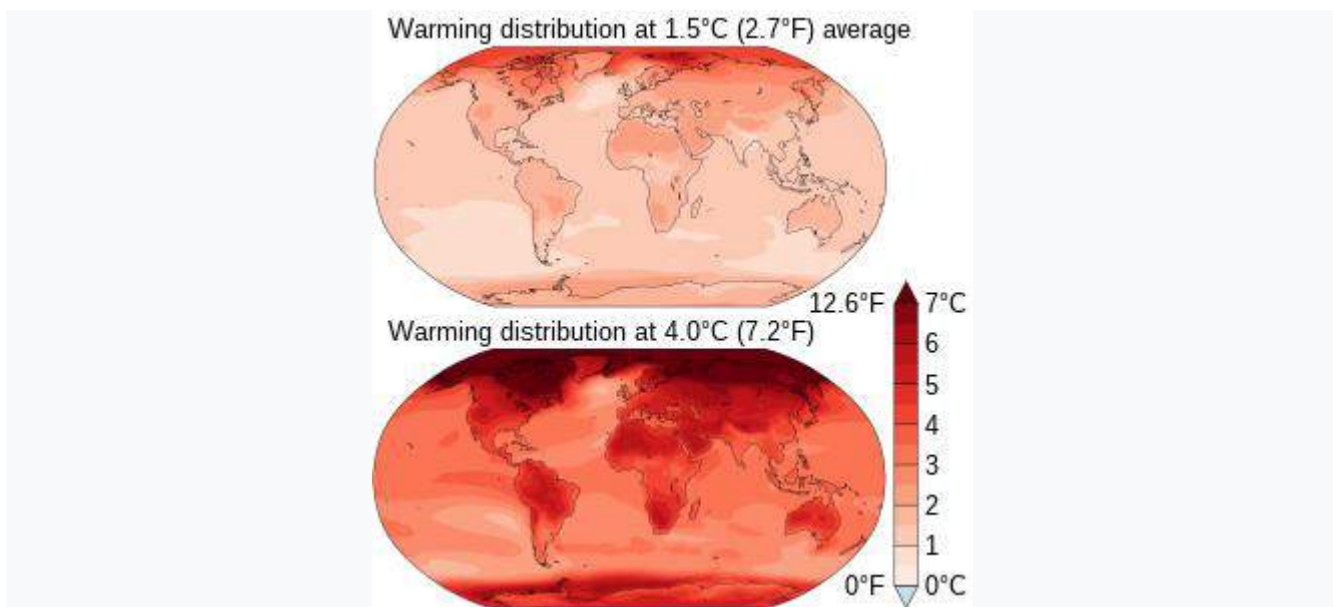
As air gets warmer, it can hold more moisture. After initial warming due to emissions of greenhouse gases, the atmosphere will hold more water. As water vapour is a potent greenhouse gas, this further heats the atmosphere. If cloud cover increases, more sunlight will be reflected back into space, cooling the planet. If clouds become more high and thin, they act as an insulator, reflecting heat from below back downwards and warming the planet. Overall, the net cloud feedback over the industrial era has probably exacerbated temperature rise. The reduction of snow cover and sea ice in the Arctic reduces the albedo of the Earth's surface. More of the Sun's energy is now absorbed in these regions, contributing



to amplification of Arctic temperature changes. Arctic amplification is also melting permafrost, which releases methane and CO₂ into the atmosphere.

Around half of human-caused CO₂ emissions have been absorbed by land plants and by the oceans. On land, elevated CO₂ and an extended growing season have stimulated plant growth. Climate change increases droughts and heat waves that inhibit plant growth, which makes it uncertain whether this carbon sink will continue to grow in the future. Soils contain large quantities of carbon and may release some when they heat up. As more CO₂ and heat are absorbed by the ocean, it acidifies, its circulation changes and phytoplankton takes up less carbon, decreasing the rate at which the ocean absorbs atmospheric carbon. Climate change can increase methane emissions from wetlands, marine and freshwater systems, and permafrost.

24.7 Future Warming & Carbon Budgeting:



Projected global surface temperature changes relative to 1850–1900, based on CMIP6 multi-model mean changes.

Future warming depends on the strengths of climate feedbacks and on emissions of greenhouse gases. The former are often estimated using various climate models, developed



by multiple scientific institutions. A climate model is a representation of the physical, chemical, and biological processes that affect the climate system. Models include changes in the Earth's orbit, historical changes in the Sun's activity, and volcanic forcing. Computer models attempt to reproduce and predict the circulation of the oceans, the annual cycle of the seasons, and the flows of carbon between the land surface and the atmosphere. Models project different future temperature rises for given emissions of greenhouse gases; they also do not fully agree on the strength of different feedbacks on climate sensitivity and magnitude of inertia of the climate system.

The physical realism of models is tested by examining their ability to simulate contemporary or past climates. Past models have underestimated the rate of Arctic shrinkage and underestimated the rate of precipitation increase. Sea level rise since 1990 was underestimated in older models, but more recent models agree well with observations. The 2017 United States-published National Climate Assessment notes that "climate models may still be underestimating or missing relevant feedback processes".

A subset of climate models adds societal factors to a simple physical climate model. These models simulate how population, economic growth, and energy use affect – and interact with – the physical climate. With this information, these models can produce scenarios of how greenhouse gas emissions may vary in the future. This output is then used as input for physical climate models to generate climate change projections. In some scenarios emissions continue to rise over the century, while others have reduced emissions. Fossil fuel resources are too abundant for shortages to be relied on to limit carbon emissions in the 21st century. Emissions scenarios can be combined with modelling of the carbon cycle to predict how atmospheric concentrations of greenhouse gases might change in the future. According to these combined models, by 2100 the atmospheric concentration of CO₂ could be as low as 380 or as high as 1400 ppm, depending on the socioeconomic scenario and the mitigation scenario.

The remaining carbon emissions budget is determined by modelling the carbon cycle and the climate sensitivity to greenhouse gases. According to the IPCC, global warming can be kept below 1.5 °C (2.7 °F) with a two-thirds chance if emissions after 2018 do not exceed 420 or 570 gigatonnes of CO₂, depending on exactly how the global temperature is defined. This amount corresponds to 10 to 13 years of current emissions. There are high uncertainties

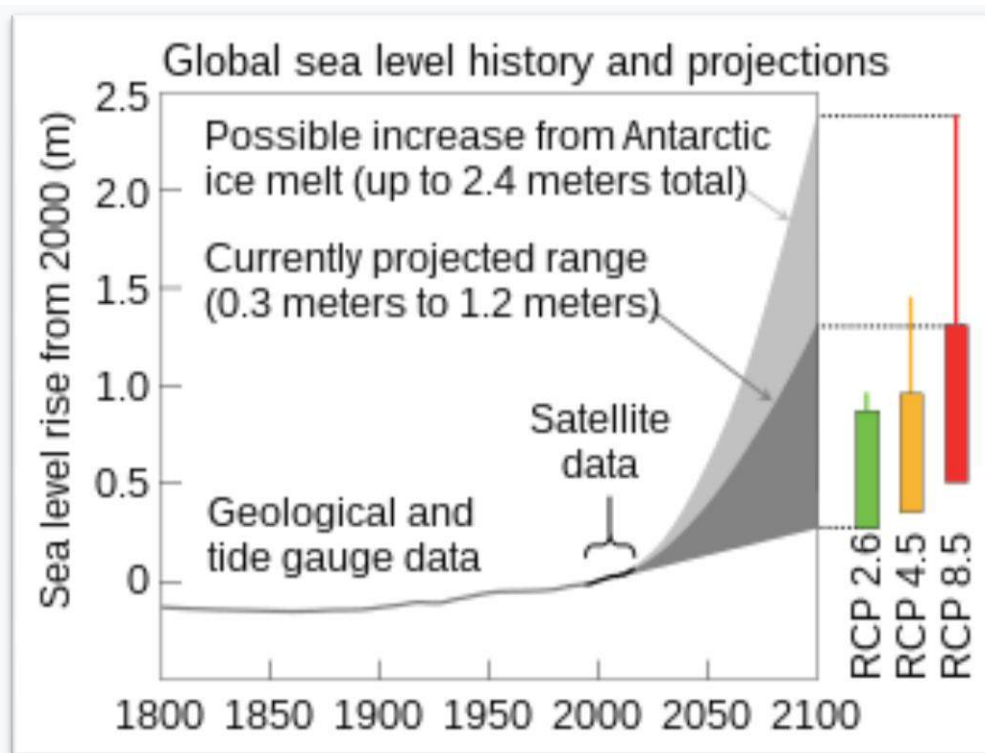


about the budget; for instance, it may be 100 gigatonnes of CO₂ smaller due to methane release from permafrost and wetlands.

24.8 Impact of Climate Change:

24.8.1 Physical environment

The environmental effects of climate change are broad and far-reaching, affecting oceans, ice, and weather. Changes may occur gradually or rapidly. Evidence for these effects comes from studying climate change in the past, from modelling, and from modern observations. Since the 1950s, droughts and heat waves have appeared simultaneously with increasing frequency. Extremely wet or dry events within the monsoon period have increased in India and East Asia. The rainfall rate and intensity of hurricanes and typhoons is likely increasing. Frequency of tropical cyclones has not increased as a result of climate change.



Historical sea level reconstruction and projections up to 2100 published in 2017 by the U.S. Global Change Research Program

Global sea level is rising as a consequence of glacial melt, melt of the ice sheets in Greenland and Antarctica, and thermal expansion. Between 1993 and 2020, the rise



increased over time, averaging 3.3 ± 0.3 mm per year. Over the 21st century, the IPCC projects that in a very high emissions scenario the sea level could rise by 61–110 cm. Increased ocean warmth is undermining and threatening to unplug Antarctic glacier outlets, risking a large melt of the ice sheet and the possibility of a 2-meter sea level rise by 2100 under high emissions.

Climate change has led to decades of shrinking and thinning of the Arctic sea ice, making it vulnerable to atmospheric anomalies. While ice-free summers are expected to be rare at 1.5°C (2.7°F) degrees of warming, they are set to occur once every three to ten years at a warming level of 2.0°C (3.6°F). Higher atmospheric CO_2 concentrations have led to changes in ocean chemistry. An increase in dissolved CO_2 is causing oceans to acidify. In addition, oxygen levels are decreasing as oxygen is less soluble in warmer water, with hypoxic dead zones expanding as a result of algal blooms stimulated by higher temperatures, higher CO_2 levels, ocean deoxygenation, and eutrophication.

24.8.2 Tipping points and long-term impacts

The greater the amount of global warming, the greater the risk of passing through ‘tipping points’, thresholds beyond which certain impacts can no longer be avoided even if temperatures are reduced. An example is the collapse of West Antarctic and Greenland ice sheets, where a temperature rise of 1.5 to 2.0°C (2.7 to 3.6°F) may commit the ice sheets to melt, although the time scale of melt is uncertain and depends on future warming. Some large-scale changes could occur over a short time period, such as a collapse of the Atlantic Meridional Overturning Circulation, which would trigger major climate changes in the North Atlantic, Europe, and North America.

The long-term effects of climate change include further ice melt, ocean warming, sea level rise, and ocean acidification. On the timescale of centuries to millennia, the magnitude of climate change will be determined primarily by anthropogenic CO_2 emissions. This is due to CO_2 's long atmospheric lifetime. Oceanic CO_2 uptake is slow enough that ocean acidification will continue for hundreds to thousands of years. These emissions are estimated to have prolonged the current interglacial period by at least 100,000 years. Sea level rise will continue over many centuries, with an estimated rise of 2.3 metres per degree Celsius (4.2 ft/ $^{\circ}\text{F}$) after 2000 years.

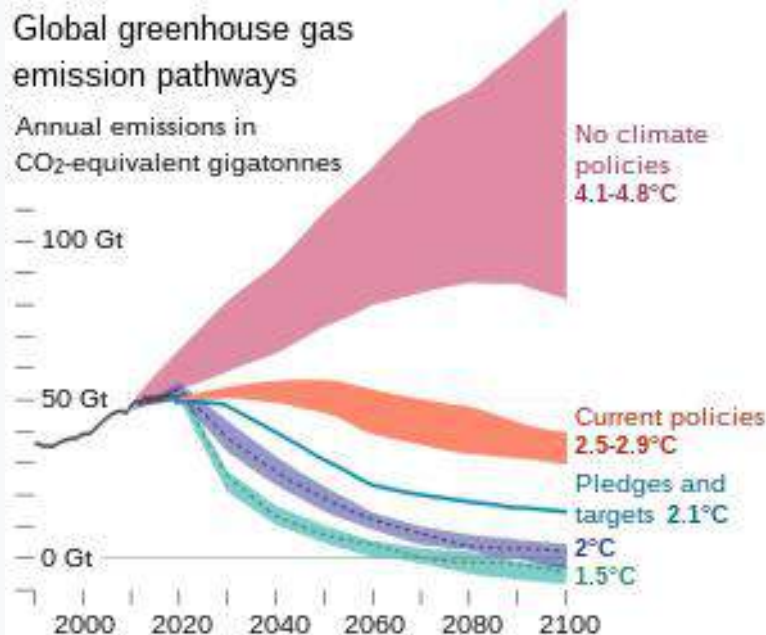


24.8.3 Effect on Nature and wildlife:

Recent warming has driven many terrestrial and freshwater species poleward and towards higher altitudes. Higher atmospheric CO₂ levels and an extended growing season have resulted in global greening, whereas heatwaves and drought have reduced ecosystem productivity in some regions. The future balance of these opposing effects is unclear. Climate change has contributed to the expansion of drier climate zones, such as the expansion of deserts in the subtropics. The size and speed of global warming is making abrupt changes in ecosystems more likely. Overall, it is expected that climate change will result in the extinction of many species.

The oceans have heated more slowly than the land, but plants and animals in the ocean have migrated towards the colder poles faster than species on land. Just as on land, heat waves in the ocean occur more frequently due to climate change, with harmful effects found on a wide range of organisms such as corals, kelp, and seabirds. Ocean acidification is impacting organisms who produce shells and skeletons, such as mussels and barnacles, and coral reefs; coral reefs have seen extensive bleaching after heat waves. Harmful algae bloom enhanced by climate change and eutrophication cause anoxia, disruption of food webs and massive large-scale mortality of marine life. Coastal ecosystems are under particular stress, with almost half of wetlands having disappeared as a consequence of climate change and other human impacts.

24.9 Mitigation



Scenarios of global greenhouse gas emissions. If all countries achieve their current Paris Agreement pledges, average warming by 2100 would still significantly exceed the maximum 2°C target set by the Agreement.

Climate change impacts can be mitigated by reducing greenhouse gas emissions and by enhancing sinks that absorb greenhouse gases from the atmosphere. In order to limit global warming to less than 1.5 °C with a high likelihood of success, global greenhouse gas emissions needs to be net-zero by 2050, or by 2070 with a 2 °C target. This requires far-reaching, systemic changes on an unprecedented scale in energy, land, cities, transport, buildings, and industry. Scenarios that limit global warming to 1.5 °C often describe reaching net negative emissions at some point. To make progress towards a goal of limiting warming to 2 °C, the United Nations Environment Program estimates that, within the next decade, countries need to triple the amount of reductions they have committed to in their current Paris Agreements; an even greater level of reduction is required to meet the 1.5 °C goal.

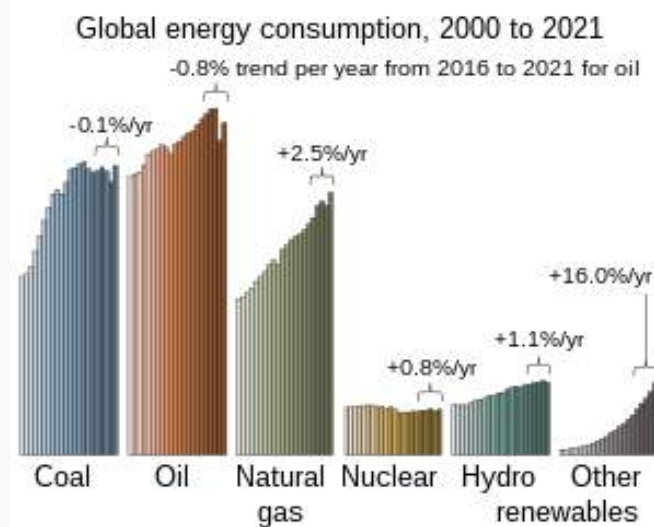
Although there is no single pathway to limit global warming to 1.5 or 2.0 °C (2.7 or 3.6 °F), most scenarios and strategies see a major increase in the use of renewable energy in combination with increased energy efficiency measures to generate the needed greenhouse gas reductions. To reduce pressures on ecosystems and enhance their carbon sequestration



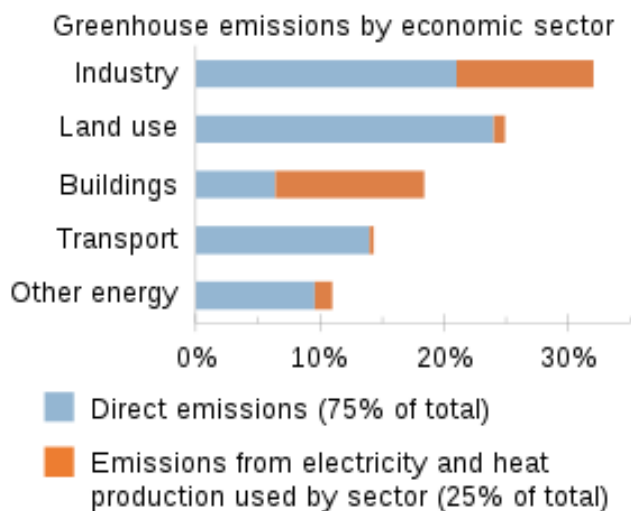
capabilities, changes would also be necessary in agriculture and forestry, such as restoring natural ecosystems by reforestation.

Other approaches to mitigating climate change entail a higher level of risk. Scenarios that limit global warming to 1.5 °C typically project the large-scale use of carbon dioxide removal methods over the 21st century. There are concerns, though, about over-reliance on these technologies, as well as possible environmental impacts. Solar radiation management (SRM) methods have also been explored as a possible supplement to deep reductions in emissions. However, SRM would raise significant ethical and legal issues, and the risks are poorly understood.

24.9.1 Clean energy:



Coal, oil, and natural gas remain the primary global energy sources even as [renewables](#) have begun rapidly increasing. ^[214]



Economic sectors with more greenhouse gas contributions have a greater stake in climate change policies.

Long-term decarbonization scenarios point to rapid and significant investment in renewable energy, which includes solar and wind power, bioenergy, geothermal energy, and hydropower. Fossil fuels accounted for 80% of the world's energy in 2018, while the remaining share was split between nuclear power and renewable; that mix is projected to change significantly over the next 30 years. Solar and wind have seen substantial growth and progress over the last few years; photovoltaic solar and onshore wind are the cheapest forms of adding new power generation capacity in most countries. Renewable represented 75% of all new electricity generation installed in 2019, with solar and wind constituting nearly that entire amount. Meanwhile, nuclear power costs are increasing amidst stagnant power share, so that nuclear power generation is now several times more expensive per megawatt-hour than wind and solar.

To achieve carbon neutrality by 2050, renewable energy would become the dominant form of electricity generation, rising to 85% or more by 2050 in some scenarios. The use of electricity for other needs, such as heating, would rise to the point where electricity becomes the largest form of overall energy supply. Investment in coal would be eliminated and coal use nearly phased out by 2050.



In transport, scenarios envision sharp increases in the market share of electric vehicles, and low carbon fuel substitution for other transportation modes like shipping. Building heating would be increasingly decarbonizes with the use of technologies like heat pumps.

There are obstacles to the continued rapid development of renewable. For solar and wind power, a key challenge is their intermittency and seasonal variability. Traditionally, hydro dams with reservoirs and conventional power plants have been used when variable energy production is low. Intermittency can further be countered by demand flexibility and by expanding battery storage and long-distance transmission to smooth variability of renewable output across wider geographic areas. Some environmental and land use concerns have been associated with large solar and wind projects, while bioenergy is often not carbon neutral and may have negative consequences for food security. Hydropower growth has been slowing and is set to decline further due to concerns about social and environmental impacts.

Low-carbon energy improves human health by minimizing climate change and has the near-term benefit of reducing air pollution deaths, which were estimated at 7 million annually in 2016. Meeting the Paris Agreement goals that limit warming to a 2 °C increase could save about a million of those lives per year by 2050, whereas limiting global warming to 1.5 °C could save millions and simultaneously increase energy security and reduce poverty.

24.9.2 Energy efficiency

Reducing energy demand is another major feature of decarbonization scenarios and plans. In addition to directly reducing emissions, energy demand reduction measures provide more flexibility for low carbon energy development, aid in the management of the electricity grid, and minimize carbon-intensive infrastructure development. Over the next few decades, major increases in energy efficiency investment will be required to achieve these reductions, comparable to the expected level of investment in renewable energy. However, several COVID-19 related changes in energy use patterns, energy efficiency investments, and funding have made forecasts for this decade more difficult and uncertain.

Efficiency strategies to reduce energy demand vary by sector. In transport, gains can be made by switching passengers and freight to more efficient travel modes, such as buses and trains, and increasing the use of electric vehicles. Industrial strategies to reduce energy demand include increasing the energy efficiency of heating systems and motors, designing less energy-intensive products, and increasing product lifetimes. In the building sector the focus is



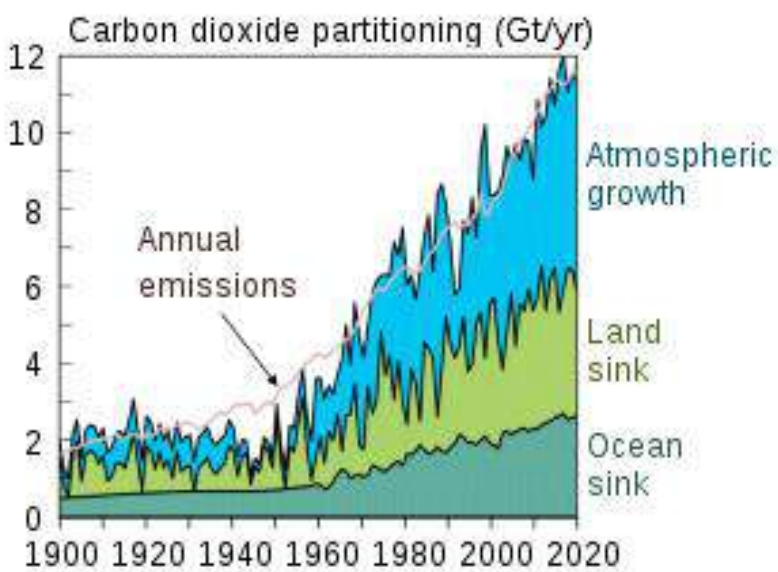
on better design of new buildings, and incorporating higher levels of energy efficiency in retrofitting techniques for existing structures. In addition to decarbonizing energy use, the use of technologies like heat pumps can also increase building energy efficiency.

24.9.3 Agriculture and industry

Agriculture and forestry face a triple challenge of limiting greenhouse gas emissions, preventing the further conversion of forests to agricultural land, and meeting increases in world food demand. A suite of actions could reduce agriculture and forestry-based greenhouse gas emissions by two thirds from 2010 levels by reducing growth in demand for food and other agricultural products, increasing land productivity, protecting and restoring forests, and reducing greenhouse gas emissions from agricultural production.

In addition to the industrial demand reduction measures mentioned earlier, steel and cement production, which together are responsible for about 13% of industrial CO₂ emissions, present particular challenges. In these industries, carbon-intensive materials such as coke and lime play an integral role in the production process, so that reducing CO₂ emissions requires research-driven efforts aimed at decarbonizing the chemistry of these processes.

24.9.4 Carbon sequestration



Most CO₂ emissions have been absorbed by carbon sinks, including plant growth, soil uptake, and ocean uptake (2020 Global Carbon Budget).



Natural carbon sinks can be enhanced to sequester significantly larger amounts of CO₂ beyond naturally occurring levels. Reforestation and tree planting on non-forest lands are among the most mature sequestration techniques, although the latter raises food security concerns. Soil carbon sequestration and coastal carbon sequestration are less understood options. The feasibility of land-based negative emissions methods for mitigation are uncertain in models; the IPCC has described mitigation strategies based on them as risky.

Where energy production or CO₂-intensive heavy industries continue to produce waste CO₂, the gas can be captured and stored instead of being released to the atmosphere. Although its current use is limited in scale and expensive, carbon capture and storage (CCS) may be able to play a significant role in limiting CO₂ emissions by mid-century. This technique, in combination with bio-energy production (BECCS) can result in net-negative emissions, where the amount of greenhouse gasses that are released into the atmosphere are less than the sequestered, or stored, amount in the bio-energy fuel being grown. It remains highly uncertain whether carbon dioxide removal techniques, such as BECCS, will be able to play a large role in limiting warming to 1.5 °C, and policy decisions based on reliance on carbon dioxide removal increases the risk of global warming increasing beyond international goals.

24.9.5 Adaptation:

Adaptation is "the process of adjustment to current or expected changes in climate and its effects". Without additional mitigation, adaptation cannot avert the risk of "severe, widespread and irreversible" impacts. More severe climate change requires more transformative adaptation, which can be prohibitively expensive. The capacity and potential for humans to adapt, called *adaptive capacity*, is unevenly distributed across different regions and populations, and developing countries generally have less. The first two decades of the 21st century saw an increase in adaptive capacity in most low- and middle-income countries with improved access to basic sanitation and electricity, but progress is slow. Many countries have implemented adaptation policies. However, there is a considerable gap between necessary and available finance.

Adaptation to sea level rise consists of avoiding at-risk areas, learning to live with increased flooding, protection and, if needed, the more transformative option of managed retreat. There are economic barriers for moderation of dangerous heat impact: avoiding strenuous work or employing private air conditioning is not possible for everybody. In agriculture, adaptation options include a switch to more sustainable diets, diversification, erosion control



and genetic improvements for increased tolerance to a changing climate. Insurance allows for risk-sharing, but is often difficult to obtain for people on lower incomes. Education, migration and early warning systems can reduce climate vulnerability.

Ecosystems adapt to climate change, a process that can be supported by human intervention. Possible responses include increasing connectivity between ecosystems, allowing species to migrate to more favourable climate conditions and species relocation. Protection and restoration of natural and semi-natural areas helps build resilience, making it easier for ecosystems to adapt. Many of the actions that promote adaptation in ecosystems, also help humans adapt via ecosystem-based adaptation. For instance, restoration of natural fire regimes makes catastrophic fires less likely, and reduces human exposure. Giving rivers more space allows for more water storage in the natural system, reducing flood risk. Restored forest act as a carbon sink, but planting trees in unsuitable regions can exacerbate climate impacts.

There are some synergies and trade-offs between adaptation and mitigation. Adaptation measures often offer short-term benefits, whereas mitigation has longer-term benefits. Increased use of air conditioning allows people to better cope with heat, but increases energy demand. Compact urban development may lead to reduced emissions from transport and construction. Simultaneously, it may increase the urban heat island effect, leading to higher temperatures and increased exposure. Increased food productivity has large benefits for both adaptation and mitigation.

Countries that are most vulnerable to climate change have typically been responsible for a small share of global emissions, which raises questions about justice and fairness. Climate change is strongly linked to sustainable development, along with the use of fossil fuels and emission of greenhouse gases. Limiting global warming makes it easier to achieve sustainable development goals, such as eradicating poverty and reducing inequalities. The connection between the two is recognized in the Sustainable Development Goal 13 which is to "Take urgent action to combat climate change and its impacts". The goals on food, clean water and ecosystem protections have synergies with climate mitigation.

The geopolitics of climate change is complex and has often been framed as a free-rider problem, in which all countries benefit from mitigation done by other countries, but individual countries would lose from investing in a transition to a low-carbon economy themselves. This framing has been challenged. For instance, the benefits in terms of public



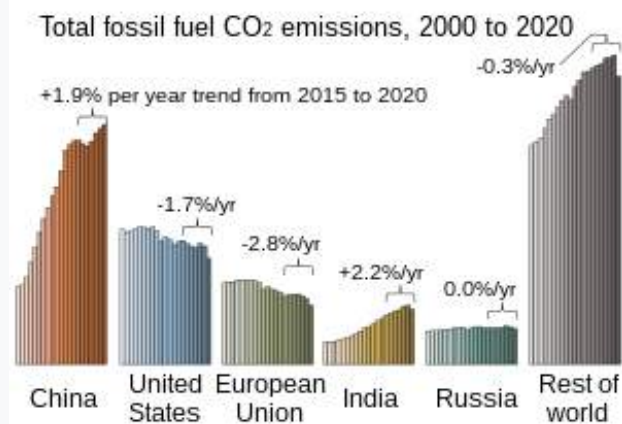
health and local environmental improvements of coal phase-out exceed the costs in almost all regions. Another argument against this framing is that net importers of fossil fuels win economically from transitioning, causing net exporters to face stranded assets: fossil fuels they cannot sell.

24.9.6 Policy options

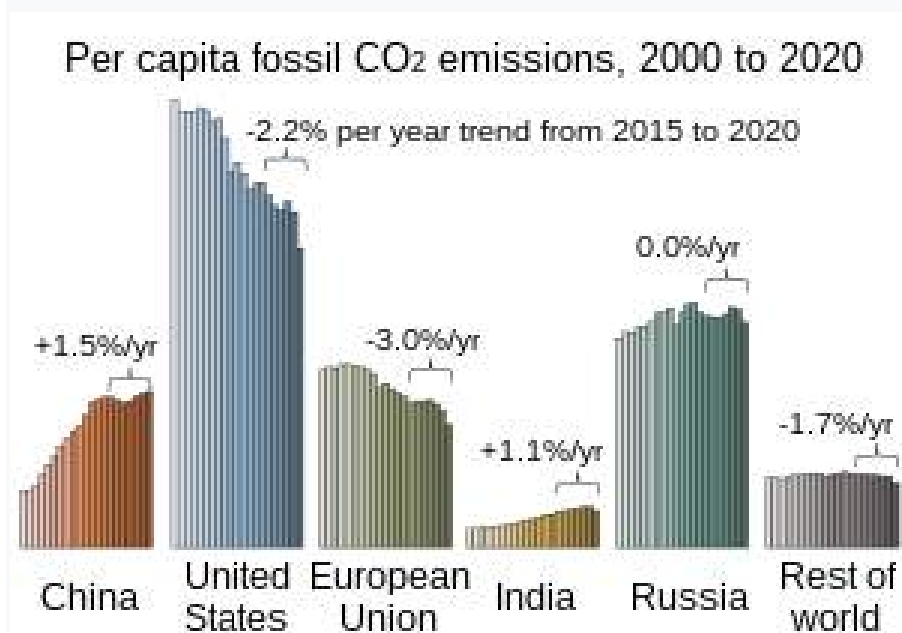
A wide range of policies, regulations and laws are being used to reduce greenhouse gases. Carbon pricing mechanisms include carbon taxes and emissions trading systems. As of 2019, carbon pricing covers about 20% of global greenhouse gas emissions. Direct global fossil fuel subsidies reached \$319 billion in 2017, and \$5.2 trillion when indirect costs such as air pollution are priced in. Ending these can cause a 28% reduction in global carbon emissions and a 46% reduction in air pollution deaths. Subsidies could also be redirected to support the transition to clean energy. More prescriptive methods that can reduce greenhouse gases include vehicle efficiency standards, renewable fuel standards, and air pollution regulations on heavy industry. Renewable portfolio standards have been enacted in several countries requiring utilities to increase the percentage of electricity they generate from renewable sources.

As the use of fossil fuels is reduced, there are Just Transition considerations involving the social and economic challenges that arise. An example is the employment of workers in the affected industries, along with the well-being of the broader communities involved. Climate justice considerations, such as those facing indigenous populations in the Arctic, are another important aspect of mitigation policies.

24.9.7 International climate agreements.



Since 2000, rising CO₂ emissions in China and the rest of world have surpassed the output of the United States and Europe.



Per person, the United States generates CO₂ at a far faster rate than other primary regions.

Nearly all countries in the world are parties to the 1994 United Nations Framework Convention on Climate Change (UNFCCC). The objective of the UNFCCC is to prevent dangerous human interference with the climate system. As stated in the convention, this requires that greenhouse gas concentrations are stabilised in the atmosphere at a level where ecosystems can adapt naturally to climate change, food production is not threatened, and economic development can be sustained. Global emissions have risen since signing of



the UNFCCC, which does not actually restrict emissions but rather provides a framework for protocols that do. Its yearly conferences are the stage of global negotiations.

The 1997 Kyoto Protocol extended the UNFCCC and included legally binding commitments for most developed countries to limit their emissions. During Kyoto Protocol negotiations, the G77 (representing developing countries) pushed for a mandate requiring developed countries to "[take] the lead" in reducing their emissions, since developed countries contributed most to the accumulation of greenhouse gases in the atmosphere, and since per-capita emissions were still relatively low in developing countries and emissions of developing countries would grow to meet their development needs.

The 2009 Copenhagen Accord has been widely portrayed as disappointing because of its low goals, and was rejected by poorer nations including the G77. Associated parties aimed to limit the increase in global mean temperature to below 2.0 °C (3.6 °F). The Accord set the goal of sending \$100 billion per year to developing countries in assistance for mitigation and adaptation by 2020, and proposed the founding of the Green Climate Fund. As of 2020, the fund has failed to reach its expected target, and risks a shrinkage in its funding.

In 2015 all UN countries negotiated the Paris Agreement, which aims to keep global warming well below 1.5 °C (2.7 °F) and contains an aspirational goal of keeping warming under 1.5 °C. The agreement replaced the Kyoto Protocol. Unlike Kyoto, no binding emission targets were set in the Paris Agreement. Instead, the procedure of regularly setting ever more ambitious goals and reevaluating these goals every five years has been made binding. The Paris Agreement reiterated that developing countries must be financially supported. As of February 2021, 194 states and the European Union have signed the treaty and 188 states and the EU have ratified or acceded to the agreement.

The 1987 Montreal Protocol, an international agreement to stop emitting ozone-depleting gases, may have been more effective at curbing greenhouse gas emissions than the Kyoto Protocol specifically designed to do so. The 2016 Kigali Amendment to the Montreal Protocol aims to reduce the emissions of hydro fluorocarbons, a group of powerful greenhouse gases which served as a replacement for banned ozone-depleting gases. This strengthened the makes the Montreal Protocol a stronger agreement against climate change.



24.10 National responses

In 2019, the United Kingdom parliament became the first national government in the world to officially declare a climate emergency. Other countries and jurisdictions followed suit. In November 2019 the European Parliament declared a "climate and environmental emergency", and the European Commission presented its European Green Deal with the goal of making the EU carbon-neutral by 2050. Major countries in Asia have made similar pledges: South Korea and Japan have committed to become carbon neutral by 2050, and China by 2060. Major developing countries like India have undertaken policy initiatives like the National action plan on Climate Change since 2009 that promote development objectives while also yielding co-benefits for addressing climate change effectively under 8 sub missions. India has a target of 175 GW of renewable energy capacity by 2022 and 450 GW by 2030 under its nationally determined contributions.

As of 2021, based on information from 48 NDCs which represent 40% of the parties to the Paris Agreement, estimated total greenhouse gas emissions will be 0.5% lower compared to 2010 levels, below the 45% or 25% reduction goals to limit global warming to 1.5 °C or 2 °C, respectively.





CHAPTER-25

APPLICATION OF MODERN TECHNOLOGY

25.0 Introduction:

A number of popular technologies are currently being used in the field, but Geographic Information Systems (GIS) and Global Positioning System (GPS) rank at the top. Pick up a modern smart phone and you'll see how far this technology has come in just a short period of time. For modern foresters and loggers, an array of similar handheld receivers can be used to download data gathered from GPS, which can then be input into databases that combine it with other GIS information. This data can then be added directly into spreadsheets, modeling programs, visualization applications and mapping projects. Such technology helps foresters and loggers monitor and analyze timberland health, improve transportation routing, track forest growth and maintain a database of timberland changes.

LIDAR technology (Light Detection and Ranging) is also beneficial for modern foresters, which collects tree measurements and detailed imaging. While traditional prisms are still valuable tools, LIDAR helps to measure canopy heights and volume, basal areas and habitat mapping. Drones are also proving to be increasingly valuable to foresters. While drones are still considered to be a hobbyist toy by many, forestry professionals use them to help with forest management planning, detecting disease and managing forest fires. For large properties, drones are a great device for assessing volume and the overall condition of tree plantations. Most of these tools have practical applications on the ground and in the field, which result in real-world information that cannot be replaced. However, combining this information with the detailed, customizable datasets that are available in SilvaStat360 allows foresters to apply context to the information they gather in the field so they are better equipped to make more informed decisions.

All of these technologies provide incredible benefits to the forestry industry and the pace of exciting, new technological developments continues to quicken. Members of the modern forest supply chain who embrace and utilize these technologies will be well-positioned to succeed in the modern global forest economy.



25.1 Modern Technology being adopted:

At present the Forest Officials are quite conversant with the following technology and frequently using for forest management. These are

- Use of Global Positioning System (GPS) in survey, Demarcation & locating the specified spot.
- Use of Differential Global Positioning System (DGPS) for survey of Forest blocks / area with an exact accuracy of 95% level.
- GIS applications for map study / Map preparation etc.
- Study and use of Satellite Imagery for detecting vegetation change, degradation of land / vegetation.
- Use of Satellite imagery for detection of Fire and faster communication of location of incidents.
- Clonally Propagation with mist chamber facilities for better genetically improved seedlings for plantation purpose.
- Root trainer nursery for mass seedling production.
- Use of Sprinkler for watering in Nursery.
- Use of blowers, Chemical fire extinguisher to combat Forest fire.
- Various mobile applications, Satellite telemetry, Infrared radio collars to monitor animal movement & reporting.
- Use of Bioacoustics machine, Trip alarm system, Scare away multiboring guns etc. are being used as elephant human conflict mitigation measures.

The available technology at the hands of Forester, as stated above are not used / applied in an extensive manner that is required & desirable. During this plan period it is expected that each forester in field should have access to all these facilities and use them for day to day management.

25.2 Modern Technology to be introduced in Forest Management:

With advancement of technology it is proposed to have the following facilities available with Rairakhol Division for better management.

- a. Identified Plus trees within the Division and maintaining a Clonal Orchard.



- b. To have improved MegaHi-techNursery with clonally propagation facilities with mist chamber, Sprinkler System at Charmal Central Nursery.
- c. Root trainer facilities and capacity to meet requirement of Quality Planting Materials (QPM) for the division instead of depending upon temporary nursery.
- d. All forest blocks / plantations to be surveyed with DGPS and mapping thereof, which is in progress.
- e. Establishment of GIS Cell with available Satellite imagery for monitoring purpose at Divisional and Range level.
- f. Modern logging tools to meet emergency.
- g. Drone camera facilities to watch forest fire, wildlife movement and winter bird's congregation& problems.
- h. Use of Tranquilizing guns and drug and other rescue equipments for dealing with problematic Wild animals.
- i. Use of Red Dot Sight and Laser Range Finder.
- j. Night vision Binocular.
- k. Trap- Cameras, Mega phone with Siren, Public Portable Address Sound system.
- l. Use of VHF fixed set and Hand held set for communication.
- m. Improvement and enhancement of VHF network is suggested.





CHAPTER-26

MISCELLANEOUS REGULATION

26.1 Introduction:

During forest Management many issues remain outside the purview of the Working Plan Prescriptions. Some of the burning issues are attempted to be addressed in this chapter i.e. “Miscellaneous Regulation”

26.2 Forest Consolidation:

At present there are 16 PRF and 15 no of DPF in the Division. Some of the PRF Notification are dated to during late 70's and early 80's. No substantial progress has been made in declaring PRF as RF under Section 21 of the Forest act to complete the process. Similarly DPF position is not at all improving.

There are many good forest patches needs to be brought under administrative control of Forest Department. Steps are required to be taken for initiating proposal for Reservation. The process that requires to followed are

1. Identification of area to be reserved. It should not be less than 50 ha for future management convenience.
2. Collection of Land Schedule as per Hal Settlement and preliminary mapping of Cadastral Map.
3. Obtain permission from PCCF and intimate intention for reservation with due justification (Vegetation, Proximity to water body / River/ Spring etc).
4. Intimate Collector, Sambalpur for his approval
5. On approval take detail survey, prepare Cadastral map, Topo map with Pillar position, Field Book, Latitude / Longitude.
6. Prepare six set of such map / Land Schedule and Field book with Boundary description. (Chainage, Degree with FB/ BB), General Boundary description.
7. Submit proposal to PCCF for his approval.
8. On approval submit the proposal to Collector, Sambalpur for on ward transmission to R& DM department for notification u/s 4 of the Odisha Forest Act,1972.
9. After Section 4 notifications, the process to RF notification u/s 21 to be pursued.



26.3 Forest Boundary Maintenance:

Forest Boundary position is in very poor stage. About 34.7% of the pillars are in good Condition (For RF & PRF only). The Village Forest (as Declared u/s 30 of OFA'1972) boundary is in extremely bad position. The pillars are required to be maintained. The Boundary Pillar maintenance is required to be taken up in a five year Cycle as indicated under Para 2.3.2.

In case of Village Forest / Protected Forest special drive is required to find out maps / corresponding Hal Settlement records, demarcation and secured its boundary. It is most vulnerable forest area with department.

26.4 Fire Protection:

Fire Protection is an important issue in case of Forest management. During 2021, massive fire broke out in Odisha and lot up hue & cry raised. Keeping in view the damage caused and under preparedness in this matter a Standard Operational Calendar has been developed and suggested below.

Table No 25.1 Standard Operational Calendar for Fire Protection

Sl No	Description	Period	Executing Authority
1	Review of last Fire seasons loss & financial burden	October	Divisional Forest Officer & Supervising authority
2	Review Resource available at Hand	October	
3	Prepare a systematic Fire Fighting method to be adopted – Vulnerable sites etc & requirement of Man power, Resource and equipments.	November	Range Officer, DFO
4	Procure equipments / repair and maintenance of Equipments	November	Range Officer, DFO
5	Activate VSS / Villagers and all squad at hand – Demonstration camps etc	December	Range Officer, DFO
6	Collect & Display Contact number of Fire Station, Emergency Number, Range / Forester / Forest Guard Number	January	Range Officer, DFO
7	Fire Line maintenance	January/ 1 st Week of February	Forester / Range Officer and DFO
8	Identification of Vulnerable points / Control burning etc	January / February – 1 st part.	Forester / Forest Guard/ Range Officer.
9	Operate Control Room and deploy	1 st Week of	Forest Range Officer /



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

	Frontline Staff / Squads / Vehicles	February	DFO
10	Improvement Communication System and appointment of Contact person to Divisional / Range Fire Control Cell.	1 st Week of February	DFO
11	Prepare for facing eventuality like Fire Burnt / First aid Kit Hospitalization etc	During Fire Season February – June	Medical Contact to be established February 2 nd Week onwards.
13	Fire Review / Guideline / command during season	As and When Required	Forest Range Officer / DFO.
14	Review / Fire mapping	July	Forest Range Officer / DFO.

Fire Protection measures need to be implemented with for better forest management, growth and regeneration.

26.5 Protection against Grazing:

At present Grazing in Reserved forests, Proposed Reserved Forests, DPF etc are not allowed. The forest blocks / sections / plantations needs to be protected against Grazing. A formal notification indicating Regenerated area may be issued by DFO, Rairakhol as “Closed to Grazing” for three years from year of treatment. This needs to be circulated to local bodies, PRI (Panchyat Raj Institutions) to have an effect on controlled grazing.

26.6 Forest road:

There are 19 (Nineteen forest roads covering a length of 244.30 KM in the division. It should be annually maintained for effective supervision. The Forest Roads need to be closed to Public for a day in a year.

26.7 Identification of Plus Trees:

Plantation is an important component in enrichment of forests and creation of new manmade forests. Day by Day good plus trees – the source of Quality Seed are reducing day by day. To preserve the available genetically superior plus trees in the locality, a special drive to “**Know your plus trees**” is required to be lunched. Under this drive all forest staffs, VSS members, temporarily engaged staffs are to be shortly briefed about aim & objectives of this drive and asked to enlist plus trees in there locality They may be asked to enlist trees (Plus Trees) of any species found in the locality (privet / Govt. land / Forest land) and report in the following format.



Revised working plan of Rairakhol Division (2021-22 to 2030-31)

Name of Species	Description of tree identified	Girth / Height in m	Location	Latitude / Longitude.	Remark / Date of Identification.

Such list is to be compiled, visited by officials for verification. After verification each tree may be given a Unique No from the Division Office and the number may be written on the tree.

Consolidated list may be circulated to all staffs / VSS of the locality for its protection and collection of seeds from such trees

Steps may also be initiated to preserve the Genetic quality by Vegetative Propagation in Central nursery of the division.

26.8 Demarcation of VSS assigned area, Preparation of map and signing of MoU

In general it is observed that the forest assigned to VSS has not been properly demarcated, mapped and MoU has not been signed between Forest Department and Villagers. This aspect is to be addressed in a time bound manner which will give a boosting effect to Joint Forest Management drive in the division. Record keeping pertaining to VSS requires to be monitored and a special drive is to be taken to update the records.





CHAPTER-27

SUMMARY OF PRESCRIPTIONS

27.1 Objectives of Management & Working Circles Constituted:

The objectives of this working plan is to provide a basic approach for sustainable management of forests and preserve its biodiversity in light of the National Forest Policy, encompassing the ecological (environmental), economic (production) and social (including cultural) dimensions. The objectives for attaining this goal include conservation of forests and reducing forest degradation, maintenance and enhancement of ecosystem services including ecotourism, enhancement of forest productivity together with establishment of regeneration to improve forest health and vitality as per ecological and silvicultural requirements of the species, progressively increasing the growing stock and carbon sequestration potential, maintenance of biological diversity, sustainable yield of forest produce, prevention of soil erosion and stabilization of the terrain; improvement and regulation of hydrological regime; people's involvement in planning and management of forests fulfilling socio-economic and livelihood needs of the people. The sectors of consideration are Dynamics of Forests and Stands, Forests and Soil, Forests and Water, Forest Biodiversity, Climate and Forests, Socioeconomic Considerations and generation of forest based employment opportunities and livelihood options. The following Working Circles have been constituted for scientific management of available forest resources of the Division.

- i. Selection Working Circle (80468.466 ha)
- ii. Rehabilitation Working Circle (9995.9725ha)
- iii. Plantation Working Circle (455.0830 ha)
- iv. Protection Working Circle (10937.910 Ha)
- v. Bamboo (Overlapping) Working Circle (13821.014ha).
- vi. Non Timber Forest Produce (Overlapping) Working Circle (101761.1785 Ha).
- vii. Wildlife (Overlapping) Working Circle (101761.1785 Ha)
- viii. Joint Forest Management (Overlapping) Working Circle (5506.50 Ha)
- ix. TOF Working Circle (4157.69 ha +414 RKM Avenue Plantation)

All total it is proposed to have Nine Working Circle. Out of these working circles, Four Working Circle will have independent area where as other four Working Circle will have



overlapping jurisdiction. The TOF (Tree outside the Forest Area) Working Circle does not cover any RF/ PRF or VF.

27.1.1 Plan Validity:

The period of this working Plan is **from 1st April'2021 to 31st March 2031**. The implementation and probable impact of various prescriptions may be reviewed after five years of working, if it is so required.

27.2 Selection cum Improvement Working Circle (S.I.W.C)

27.2.1 Special objectives of Management:

Special objectives of management of this working Circle is within the general objectives of the Working Plan. The special objectives are outlines below.

- i) To remove mature and silviculturally available trees before they become unsound.
- ii) To create openings in the canopy to allow adequate light so as to allow establishment of light demanding species i.e. principally Sal.
- iii) To thin out the congested pole crop to allow diameter growth and also have interim harvest through which the VSS looking after the area will be benefited.
- iv) To allow natural regeneration and cover the entire area with vegetation of climatic species.
- v) To improve the density of the forest crop as well as stand structure by suitable silvicultural operations.
- vi) To remove dead and unsound trees for creating hygienic condition in the forest.
- vii) To carryout subsidiary silvicultural operations so that conducive situation can be created for better growth of existing crop and natural regeneration.
- viii) To manage the forest to maintain it at this Climatic Stage so as to keep this composition of Forest with majority of Sal.

27.2.2 Exploitable Girth

Basing on Sample enumeration data number of trees in different girth class available in the assigned compartments, the number of trees that can be harvested and exploitable girth has been prescribed. For Sal exploitable Class is 150cm. The Felling Series wise exploitable Girth is furnished at Table No 27.1



Table No 27.1 Exploitable Girth Rairakhol Division

Name of the Blocks	Name of the trees	Exploitable g.b.h in cm
Hatidhara FS , Kholgarh FS, Daincha FS, Charmal FS, Landakot FS, Badmal FS, Rail FS, Naktideul FS, Landimal FS, GCPur FS, Balikiari FS, Luhabir FS and Jarasingha FS	1. Sal	150
	2. Bija, Haldu and Mundi	135
	3. Bandhan and Sisoo	135
	4. Asan, Dhaura and Semul	150
	5. All other species	135
Other Felling Series	1. Sal	135
	2. Bija, Haldu and Mundi	120
	3. Bandhan and Sisoo	120
	4. Asan,Dhaura and Semul	150
	5. All other species	135

27.2.3 Silvicultural System:

The Silvicultural System adopted is **“Selection System with adequate improvement measures to restock the area in High Forest System”**. Under this adopted system the matured and dead trees will be selectively removed leaving adequate mother trees to have good seed dispersal and natural regeneration. After removal of selected trees, the remaining trees will be treated so as to obtain good established regeneration

27.2.4 Constitution of Felling Series:

The forests allotted to this Working Circle are divided to sixteen Felling Series namely Bidhyabasini FS, Hatidhara FS, Kholgarh FS, Daincha FS, Rahan FS, Charmal FS, Landakot FS, Sagmalia FS, Badmal FS, Rail FS, Naktideul FS, Landimal FS, GCPur FS, Balikiari FS, Luhabir FS and Jarasingha FS. The Plan period is 10 years i.e. from 2021-22 to 2030-31. The area assigned to this working circle will be covered within the Plan Period i.e. 10 years.

27.2.5 Subsidiary silvicultural operations (cleaning and thinning):

After main felling the area will be treated with Subsidiary Silvicultural Operation (SSO). Besides cleaning and thinning other operations are Soil & Moisture Conservation with Vegetative / brushwood Check dams on nalla bed, Loose boulder Check dams (LBCD),



Percolation Pits etc & Create & Maintain Humus layers to reduce run off and enhance time of collection.

27.2.6 Regeneration:

For regeneration of area sowing of Seeds, Closing to Grazing, Fire Protection Measure will be strictly implemented.

27.3 Rehabilitation Working Circle (RWC)

27.3.1 Constitution:

The Forest Blocks previously managed under Rehabilitation Working Circle and and still in open forest category i.e. crop density below 40% are included under this Working Circle. For management. 5 Rehabilitation Series have been prescribed. These are Rairakhol – Badbahal Rehabilitation Series, Charmal Rehabilitation Series, Badmal Rehabilitation Series, Naktideul Rehabilitation Series, Naktideul- GCPur Rehabilitation Series. Total area covered under this working Circle is 9995.9725 Ha

27.3.2 Special objectives of Management:

The Special Objectives of Management set out for this Working Circle within the ambit of the general objectives of management are as follows.

- (i) To induce natural regeneration & improve the condition of existing forests through protection against encroachment, grazing, fires and illicit felling.
- (ii) To improve the crop density to more than 50% from the present position through protection, Silvicultural practices.
- (iii) To enhance soil enrichment through Soil & Moisture Conservation measures.
- (iv) To regulate the surface water runoff to enhance percolation and water availability down the streams.
- (v) To protect against the River Bank / Stream Bank erosion through vegetative measures.
- (vi) To restock barren areas through artificial regeneration with most desirable indigenous species.
- (vii) To have partnership with the local community in protection and management of the forests.
- (viii) To increase the water retaining capacity of the soil & bring the crop to climax species composition.
- (ix) To Control / eradicate the weeds and check its invasion.



- (x) To restore and improve the microclimate and micro edaphic condition of forests.
- (xi) To increase the biodiversity and heterogeneity in the forest crop by encouraging natural regeneration.

Analysis of Data from stand table at random indicates lack of adequate trees above 120cm GBH.

27.3.4 Silvicultural system

The Silvicultural System to be adopted for this working Circle is ***“Silvicultural Cleaning, Tending followed by Aided Natural Regeneration supplemented with enrichment Plantation”***

27.3.5 Harvestable diameters:

From enumeration / sampling data, it is observed that only 2.55 % of trees are above 120 cm and below 150 cm and 0.92 % above 150cm girth class. Under this condition no removal of trees is prescribed from the forests assigned to this Working Circle.

27.3.6 Prescription:

Silvicultural Cleaning, Tending along with Soil & Moisture Conservation, Treatment of Natural seedlings available, Control of Grazing, Fire Protection Measures, Encourage High Forest System, Supplement the regeneration through planting are prescribed to improve the stand.

27.4 Plantation Working Circle:

All Plantations raised during last Plan period either under B Economic Plantations, Miscellaneous Plantations, Village Woodlots of Social Forestry Project Plantations, All Protected Forests declared under Odisha Forest Act, 1972 and encroached area are included in this Working Circle. Miscellaneous Plantations Raised in different blocks within the outgoing plan period covering 455.0830 ha are included in this working Circle.

27.4.1 Crop Condition:

During Working Plan Exercise the plantations have been visited and it is observed that the miscellaneous Plantations have been merged with the existing forest growth and not in a position to differentiate from natural vegetation. These plantations have been identified by Species composition available and availability of natural growth within the plantation sites.



27.4.2 Special objectives of Management:

The objectives of management of this working circle are in tandem with the general objectives of this Plan. The Special Objectives are as follows.

- i) To manage the economic / mixed Plantations in a scattered manner and improve growth status through Silvicultural practices.
- ii) To bring the plantations raised here and there to a single management fold and scientifically manage to optimize the yield.
- iii) To encourage participatory management of erstwhile Social Forestry Plantations and activate the VFC.
- iv) To manage the plantations raised under Compensatory Afforestation Scheme and declared as Protected Forest thereafter.
- v) To Increase availability of Firewood and timbers in the locality and reduce pressure on forests for fuel wood and furniture wood.
- vi) To increase the crop density of forests and improve the Carbon Sequestration.
- vii) To develop a healthy usufruct benefit sharing mechanism in the villages and encourage natural resource management with a community approach method.
- viii) To take suitable measures to prevent soil erosion and conserve soil and moisture in barren hilly tracts.

27.4.3 Silvicultural System:

The Silvicultural System for the village woodlots of erstwhile Social Forestry Plantation will be managed with Silvicultural System **“Clear felling with standard followed by Artificial Regeneration”** by planting will be adopted. Where ever promising coppice shoots will be developed / come up, the same will also be retained to reduce the replanting cost.

27.4.4 Rotation Period:

Rotation period for Sal, Teak and other species for the Division has been discussed at Para14.6.3. The Rotation Period of 120 years for Sal is prescribed and followed. In the outgoing Plan 120 years of Rotation age was prescribed for all species. During field visit and growth statistics available it is felt that except Teak, Sisoo, Ghambhari for all other species, the Rotation Period of 120 years is accepted and followed. In case of teak which has been introduced as gap planting in rehabilitation Working Circle or in Block Plantation in blank areas under Economic Plantation, the growth is very encouraging. Due to its high timber value it is in much demand in the locality, in the State and outside. Selective removal by illicit



felling is a perceptible threat. Considering all its aspect i.e. Growth Status and Market demand, rotation age of 100 years for teak Sisoo, Gambhari and other natural timber species in this division is suggested.

27.4.5 Harvestable Diameter:

Harvesable Girth at Brest Height has been prescribed for various species. These are *Acacia auriculiformis* (*Sunajhari*)- 90 cm, *Anogeissus acuminata* (*Phashi*)– 150 cm *Anthocephalus cadamba* (*Kadamba*) -150 cm , *Azadirachta indica* (*Neem*)- 180 cm *Bomax ceiba* (*Simili*)- 150cm, *Erythrina variegata* (*Paladhua*)- 120cm , *Gmelina arborea* (*gambhari*)-120 cm, Teak, Sisoo- 120 cm.

27.4.6 Prescription:

For Old Plantations of Teak, Thinning has been prescribed. In thinning Yield is expected in shape of Poles and Timber. In case of Mixed Plantations it will be managed as per prescription of working circle to which the forest block belongs as they became a part of the vegetation.

27.4 Protection Working Circle (Pr.WC)

Forest blocks coming under Tal- Kholgarh Elephant Corridor and Forest blocks / compartments are continuous to Satkosia Tiger Reserve through Northern Reserved Forests of Athmallik Division to Rail Reserved Forests of Naktideul Range of Rairakhol Division. These blocks are identified as Tiger Land Scape. It is felt necessary to keep these forest blocks under protection working circle instead of Selection Working Circle in order to provide a safer and a long Tiger land scape from Stkosia Tiger Reserve to Naktideul with a “**Wider Tiger Territory**”. The Total area allotted to this working circle is 10937.91 ha

27.4.1 Sites included in the Working Circle:

Forest blocks of Tal, Kholgarh, Rahan RF, Rail RF, Chadchadi PRF are also included in this protection Working Circle.

27.4.2 The objectives of Management

The objectives of Management of this working Circle is as follows.

- (i) To provide an undisturbed tree cover and improve the ecological condition of the forest assigned.



- (ii) To maintain the elephant corridor and Tiger Landscape so as to have an undisturbed movement of animal in the corridor / landscape.
- (iii) To induce natural vegetation through appropriate seeding.

27.5 Bamboo Overlapping Working Circle (Bamboo (O) WC)

There are bamboo Forests in Rairakhol Division. About 12% of the forest area bears bamboo. It is an important NTFP of the Division. These Bamboo Forests are in a degraded path. No harvesting was taken up partly due to poor crop and partly for no demand after closer of Bamboo based industries during the outgoing plan period. In order to improve the bamboo forest this working circle is constituted taking all bamboo forests available. These forests are proposed to be managed under **Bamboo (Overlapping) Working Circle**. The area allotted to this Working Circle is **13821.014 ha**.

27.6.1 Crop Condition:

Bamboo is available in Five Reserved Forests and One PRF of the division. During assessment of Regeneration of bamboo, it is observed that all bamboo forests can be classified as Good . The average height of culms is 7-8 meter i.e. Type-II. The clump size is 2 to 2.5 m dia with 20-35 culms per clump. Number of Clumps per hectare varies from 80to 125 numbers per hectare.

27.6.2 Special objectives of Management:

The special objectives of management in respect of this Over Lapping Working Circle are within the scope of general objectives of management of forest. These are as follows:

- i) To enforce scientific harvesting of Bamboo and provide bamboo to local artisans and industrial purpose basically to paper mills for raw materials on sustainable basis.
- ii) To restore the bamboo forests through intense silvicultural practices and checking fire & soil erosion.
- iii) To enhance fodder availability to wild animals from bamboo crops.
- iv) To improve the bamboo growing stock through plantations.
- v) To improve bamboo forests through JFM and provide employment to bamboo artisans

27.6.3 Silvicultural system:

For Bamboo forests proposed for commercial harvesting will be worked under “**Culm Selection Cum Improvement System**”. Under this system, Bamboo culms are selectively



removed depending upon number of culms available under different age i.e. 1st yr to 4th year and above. After cutting of bamboo as per rules, Simultaneous Silvicultural operation is to be taken up to improve the clump and induce good regeneration.

Bamboo Crop is moderate to fair in most of the forest blocks allotted to this working circle. Due to non working of Bamboo coupes congested clumps are noticed in many forest blocks. Raised Clumps are also a common sight. The crop is considered as degraded and needs constant harvesting and Silvicultural operation.

A four year cutting cycle and treatment Cycle is prescribed in this plan. During the Plan period 2 & ½ Cycle will be completed.

27.7 Non Timber Forest Produce (Overlapping) Working Circle

The Non Timber Forest Produces (NTFP) including Medicinal & Aromatic Plants (MAP) is mostly seen in moist forests of Gupteswar and Boipariguda Range of the division. Besides Char, kendu, Kusuma, myrobalance, Siali leaves, Kendu leaf, Palua, Bana haldi, Satabari, Sarpagandha, Honey are available to a greater extent in this division. For management of NTFP available in the division this **Non Timber Forest Produce (Overlapping) Working Circle [NTFP (O) WC]** has been constituted. The area assigned is -101761.1785 ha.

27.7.1 Management Unit :

The forests coming within a range is considered as a management unit for all purpose of this Working Circle.

27.7.2 Special objectives of Management:

The special objectives of management are as follows.

- i. To educate VSS / JFM Committee and Gram panchyat about scientific collection methods of NTFP on a sustainable basis.
- ii. To educate primary collectors of NTFP about contribution of NTFP towards their livelihood and share of income from NTFP.
- iii. To educate VSS / Primary collectors about propagation of various herbs / shrubs / climbers and how to improve the stock in forest both quality and quantity.
- iv. To enhance abundance of NTFP species in forest through regulatory mechanism in non-assigned VSS areas / VSS areas.



- v. To conserve and protect the depleting natural medicinal plant resources in the forest area.
- vi. To encourage local community for ex-situ / in situ conservation of NTFP & medicinal plants through VSS.
- vii. To generate self employment and livelihood support for the forest fringe dwellers.
- viii. To develop and disseminate scientific harvesting, processing and storage techniques relating to NTFP products.
- ix. To share market information to primary gatherers.
- x. To impart training on value addition

27.7.3 Crop Condition:

No systematic study has been made to assess the potentiality of NTFP species wise. However on general observation, the area is rich in Sal leaf, Siali Leaf & Fiber. , Kendu, Chara, Bahada, Harida, Anla, Kusum, Bana Haladi, Tamarind, Mango, Jack Fruit, Honey, Wax, Siali Leaf & Fibre, Sal seeds, various barks and tubers. It is desired to have a complete study and documentation of available NTFP and MAP in the region. The availability of NTFP is in a declined trend all over the division with unscientific collection of NTFP resources.

27.7.4 Silvicultural system:

No silvicultural System is prescribed for management of NTFP species found in the forests.

27.7.5 Management suggested:

It is proposed to manage the NTFP resource through

- Regulated collection & trading with Value addition by regular training.
- Impart training on Scientific Collection.
- Improve growing Stock by checking biotic interference.
- In-situ & Ex-situ Conservation.
- The NTFP like fruits / leaves, tubers, etc are normally collected in an annual cycle depending on its maturity and requirement/ utility. Honey, wax, mushrooms are widely collected depending upon availability & season. Many MAP (Medicinal & Aromatic) Plants are collected as and when required throughout the year.



27.7.6 Collection Proceduer:

Collection procedure for a sustainable harvest is most important in scientific management. The collection procedure varies for different parts of trees / plants. An attempt has been made to categorize the NTFP items depending upon parts of utility and method of collection.

27.7.7 Regeneration:

For regeneration, propogation of NTFP Species In-situ Conservation, Ex-situ Conservation and demonstration plots have been suggested.

27.8 Wildlife (Overlapping) Working Circle [WL(O)WC]

In order to have a basic management approach this working circle has been constituted i.e. **Wildlife (Overlapping) Working Circle**. All forest blocks included for management are also included in this working circle. The total area assigned to this Working Circle is 101761.1785 ha.

27.8.1 Special objectives of Management:

The Special objectives of the management of this Working Circle are within the scope of general objectives of management. The special objectives are

- To Conserve, Protect and improve existing wild life and their habitat.
- To Protect & Improve the Tal- Kholgarh Elephant corridor.
- To develop Naktideul Tiger landscape for a greater Tiger Territory.
- To enhance bio-diversity and Wild Life population in the region.
- To involve people in management of Wildlife & associate them in preventing crime against Wild animals.
- To build up scientific knowledge on wildlife resources of the region.
- To train personnel at various levels for conservation and management of wildlife.
- Carry out research relevant to management including the development of techniques appropriate to Indian conditions especially to this locality.
- To educate people about wildlife and need for their conservation.
- To prevent sporadic and strategic crime against wild animals / birds.
- To protect Life and properties of public against animal depredation.



27.8.2 Methods of Treatment

The suggested methods of treatment are Improvement of Habitats, Creation & Maintenance of Grass Land, Providing water to animals, Providing Protection, Detail study of Animal behaviour & scientific Documentation, Creation of Public awareness & public participation in management.

The tiger Landscape and elephant corridor are to be improved to make it conducive for animals.

27.9 Joint Forest Management (Overlapping) Working Circle

To have a common approach for Joint Forest management this Working Circle has been constituted and named as **“Joint Forest Management (Overlapping) Working Circle”** abbreviated as **JFM (O) WC**.

At present 160 VSS has been constituted as per JFM Resolution and functioning as such. Besides VSS constituted under JFM Resolution 1993 / 2011, there are Village Forest Committees constituted under the Odisha Village Forest Rules, 1985 for management of 57.86 ha of Village Wood Lots created during Social Forestry Project.

27.9.1 Special Objectives of Management:

The special objectives of Management of this Working Circle are as follows.

- i) To restock the degraded Forests through community participation.
- ii) To ensure protection, regeneration and management of the forest wealth through a participatory approach.
- iii) Mass Awareness campaign and motivation to the villagers is to be spread to every forest fringe village.
- iv) To make the people and Forest Department equal partners in management process.
- v) Demarcation and Survey of the area allotted under V.S.S.
- vi) Artificial regeneration in the degraded forest area is to be taken up to restore the barren and blank area.
- vii) Soil and Moisture Conservation Measures have to be adopted in the VSS assigned area and preparation of micro-plan to each VSS.
- viii) To reduce the dependency on forest, income generating activities are to be created.



- ix) The other Department involve in peoples participatory aspects like Agriculture, Horticulture, Soil Conservation, veterinary; Health, mass education etc. have to be involved to achieve all-round socio-economic development of the village.
- x) To develop VSS as an institution at local level to manage **“Natural Resource”**.
- xi) To have special thrust on **“Fringe Forest Management.”**

27.9.2 Silvicultural System:

The VSS area is under overlapping working circle. It overlaps with Rehabilitation Working Circle, Protection Working Circle, Plantation Working Circle and also Bamboo (Overlapping) Working Circle. The silvicultural system prescribed to these working circles will be followed as applicable. The Micro Plan of VSS is required to be revisited after approval of this working plan so as to accommodate the prescriptions of the working plan.

27.10 Tree Outside Forest (TOF)

The Forest area in Rairakhol Division is about 75.67 % of Geographical area. Out of the forest area recorded around 28.68% area is of Revenue Forest land. Besides the forests, under administrative control of Forest department about 405.96 Sq.KM of Revenue forests (21.7% of the Geographical area) remain outside the management purview. Plantations are being raised under various schemes like Forest Development Agency, Mahatma Gandhi National Rural Employment Guarantee Act (MANREGA), CAMPA, Farm Forestry, Avenue Plantations etc. Hence its management is of equal importance. In order to provide a management strategy for these plantations / natural forests, it is proposed to constitute **“ToF Working Circle”**. Total area allotted is 4157.69 ha and 414 .0 RKM Avenue Plantation.

The plantations included for management under this working Circle are either plantations of mixed species of short rotation mostly fuel wood and fodder species, timber species, fruit bearing species with an expectation to create a man made forest to provide green cover to barren land. Avenue plantations have been taken up to have an aesthetic value and to provide shed to passerby. No yield is expected from these plantations

27.10.1 Special objectives of Management:

The objectives of management are varied and depending upon category of plantations the special objectives TOF management & specific objectives are furnished as follows.



a) General Objectives:

- i. To increase tree cover of the district / division through planting outside the forest land.
- ii. To increase bio mass production by planting quick growing species.
- iii. To stabilize the loose soil through planting & protect catchment area of Mahanadi River / Tikira River.
- iv. To improve the aesthetic value along the road net work.
- v. To enhance the Economic Condition of People.
- vi. To increase availability of Bamboo for artisans.

b) Of Avenue Plantations:

- To improve the aesthetic value of the landscape,
- To ameliorate the climate,
- To provide shade to passer-by,
- To provide habitat to birds / reptiles/ rodents.
- To add tree cover.

c) Of Farm Forestry:

- To encourage public to have their own backyard plantation to meet their household requirement on firewood, fodder.
- To bring private land under tree planting.
- To supplement raw material availability for industries/ furniture woods.
- To make public less dependent on forests.

27.10.2 Methods of treatment:

The area assigned to this working Circle bears Teak and other timber Species. For Teak a rotation period of 100 years has been fixed. For other species found in TOF areas the rotation period fixed under Para 16.6.3 will be applicable.

27.11 Reduce Emissions from Deforestation and forest Degradation (REDD+)

REDD+ stands for countries' efforts to "Reduce Emissions from Deforestation and forest Degradation", and foster conservation, sustainable management of forests, and enhancement of forest carbon stocks. Deforestation and forest degradation are the second leading cause of global warming, responsible for about 15% of global greenhouse gas emissions, which makes the loss and depletion of forests a major issue for climate change



27.11.1 Suggestive measures on Forestry Sector.

In forestry sector to combat climate change the following activities are suggested.

- a) To reduce felling of trees in all sphere and enhance creation of renewable energy.
- b) To reduce dependency on fossil fuel including that of firewood.
- c) To enhance use of solar energy / wind energy where ever possible.
- d) To motivate people to reduce consumerism & reduce generation of solid waste.
- e) Conserve water body and enhance efficient use of water.

27.12.Application of Modern Technology

A number of popular technologies are currently being used in the field, but Geographic Information Systems (GIS) and Global Positioning System (GPS) rank at the top. LIDAR technology (Light Detection and Ranging) is also beneficial for modern foresters, which collects tree measurements and detailed imaging. While traditional prisms are still valuable tools, LIDAR helps to measure canopy heights and volume, basal areas and habitat mapping. Drones are also proving to be increasingly valuable to foresters. While drones are still considered to be a hobbyist toy by many, forestry professionals use them to help with forest management planning, detecting disease and managing forest fires.

27.12.1 Suggestions:

With advancement of technology it is proposed to have the following facilities available with Jeypore Division for better management.

- a. Identified Plus trees within the Division and maintaining a Clonal Orchard.
- b. To have improved Mega Hi-tech Nursery with clonally propagation facilities with mist chamber, Sprinkler System at Naktidangar Central Nursery.
- c. Root trainer facilities and capacity to meet requirement of Quality Planting Materials (QPM) for the division instead of depending upon temporary nursery.
- d. All forest blocks / plantations to be surveyed with DGPS and mapping thereof, which is in progress.
- e. Establishment of GIS Cell with available Satellite imagery for monitoring purpose at Divisional and Range level.
- f. Modern logging tools to meet emergency.
- g. Drone camera facilities to watch forest fire, wildlife movement and winter bird's congregation& problems.



- h. Use of Tranquilizing guns and drug and other rescue equipments for dealing with problematic Wild animals.
- i. Use of Red Dot Sight and Laser Range Finder.
- j. Night vision Binocular.
- k. Trap- Cameras, Mega phone with Siren, Public Portable Address Sound system.
- l. Use of VHF fixed set and Hand held set for communication.
- m. Improvement and enhancement of VHF network is suggested.

27.13 Miscellaneous Regulation

The following issues are highlighted for taking followup action for a better management. These area Forest Consolidation, Forest Boundary Maintenance, Management of Reserved Land (RL), Fire Protection, Protection against Grazing, Harvesting & Disposal Mechanism for Sandalwood, Identification of Plus Trees, Demarcation of VSS assigned area, Preparation of map and signing of MoU.

These are some of the aspects need attention during implementation of Working Plan Prescription.





CHAPTER-28

GENERAL

28.1 General financial forecast and financial plan of operation:

Considering the prescriptions in various working circles, the activities involve & its quantum of operation with financial forecast at the present price level is furnished at Table no 27.1

Table No 28.1: General financial forecast

Sl No	Name of Working Circle	Suggested area of operation. In Ha	Per unit Cost norm in Lakh Rs	Total amount in Lakh Rs
1	S.C.I. WC	80468.4660		
a	Coupe Marking	160 coupe	25000	40.00
b	Thinning	80468.466	Rs0.05	4023.423
c	SSO in Coupe	80468.466	Rs0.30	24140.54
d	Fires Protection, Grazing	80468.466	Rs0.15	12070.27
2	Rehabilitation WC	9995.9725		
a	RDF activities		@Rs0.65	6497.38
b	Treatment to natural seed origin seedlings		@Rs0.1	999.60
c	Fires Protection, Grazing		0.15	1499.40
3	Protection WC	10937.91		
a	Training of nalla & SMC		@Rs 0.03	328.14
b	Fire Protection Measures		@Rs0.01	109.38
c	Control of Grazing		@Rs0.003	32.81
d	Motivation, Fencing & Other activities		LS	1093.79
4	Plantation WC	455.083		
a	Replanting of VWL(VF &PF)	57.86	@Rs3.00	173.58
	Thinning	275.393	@0.10	27.54
	Eviction & Plantation	121.83	@3.50	426.41
5	Bamboo (O) WC			
a	Simultaneous Silvicultural Operation. (SSO)	2.5x13821.014	@15 MD per ha Wage rate Rs311/- per MD	1611.88
b	Broad casting of Bamboo seeds	200 qts.	@Rs0.05 per Qt	10.00
c	Bamboo Plantation	138.21	@0.90	124.39
6	NTFP(O) WC	18349.4315 ha		
a	In situ conservation	Training to Primary collectors etc	LS	50.00
b	Ex- situ conservation	100 ha Planting	@2.00 lakh per ha	200.00



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c	Demonstration Plot		LS	40.00
7	Wildlife (O) WC	101761.1785		
a	Creation of Water body	100 nos	@6.00 Lakh	600.00
b	Maintenance of Creaks	10 no	@10.00 lakh	100.00
c	Wetland Management	2 no	@15.00 Lakh	30.00
d	Grass Land Development.	100 ha	@50,000/-	50.00
e	Public Awareness	50 camps	@35000/-	17.50
8	JFM (O) WC	160		
a	Training of VSS members		LS	50.00
b	Audit of VSS Account & Documentation.		LS	50.00
c	NAP	1000 ha	@Rs3.00 Lakh	3000.0
9	TOF WC			
a	Silvicultural Thinning	2850.80	@0.25 per ha	622.96
b	Avenue Plantation	421.0	@0.1 per RKM	50.2
c	Monitoring of Farm Forestry		LS	50.00
10	REDD+			
a	Reduce dependency on fossil fuel including that of firewood		LS	100.00
b	Use of solar Energy		LS	100.00
c	Public awareness		LS	50.00
11	Application of Modern Technology			
a	Plus Tree / Clone Orchard		LS	100.00
b	High tech Nursery		LS	150.00
c	GIS Cell & Drone camera		LS	40.00
12	Consolidation			
a	Pillar posting & Consolidation activities		Ls	200.00
		Total		58859.193

(NB: The financial requirement to implement the plan prescription is 588.59 crore at the present price level on an holistic approach. Basing on Wage escalation, the cost of implementation will be hiked by minimum 20% of the estimated cost.)



28.2 Source of Funding:

The division receives funds from State Plan, Central Plan, CAMPA Fund, National Afforestation Program, MANREGA, district Planning untie Funds. The level of present resource allocation is to a tune of Rs 8.0 Crores to 11.00 Crores. Govt. is putting more thrust in plantations and rehabilitation of degraded forests. Resources to a tune of Rs58.80 crores to 60.00 crores annually will not be constrain. Hence it is expected to implement the plan prescription in totality and no financial constrain will be faced.

28.3 Miscellaneous:

Besides the Working Plan Prescription various miscellaneous regulation in form Acts/ Rules / administrative directives are framed and being implemented by the Forest Department. These are

- 1) Forest (Conservation) Act,1980;
- 2) Ban on use of Polythene in State / Country.
- 3) Forest Rights Act,2005, etc.

These rules / guidelines are to be followed for better management of Forest & Environment.

28.4 Petty felling and Extraction:

Petty Felling and extraction for research and training needs may be allowed by Divisional Forest Officer on academic interest. It is necessary to emphasize the fact that experimental, preservation and sample plot, seed stand and their demarcated surrounds, etc. are excluded from all operations prescribed in the working plan. Special grants in exceptional circumstances for maintenance of these may be allowed, which do not cause much deviation.

28.5 Rights and Concessions:

At present Rights & Concessions those are allowed are

- i) Right of Way on Forest Blocks,
- ii) Collection of Non Timber Forest Produce as admissible in JFM Resolution-2011
- iii) Rights on Forest land either individual or Community to be allowed as per provisions of Forest Rights Act,2005 / Rules,2006

No other rights & concessions are allowed at this stage.



28.6 Other research and Bio Diversity study.

It is proposed to have a detail Biodiversity Study in Forest blocks of Gupteswar Range. Peoples Bio Diversity Register may be prepared with the help of Bio Diversity Board of the State. Steps for decraring Gupteswar RF as Bio Diversity Reserve as initiated are to be accelerated.





END OF PART-II



